

S P E C I F I C A T I O N S
FOR
NORTHERN KENTUCKY WATER DISTRICT

TAYLOR MILL
WATER TREATMENT PLANT
ADVANCED TREATMENT
IMPROVEMENTS
(Project No. 184-457)

March 2011

GOVERNING BODY

COMMISSIONERS:

ANDREW C. COLLINS - CHAIR
DOUG WAGNER - VICE-CHAIR
FRED MACKE, JR. - SECRETARY
JOE KOESTER - TREASURER
PAT SOMMERKAMP - COMMISSIONER
FRANK JACKSON - COMMISSIONER

RON LOVAN, PRESIDENT/CEO

COMPILED BY:

Malcolm Pirnie, Inc.
8600 Governor's Hill Drive, Suite 210
Cincinnati, OH 45249

GRW, INC.
801 Corporate Drive
Lexington, KY 40503

CDP Engineers
3250 Blazer Pkwy
Lexington, KY 40509

Strand Associates, Inc.
1525 Bull Lea Road, Suite 100
Lexington, KY 40511

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NORTHERN KENTUCKY WATER DISTRICT
TAYLOR MILL WATER TREATMENT PLANT
ADVANCED TREATMENT IMPROVEMENTS

PROJECT MANUAL VOLUME 1 OF 2

PROJECT NO. 184-457

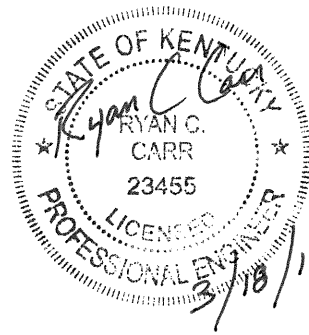
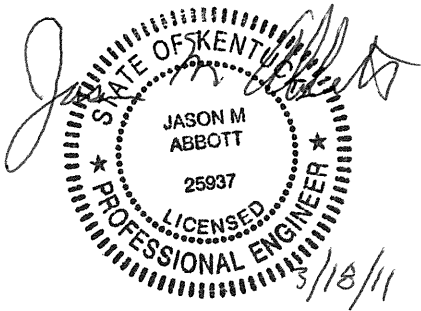
CERTIFICATIONS

Certification of the Engineers of Record

I hereby certify these documents were prepared by me, or under my direct personal supervision, and I am a duly Licensed Professional Engineer under the laws of the Commonwealth of Kentucky.

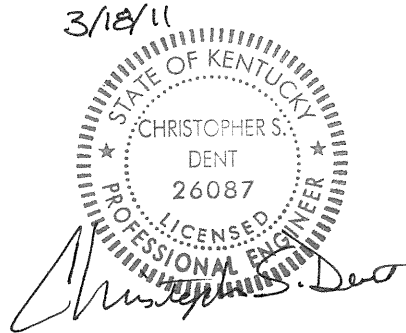
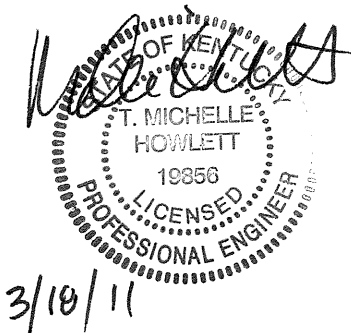
MALCOLM PIRNIE, INC.
Jason M. Abbott
KY PE Number: 25937

GRW, INC.
Ryan C. Carr
KY PE Number: 23455



CDP ENGINEERS
Teresa Michelle Howlett
KY PE Number: 19856

STRAND ASSOCIATES
Christopher S. Dent
KY PE Number: 26087



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Section 00020

ADVERTISEMENT TO BID

Date: March 24, 2011

PROJECT: Taylor Mill Water Treatment Plant Advanced Treatment Improvements

SEALED BIDS WILL BE RECEIVED AT:

Northern Kentucky Water District
2835 Crescent Springs Road
P.O. Box 18640
Erlanger, Kentucky 41018

UNTIL: Date: May 3, 2011
Time: 2:00 p.m., local time

At said place and time, and promptly thereafter, all Bids that have been duly received will be publicly opened and read aloud.

The proposed Work is generally described as follows:

1. Construction of Preliminary Treatment/Granular Activated Carbon (GAC) Building with rapid mix basin, flocculation basins, sedimentation basins, plate settling, residuals collection system and GAC pressure vessels;
2. Construction of a GAC Feed Pump Station;
3. Relocation of the existing UV system;
4. Installation of two back-up generators and various electrical improvements;
5. Demolition of existing flocculation basins, sedimentation basins, and tunnel structure;
6. General piping demolition, modifications, and new piping installation; and
7. Other miscellaneous work as indicated in the drawings or specifications.

All Bids must be in accordance with the Instructions to Bidders and Contract Documents on file, and available for examination at:

- Northern Kentucky Water District, 2835 Crescent Springs Road, Erlanger Kentucky, 41018, Attn: Amy Kramer, (859) 426-2734; or
- Malcolm Pirnie, Inc., 8600 Governor's Hill Drive, Suite 210, Cincinnati, Ohio, 45249, Attn: Carol Lovett, (513) 677-8380; or
- GRW, 801 Corporate Drives, Lexington, Kentucky, 40503, (859) 223-3999.

Copies of the Bidding Documents have also been provided to the following plan rooms:

- McGraw-Hill Construction Dodge, Kenwood Executive Center, 7265 Kenwood Road, Suite 202, Cincinnati, Ohio 45236, (513) 345-8218.
- Construction News (Allied Construction Industries), 3 Kovach Drive, Cincinnati, Ohio 45215, (513) 221-8020, ext 1010.
- Builders Exchange 9555 Rockslide Road, Suite 300, Valley View, Ohio 44125, (216) 393-6300.

- Reed Construction Data, 30 Technology Parkway South, Suite 500, Norcross, GA 30092, (800) 424-3996.

Copies of the Bidding Documents may be obtained by contacting Carol Lovett, (513) 677-8380 at Malcolm Pirnie. No documents may be picked up at this office.

Charges for all documents obtained will be made on the following basis:

Complete Set of Bidding Documents with Full Size Drawings	\$750.00
Complete Set of Bidding Documents with Half Size Drawings	\$675.00
Hard Copy of Geotechnical Reports	\$ 75.00

Checks for Bidding Documents shall be made payable to Malcolm Pirnie, Inc.

Documents will be shipped FedEx Ground unless requesting firm provides billing information for FedEx Overnight or UPS Overnight.

Neither the OWNER nor the ENGINEER will be responsible for full or partial sets of Bidding Documents, including any addenda, obtained from other sources. Return of the documents is not required and NONE OF THE AMOUNT CHARGED IS REFUNDABLE. Partial bid sets will not be available from the issuing office.

Bid security, in the form of a certified check or Bid Bond 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 Performance Bond and a Construction Payment Bond as security for the faithful performance of the project and the payment of all bills and obligations arising from the performance of the Contract.

The project advertised will be funded by the Kentucky Infrastructure Authority (KIA) through a Federally Assisted Drinking Water State Revolving Fund (DWSRF) Loan and Local Funds. The Successful Bidder must comply with the related DWSRF Loan requirements as detailed in the Bidding Documents.

All Bidders must comply with the President's Executive Order 11246 (EEO) as amended.

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 and 40 CFR, and 40 CFR 33.1016.

All Bidders, Contractors and Subcontractors must comply with 41 CFR 60-4, in regards 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 as applicable.

All Bidders must comply with OSHA (P.C. 91-596) and the Contract Work Hours and Safety Standards Act (P.E.91-54).

The Successful Bidder and all Subcontractors will be required to conform to the labor standards set forth in the Contract Documents. This project falls under the provisions of KRS 337.505 to 337.550 for prevailing wage rates.

All Prospective Bidders are strongly encouraged to attend a non-mandatory, Pre-bid conference for prospective Bidders on April 19, 2011 at 9:00 a.m. at the NKWD Central Facility located at 2835 Crescent Springs Road, Erlanger, Kentucky 41018. A site visit will follow at 10:30 a.m. at the Taylor Mill Water Treatment Plant located at 608 Grand Avenue, Taylor Mill, Kentucky 41015.

On request made at least 72-hours in advance, Owner will provide each Bidder access to the site to conduct such investigations and tests as each Bidder reasonably deems necessary for submission of a Bid. Arrangements for site visits shall be made by calling Mike Greer, Plant Supervisor, with the Northern Kentucky Water District at (859) 441-0763.

Minority Bidders are encouraged to bid and Bidders must employ good faith effort steps to solicit participation of disadvantaged business enterprises.

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 in accordance with the Bidding Documents, including without limitation Article 19, Award of Contract, specified in the Instructions to Bidders. In part, 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 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 to such an extent as may be determined by Owner.

Evaluation of Bids and the awarding of a final contract are also subject to the reciprocal preference for Kentucky resident bidders pursuant to KRS 45A.490 to 45A.494 and KAR 200 5:400, as well as the "Buy American" preference in accordance with Section 215 of the Clean Water Act (33 U.S.C. 1251 et seq.) and EPA regulations.

Richard Harrison
V.P. Engineering & Distribution
Northern Kentucky Water District

+ + END OF ADVERTISEMENT TO BID+ +

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Section 00100

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. *Issuing Office* – The office from which the Bidding Documents are to be issued and where the bidding procedures are to be administered.
- B. *Bidder* – The individual or entity who submits a Bid directly to Owner.
- C. *Successful Bidder* – The lowest responsible Bidder submitting a responsive Bid to whom Owner (on the basis of Owner's evaluation as hereinafter provided) makes an award.
- D. *Bid Submittal Document* – Separately bound set of documents which must be submitted in its entirety by the Bidder with its Bid and which includes the following:
 - a. Advertisement to Bid
 - b. Instructions to Bidders
 - c. Bid Form
 - d. Supplements to Bid Form
 - e. Affidavit For Claiming Resident Bidding Status
 - f. Bid Bond

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 Contract Documents.

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

3. QUALIFICATIONS OF BIDDERS. Each Bidder must submit with its bid an experience record form (Attachment #4 of Section 00301 – Supplement to Bid Form) with at least four projects listed that are similar to this project in size and scope. To further demonstrate qualifications to perform the Work, each Bidder must be prepared to submit within five days of Owner's request written evidence such as financial data, previous experience, present commitments, subcontractor capabilities or experience, 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 to be considered responsible Bidders will 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. If applicable, 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.

Each Bidder must be registered as a plan holder with the Issuing Office.

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 and appendices;
- b. 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 Engineer written notice of all conflicts, errors, ambiguities, or discrepancies that Bidder discovers in the Contract Documents and confirm that the written resolution thereof by Engineer 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.

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.

On request made at least 72 hours in advance, Owner will provide each Bidder access to the Site to conduct such explorations and tests as each Bidder reasonably deems necessary for submission of a Bid. Bidder shall fill all holes and clean up and restore the Site to its former condition upon completion of such explorations. Arrangements for Site visits shall be made by calling Mike Greer, Plant Supervisor, with the Northern Kentucky Water District at (859) 441-0763.

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 the specific means, methods, techniques, sequences or procedures of construction (if any) that may be shown or indicated or expressly required by the Contract Documents, the prevailing hourly wage rates for the area in which the Project is located, that Bidder has given Engineer prompt written notice of all conflicts, errors, ambiguities, and discrepancies that the Bidder has discovered in the Contract Documents, and the written resolution thereof by Engineer is 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. 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. Easements for permanent structures or permanent changes in existing facilities are to be obtained and paid for by Owner unless otherwise provided in the Contract Documents.

6. PREBID CONFERENCE. All prospective bidders are strongly encouraged to attend a non-mandatory prebid conference held on April 19, 2011 at 9:00 a.m. at the NKWD Central Facility located at 2835 Crescent Springs Road, Erlanger, Kentucky 41018. Following the prebid conference a site visit will be held at 10:30 a.m. at the Taylor Mill Water Treatment Plant located at 608 Grand Avenue, Taylor Mill, Kentucky 41015. Representatives of Owner and Engineer will be present to discuss the Project. Engineer will transmit to prospective Bidders of record such Addenda as Engineer considers necessary in response to questions arising at the conference. Oral statements may not be relied upon and will not be binding or legally effective.

7. INTERPRETATIONS AND ADDENDA. All questions about the meaning or intent of the Contract Documents are to be submitted to Engineer in writing via e-mail to Jason.Abbott@arcadis-us.com. Any interpretations or clarifications that are considered necessary by Engineer in response to such questions will be issued by Addenda mailed or delivered to all parties recorded by Engineer as having received the Contract Documents. Questions received less than seven days 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 Contract Documents as deemed advisable by Owner or Engineer.

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

8. BID SECURITY. Each Bid must be accompanied by Bid security made payable without condition to Owner in penal sum amount of 10 percent of Bidder's maximum Bid and in the form of a certified check or Bid Bond (on the form attached) issued by a surety meeting the requirements as set forth in the General Conditions and Supplementary Conditions.

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 (or incorporated therein by reference to the attached Bid Form).

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

12. SUBCONTRACTORS, SUPPLIERS, AND OTHERS. Each Bidder shall submit with its Bid the name of all such Subcontractors, Suppliers, and other individuals and organizations proposed for those portions of the Work for which such identification is required. The Bidder shall not substitute any such subcontractors, suppliers, or other individuals or organizations without the written consent of Owner and Engineer. If, after due investigation, Owner or Engineer has reasonable objection to any proposed Subcontractor, Supplier, or other individual or entity, Owner or Engineer may, before the Notice of Award is given, request the apparent Successful Bidder to submit an acceptable substitute without an increase in the Bid. If the apparent Successful Bidder declines to make any such substitution, Owner may award the Contract to another Bidder that proposes to use an acceptable Subcontractor, Supplier, or other individual or entity. Declining to make requested substitutions will not

constitute grounds for sacrificing the Bid security of any Bidder. Any Subcontractors, Suppliers, or other individual or entity to whom the Owner or Engineer does not make written objection prior to the giving of the Notice of Award will be deemed acceptable to Owner and Engineer subject to revocation of such acceptance as provided in the General Conditions. Preliminary acceptance of equipment listed by manufacturer's name shall not in any way constitute a waiver of the specifications covering such equipment; final acceptance will be based on full conformity with the Contract Documents. Any Bid conditioned on furnishing equipment or materials which are not responsive to the Contract Documents will be rejected.

13. PREPARATION OF BID. The Bid Form is included with the Contract Documents and the Bid prices must be entered therein.

All blanks on the Bid 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 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 general 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 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 Bid shall contain an acknowledgment of receipt of all Addenda, the numbers of which shall be filled in on the Bid form.

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

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 lump sum basis or unit price basis for each item of Work listed in the Bid Form. The lump sum price shall be based on the Work as indicated in the Contract Documents. The total of all estimated prices will be determined as the sum of the products of the estimated quantity of each item and the unit price Bid for the item. The final quantities and Contract Price will be determined in accordance with the General Conditions and as amended in the Supplementary Conditions and as outlined in Article 19 below.

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.

15. SUBMITTAL OF BID. A Bid shall be submitted no later than the date and time prescribed and at the place indicated in the advertisement or Invitation to Bid and shall be enclosed in an opaque sealed envelope plainly marked with the Project title (and, if applicable, the designated portion of the Project for which the Bid is submitted), the name and address of Bidder, and shall be accompanied by the Bid security and other required documents. If a Bid is sent by mail or other delivery system, the sealed envelope containing the Bid shall be enclosed in a separate envelope plainly marked on the outside with the notation "Bid Enclosed".

Bids shall be addressed to Owner at:

Northern Kentucky Water District
2835 Crescent Springs Road
P.O. Box 18640
Erlanger, Kentucky 41018

The bound copy of the Bid Submittal Document that includes the Bid Form and Supplements to Bid Form are to be completed and submitted with the Bid Security and the following data:

1. Certification Regarding Debarment, Suspension and Other Responsibilities (EPA Form 5700-49).

2. Certification Regarding Lobbying, Certification for Contracts, Grants, Loans and Cooperative Agreements.
3. Non-Collusion Affidavit.
4. Affidavit for Bidders, Offerors, and Contractors Claiming Kentucky Resident Bidder Status
5. Bidder's Qualifications.
6. Bidder's Experience Record.
7. Proposed List of Subcontractors.
8. Proposed Major Equipment Manufacturers.

Bidder shall assume full responsibility for timely delivery at the location designated for receipt of Bids. Bids received after the time and date for receipt of Bids may be returned unopened. Oral, telephone, facsimile, or telegraph Bids are invalid and will not receive consideration.

16. MODIFICATION AND WITHDRAWAL OF BIDS. A Bid may be modified or withdrawn by an appropriate document duly executed in the manner that a Bid must be executed and delivered to the place where Bids are to be submitted prior to the date and time for the opening of Bids. 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, (ia) 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 (iib) 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 at the time and place indicated in the Invitation to Bid and, unless obviously non-responsive, read aloud publicly. An abstract of the amounts of the base Bids and major alternates, if any, will be made available to Bidders after the opening of Bids.

18. BIDS TO REMAIN SUBJECT TO ACCEPTANCE. All Bids will remain subject to acceptance for the period of time stated in the Bid form, but Owner may, in its sole discretion, release any Bid and return the Bid security prior to the end of this period. If the Contract is to be awarded, Owner will give Successful Bidder a Notice of Award within the number of days stated in the Bid Form. Should there be any reasons why the Contract

cannot be awarded within the specified period, the time may be extended in writing by mutual agreement between the Owner and the Bidder.

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 informalities not involving price, time, or changes in the Work and to negotiate with the apparent Successful Bidder 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 must be submitted. Owner may also consider operating costs, maintenance requirements, performance data, and guarantees of major items of materials and equipment proposed for incorporation in the Work when such data are required to be submitted prior to the Notice of Award.
- c. If the Bidder maintains a permanent place of business.
- d. If the Bidder has adequate personnel, plant 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. If the Bidder has filed for bankruptcy.
- i. The amount of the total Base Bid, exclusive of any additive or deductive alternates, if applicable. Any alternates will be considered after selection of the lowest total Base Bid. Each alternate 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 and insurance certificates.

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 the Successful Bidder.

22. RETAINAGE. Provisions concerning retainage are set forth in the Agreement.

23. DRINKING WATER STATE REVOLVING FUND LOAN. A portion of the funding for this project comes 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. 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 bid Opening or within 5 days of the formal request to do so, whichever is greater. 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 include:

- A. EPA Form 6100-2, DBE Subcontractor Participation (Attachment 12- Section 00810).
- B. EPA Form 6100-3, DBE Subcontractor Performance (Attachment 12-Section 00810).
- C. EPA Form 6100-4 DBE Subcontractor Utilization (Attachment 12-Section 00810).
- D. Disadvantage Enterprise Participation Policy (Attachment 12-Section 00810).
- E. List of DBE Bidders of Subcontractors (Attachment 12-Section 00810).

24. "BUY AMERICAN" PROVISION. In accordance with Section 215 of the Clean Water Act (33 U.S.C. 1251 et seq.) and implementing EPA regulations, the Contractor agrees that preference will be given to domestic construction materials by the Contractor, subcontractors, materialmen and suppliers in the performance of the Work.

++ END OF SECTION ++

BID FORM

Taylor Mill Water Treatment Plant Advanced Treatment Improvements

(Project No. 184-457)

TABLE OF ARTICLES

1. Bid Recipient
2. Bidder's Acknowledgements
3. Bidder's Representations
4. Basis of Bid
5. Time of Completion
6. Attachments to this Bid
7. Defined Terms
8. Bid Submittal

ARTICLE 1 - BID RECIPIENT

1.01 This Bid is submitted to:

Northern Kentucky Water District
2835 Crescent Springs Road
P.O. Box 18640
Erlanger, Kentucky 41018

1.02 The undersigned Bidder proposes and agrees, if this Bid is accepted, to enter into an Agreement with Owner in the form included in the Bidding Documents to perform all Work as specified or indicated in the Bidding Documents for the price(s) and within the times indicated in this Bid and in accordance with the Bidding Documents.

ARTICLE 2 - BIDDER'S ACKNOWLEDGEMENTS

2.01 Bidder accepts all of the terms and conditions of the Advertisement or Invitation to Bid and Instructions to Bidders, including without limitation those dealing with the disposition of Bid security. This Bid will remain subject to acceptance for 120 days after the Bid opening, or for such longer period of time that Bidder may agree to in writing upon request of Owner. Bidder will sign the Agreement and will furnish the required contract security, and other required documents within the time periods set forth in the Bidding Documents.

ARTICLE 3 - BIDDER'S REPRESENTATIONS

3.01 In submitting this Bid, Bidder represents that:

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

Addendum No.	Date Received	Addendum No.	Date Received
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

- 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 carefully studied all: (1) reports of explorations and tests of subsurface conditions at or contiguous to the Site and all drawings of physical conditions in or relating to existing surface or subsurface structures at or contiguous to the Site (except Underground Facilities) which have been identified in the Supplementary Conditions as provided in Paragraph 4.02 of the General Conditions, and (2) reports and drawings of Hazardous Environmental Conditions identified at the Site, if any, which that have been identified in the Supplementary Conditions as provided in Paragraph 4.06 of the General Conditions.
- E. Bidder has obtained and carefully studied (or accepts the consequences for not doing so) all additional or supplementary examinations, investigations, explorations, tests, studies and data concerning conditions (surface, subsurface and Underground Facilities) at or contiguous to the Site which may effect cost, progress or performance of the Work or which relate to any aspect of the means, methods, techniques, sequences and procedures of construction to be employed by Bidder, including applying the specific means, methods, techniques, sequences, and procedures of construction expressly required by the Bidding Documents to be employed by Bidder, and safety precautions and programs incident thereto.

- F. Bidder does not consider that any further examinations, investigations, explorations, tests, studies or data are necessary for the determination of this Bid for performance of the Work at the price(s) bid and within the times and in accordance with the other terms and conditions of the Bidding Documents.
- G. Bidder is aware of the general nature of work (if any) to be performed by Owner and others at the Site that relates to the Work as indicated in the Bidding Documents.
- H. Bidder has correlated the information known to Bidder, information and observations obtained from visits to the Site, reports and drawings identified in the Bidding Documents, and all additional examinations, investigations, explorations, tests, studies and data with the Bidding Documents.
- I. Bidder has given Engineer written notice of all conflicts, errors, ambiguities, or discrepancies that Bidder has discovered in the Bidding Documents, and the written resolution thereof by Engineer is acceptable to Bidder.
- J. The Bidding Documents are generally sufficient to indicate and convey understanding of all terms and conditions for the performance of the Work for which this Bid is submitted.

K. [Check the one that applies]

_____ Bidder is a “resident bidder” as defined in KRS 45A.494(2) of Kentucky’s resident bidder reciprocal preference statute AND submits with this Bid a properly executed and notarized Affidavit that affirms that Bidder meets the resident bidder criteria, which Affidavit is hereby incorporated herein and made a part of this Bid.

OR

_____ Bidder is a “nonresident bidder” as defined in KRS 45A.494(3) of Kentucky’s resident bidder reciprocal preference statute AND its principal place of business as identified its Certificate of Authority to transact business in Kentucky as filed with Kentucky’s Secretary of State or, if Bidder hereby represents and covenants that it is not required to obtain a Certificate of Authority to transact business in Kentucky, its mailing address, is:

L. 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.

3.02 Bidder further represents that:

- A. This Bid is genuine and is 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;
- B. 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;
- C. Bidder has not sought by collusion to obtain for itself any advantage over any other Bidder or over Owner; and
- D. No person or persons acting in any official capacity for the Owner are directly or indirectly interested in this Bid, or in any portion of the profit thereof.

ARTICLE 4 - BASIS OF BID

4.01 Bidder will complete the Work in accordance with the Contract Documents for the following price(s). Amounts will be shown in both words and figures. In case of discrepancy, the amount in words will govern. Unit prices have been computed in accordance with Paragraph 11.03.B of the General Conditions.

All specified cash allowances are included in the price(s) set forth below and have been computed in accordance with Paragraph 11.02 of the General Conditions.

Bidder acknowledges that estimated quantities of items of Unit Price Work are not guaranteed and are solely for the purpose of comparison of Bids, and final payment for all Unit Price items will be based on actual quantities of Unit Price Work, determined as provided in the Contract Documents.

Note: The quantities for the Unit Price items are unpredictable and the Engineer has inserted certain quantities in the proposal to be used solely for the purpose of comparison of the Bids. The Bidder shall not be entitled to any adjustment in the contract Unit Price bid items as a result of changes in any of these items from zero to any quantity. The Bidder shall make no claims for anticipated profits, or loss of profits, or for other damages as a result of changes in the quantities purchased.

Base Bid Item Description	Estimated Quantities	Computed Totals
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Item 1 – For General Construction of
Taylor Mill Water Treatment Plant
Advanced Treatment Improvements

_____ Dollars and	Lump Sum	\$ _____
_____ Cents.		

Item 2 – For Drilled Concrete Piers
(3'-0" Diameter)

_____ Dollars and	5,400 VF	\$ _____
_____ Cents per		
Vertical foot. (\$ _____) per VF		

Item 3 – Computer Hardware /
Software Allowance

Lump Sum	\$ <u>35,000</u>
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Item 4 – Contingency Allowance

Lump Sum	\$ <u>100,000</u>
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TOTAL BASE BID AMOUNT

_____ Dollars and	
(words)	
_____ Cents (\$ _____)	(numerals)

4.02 ALTERNATE BID SCHEDULE

- A. The following is included for the Bidder to provide a lump sum amount for the addition or deletion of certain Work, if desired by the Owner. All Bidders are required to complete this portion of the Bid Form.
- B. Bidder shall enter an amount for each Alternative and also must indicate whether the Alternative is an ADD or DEDUCT by circling the word which does apply and crossing out the word which does not apply. If no amount is entered, Bidder agrees to perform Alternative at no change in cost. If neither ADD or DEDUCT is identified as stated herein, the Bidder agrees to do the Work described in the Alternative as a DEDUCT.
- C. ALTERNATE NO. 1 - SKY LIGHT ACCESS ON GAC FEED PUMP STATION

Bidder shall indicate the amount of monies to be ADDED/DEDUCTED from its Bid for Alternative No. 1, should the OWNER decide to accept Alternative No. 1 as described in Section 01230, Alternatives.

No extension of time will be granted if this Alternate is accepted.

For Alternative No. 1, ADD / DEDUCT the lump sum of _____
_____ Dollars and _____ Cents
(words)
(\$ _____).
(numerals)

- D. ALTERNATE NO. 2 – DUKE ENERGY ONE TO CONSTRUCT 69 KV TRANSMISSION SUBSTATION

Bidder shall indicate the amount of monies to be ADDED/DEDUCTED from its Bid for Alternative No. 2, should the OWNER decide to accept Alternative No. 2 as described in Section 01230, Alternatives.

No extension of time will be granted if this Alternate is accepted.

For Alternative No. 2, ADD / DEDUCT the lump sum of _____
_____ Dollars and _____ Cents
(words)
(\$ _____).
(numerals)

E. ALTERNATE NO. 3 – DUKE ENERGY ONE TO DEMOLISH THE EXISTING ELECTRICAL SUBSTATION

Bidder shall indicate the amount of monies to be ADDED/DEDUCTED from its Bid for Alternative No. 3, should the OWNER decide to accept Alternative No. 3 as described in Section 01230, Alternatives.

No extension of time will be granted if this Alternate is accepted.

For Alternative No. 3, ADD / DEDUCT the lump sum of _____ Dollars and _____ Cents
(words)
(\$ _____).
(numerals)

F. ALTERNATE NO.4 – 732 DAYS FOR SUBSTANTIAL COMPLETION

Bidder shall indicate the amount of monies to be ADDED/DEDUCTED from its Bid for Alternative No. 4, should the OWNER decide to accept Alternative No. 4 as described in Section 01230, Alternatives.

The date of Substantial Completion shall be reduced to 732 days if this Alternate is accepted.

For Alternative No. 4, ADD / DEDUCT the lump sum of _____ Dollars and _____ Cents
(words)
(\$ _____).

ARTICLE 5 - TIME OF COMPLETION

- 5.01 Bidder agrees that the Work will be substantially complete and completed and ready for final payment in accordance with Paragraph 14.07.B of the General Conditions on or before the dates or within the number of calendar days indicated in the Agreement.
- 5.02 Bidder accepts the provisions of the Agreement as to liquidated damages, including Paragraph 4.03.A of the Agreement, in the event of failure to complete the Work within the required Contract Times.

ARTICLE 6 - ATTACHMENTS TO THIS BID

- 6.01 The following documents are attached to and made a condition of this Bid:
- A. Required Bid security in the form of Bid Bond.
 - B. Certification Regarding Debarment, Suspension and Other Responsibilities (EPA Form 5700-49)
 - C. Certification Regarding Lobbying, Certification for Contracts, Grants, Loans and Cooperative Agreements
 - D. Non-Collusion Affidavit of Prime Bidder
 - E. Affidavit for Bidders, Offerors, and Contractors Claiming Kentucky Resident Bidder Status
 - F. Statement of Bidder's Qualifications
 - G. Bidders Experience Record
 - H. Proposed Subcontractors
 - I. Proposed Major Equipment Manufacturers

ARTICLE 7 - DEFINED TERMS

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

ARTICLE 8 - BID SUBMITTAL

- 8.01 This Bid submitted on _____, 20__ by:

If Bidder is:

An Individual

Name (Typed or Printed): _____

By: _____
(Individual's Signature)

Doing business as _____

License or Registration Number: _____

Business Address: _____

Phone No.: _____ Facsimile: _____

A Partnership

Partnership Name: _____

By: _____
(Signature of General Partner - Attach evidence of authority to sign)

(Name (Typed or Printed): _____

License or Registration Number: _____

Business Address: _____

Phone No.: _____ Facsimile: _____

A Corporation

Corporation Name: _____

(State of Incorporation)

By: _____

(Signature - Attach evidence of authority to sign)

Name and Title (Typed or Printed): _____

(CORPORATE
SEAL)

Attest: _____

(Secretary)

License or Registration Number: _____

Business Address: _____

Phone No.: _____ Facsimile: _____

Limited Liability Company

By: _____

(Firm Name)

(State of Formation)

By: _____

(Signature of Member or Manager/Authorized to Sign)

(Printed or Typed Name and Title of Member or Manager Authorized to Sign)
(Attach evidence of authority to sign)

License or Registration Number: _____

Business Address: _____

Phone No.: _____ Facsimile: _____

A Joint Venture

Name of Joint Venture: _____

First Joint Venturer Name: _____

By: _____

(Signature of First Joint Venturer - Attach evidence of authority to sign)

Name (Typed or Printed): _____

(Title)

Title: _____

Second Joint Venturer Name: _____

By: _____

(Signature of Second Joint Venturer - Attach evidence of authority to sign)

Name (Typed or Printed): _____

(Title)

(Each joint venturer must sign. The manner of signing for each individual, partnership, corporation or limited liability company that is a party to the joint venture shall be in the manner indicated above).

Business Address: _____

Phone and Fax number and address for receipt of communications to joint venture:

Phone: _____ Facsimile: _____

++ END OF BID FORM ++

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SECTION 00301

SUPPLEMENTS TO BID FORM

1. FORMS TO BE SUBMITTED WITH BID

- A. Certification Regarding Debarment, Suspension and Other Matters—EPA Form 5700-49 (Attachment No. 1)
- B. Certification Regarding Lobbying (Attachment No. 2)
- C. Non-Collusion Affidavit from Bidder (Attachment No. 3)
- D. Bidder's Qualifications (Attachment No. 4)
- E. Bidder's Experience Record (Attachment No. 5)
- F. Proposed List of Subcontractors (Attachment No. 6)
- G. Proposed Major Equipment Manufacturers (Attachment No. 7)
- H. Affidavit for Bidders, Offerors, and Contractors Claiming Kentucky Resident Bidder Status (Specification Section 00302)
- I. Bid Security (Specification Section 00435)

2. FORMS TO BE SUBMITTED WITHIN 7 DAYS OF BID OPENING

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 Bid Opening or within 5 days of the formal request to do so, whichever is greater. 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 include:

- A. EPA Form 6100-2 DBE Participation (Attachment 12 – Section 00810)
- B. EPA Form 6100-3 DBE Subcontractor Performance (Attachment 12 – Section 00810)
- C. EPA Form 6100-4 DBE Subcontractor Utilization (Attachment 12 – Section 00810)
- D. Disadvantage Enterprise Participation Policy (Attachment 12 – Section 00810)
- E. List of DBE Bidders of Subcontracts (Attachment 12 – Section 00810)

EPA Form 5700-49
CERTIFICATION REGARDING DEBARMENT, SUSPENSION AND OTHER SPONSIBILITIES
Attachment Number 1

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 participation in this transaction by any Federal department or agency;
- (B) Have not within a three-year period preceding this certification been convicted of or had a civil judgment rendered for commission of fraud of 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 governmental 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 certification 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 ground 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
Attachment Number 2**

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

- (1) No Federal appropriate 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 appropriate 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.

NON-COLLUSION AFFIDAVIT OF PRIME BIDDER
Attachment Number 3

STATE OF _____

COUNTY OF _____

- (1) He/She is _____
(OWNER, PARTNER, REPRESENTATIVE OR AGENT)
of, _____ the Bidder that has submitted the attached bid;
- (2) He/She is fully informed respecting the preparation and contents of the attached Bid and of all pertinent circumstances respecting such Bid;
- (3) Such Bid is genuine and is not a collusive or sham Bid;
- (4) Neither the said Bidder nor any of its officers, partners, owners, agents or representatives, employees or parties in interest, including the affinity has in any way colluded, conspired, connived or agree, directly or indirectly with any other bidder, firm or person to submit a collusive or sham Bid in connection with the Contract for which the attached Bid has been submitted or to refrain from bidding in connection with such Contract, or has in any manner, directly or indirectly, sought by agreement or collusion or communication or conference with any other bidder, firm or person to fix the price or prices in the attached Bid or of any other Bidder, or to fix any overhead, profit or cost element of the Bid price or the Bid price of any other bidder, or to secure through any collusion, conspiracy, connivance or unlawful agreement any advantage against the Owner of the Project or any person interested in the proposed Contract; and
- (5) The price or prices quoted in the attached Bid are fair and proper and are not tainted by any collusion, conspiracy, connivance or unlawful agreement on the part of the Bidder or any of its agents, representatives, owners, employees or parties, including this affiant.

SIGNED _____

TITLE _____

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

(NAME)

(TITLE)

MY COMMISSION EXPIRES: _____

.

STATEMENT OF BIDDER'S QUALIFICATIONS
Attachment Number 4

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 Bidder is a joint venture, submit previous 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 (general contractor, electrical contractor, etc.).
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 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

STATEMENT OF BIDDER'S QUALIFICATIONS
Attachment Number 4
Continued

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 _____, of this year

NAME OF BIDDER

BY _____

TITLE _____

STATE OF _____

COUNTY OF _____

_____ being duly sworn deposes and says that he 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 _____

BIDDERS EXPERIENCE RECORD
Attachment Number 5
 (PROJECTS NEED TO BE OF SIMILAR SIZE AND NATURE)

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

**ATTACHMENT NO. 6
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 for rejection of the Bid.

Branch of Work	Name of Subcontractor
1. Excavation & Grading	
2. Concrete Work	
3. Masonry	
4. Electrical	
5. Panel Fabricator	
6. Instrumentation & Controls	
7. Mechanical	

**ATTACHMENT NO. 7
PROPOSED MAJOR EQUIPMENT MANUFACTURERS**

The BIDDER'S proposed major equipment manufacturers included in its Base Bid price shall be listed below for the requested items. **For the purposes of determining low Bidder, the Bidder shall include only manufacturers named in the specifications. Substitute or "or equal" manufacturer's will be considered after the Bid.** The OWNER reserves the right to reject any equipment manufacturers not listed in the Specifications. **Unless rejected or otherwise permitted by the OWNER, no substitutions or changes to this list of the major equipment manufacturers will be allowed after opening of the Bids.**

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

Major Equipment Item	Name of Manufacturer
1. Vertical Turbine Flocculation Equipment	
2. Inclined Plate Settlers	
3. Sedimentation Basin Equipment	
4. Vertical Turbine Pumps – GAC Feed Pumps	
5. Granular Activated Carbon Pressure Vessels	
6. Granular Activated Carbon Filter Media	
7. Diesel Engine Generators	
8. Vegetative Roof	
9. Desiccant Dehumidifier	
10. Medium Voltage Motor Control	
11. Medium Voltage Switch Gear	

++ END OF SUPPLEMENTS TO BID FORM ++

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Bid Description: Taylor Mill Treatment Plant Advanced Treatment Improvements

REQUIRED NOTARIZED AFFIDAVIT FOR BIDDERS, OFFERORS AND CONTRACTORS CLAIMING KENTUCKY RESIDENT BIDDER STATUS

FOR BIDS AND CONTRACTS IN GENERAL:

The bidder or offeror hereby swears and affirms under penalty of perjury that, in accordance with KRS 45A.494(2), the entity bidding is an individual, partnership, association, corporation, or other business entity that, on the date the contract was first advertised or announced as available for bidding:

- 1. Is authorized to transact business in the Commonwealth of Kentucky; AND
- 2. Has for one year prior to and through the date this contract was first advertised or announced as available for bidding:
 - a. Filed Kentucky corporate income taxes;
 - b. Made payments to the Kentucky unemployment insurance fund established in KRS 341.490; and
 - c. Maintained a Kentucky workers' compensation policy in effect.

The undersigned acknowledges that the District reserves the right to request documentation supporting a bidder's claim of resident bidder status. Failure to provide such documentation upon request shall result in disqualification of the bidder or contract termination.

 Signature

 Printed Name

 Title (if signing on behalf of an entity)

 Date

State of _____
)
)ss.

County of _____
)

Subscribed and sworn to before me by _____, as the _____, of _____, this _____ day of _____, 2011.

 Notary-at-Large
 My comm. exp.: _____

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SECTION 00435

BID BOND
(Damages Form)

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

BIDDER (Name and Address):

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

OWNER:

Northern Kentucky Water District
2835 Crescent Springs Road
Erlanger, Kentucky 41018

BID:

Bid Due Date: _____

PROJECT:

Taylor Mill Water Treatment Plant
Advanced Treatment Improvements (Project No. 184-457)
608 Grand Ave.
Taylor Mill, KY 41015

BOND:

Bond Number: _____

Date: (Not later than Bid due date): _____

Penal Sum: _____
(Words) (Figures)

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

BIDDER

SURETY

_____(Seal)
Bidder's Name and Corporate Seal

_____(Seal)
Surety's Name and Corporate Seal

By: _____
Signature and Title

By: _____
Signature and Title
(Attach Power of Attorney)

Attest: _____
Signature and Title

Attest: _____
Signature and Title

-
- Notes: (1) Above addresses are to be used for giving required notice.
(2) Adapted from EJCDC No. C-435 (2002 Edition).

1.0 Bidder and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors and assigns to pay to Owner upon default of Bidder any difference between the total amount of Bidder's Base Bid and the total amount of the Bid of the next lowest, responsible Bidder who submitted a responsive Bid as determined by Owner for the Work required by the Bidding Documents, provided that:

1.1 If there is no such next Bidder, and Owner does not abandon the Project, then Bidder and Surety shall pay to Owner the penal sum set forth on the face of this Bond, and

1.2 In no event shall Bidder's and Surety's obligation hereunder exceed the penal sum set forth on the face of this Bond.

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

3.0 This obligation shall be null and void if:

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

3.2 All Bids are rejected by Owner, or

3.3 Owner fails to issue a Notice of Award to Bidder within the time specified in the Bidding Documents (or any extension thereof agreed to in writing by Bidder and, if applicable, consented to by Surety when required by Paragraph 5.0 hereof).

4.0 Payment under this Bond will be due and payable upon default by Bidder and within 30 calendar days after receipt by

Bidder and Surety of written notice of default from Owner, which notice will be given with reasonable promptness, identifying this Bond and the Project and including a statement of the amount due.

5.0 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.

6.0 No suit or action shall be commenced under this Bond prior to 30 calendar days after the notice of default required in Paragraph 4.0 above is received by Bidder and Surety and in no case later than one year after Bid due date.

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

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

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

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

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

++END OF BID BOND++

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Section 00500

AGREEMENT

THIS AGREEMENT is dated as of the _____ day of _____ in the year _____, by and between the Northern Kentucky Water District, 2835 Crescent Springs Road, Erlanger, Kentucky 41018 (hereinafter called Owner) and _____
(hereinafter called Contractor).

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

ARTICLE 1 - WORK

1.01 Contractor shall at its own cost and expense furnish all labor, services, tools, materials, equipment and incidentals necessary to complete all Work as specified or indicated in the Contract Documents to construct the Taylor Mill Water Treatment Plant Advanced Treatment Improvements project. The Work is generally described in Section 01110, Summary of Work and alternatives described in section 01230, Alternatives.

ARTICLE 2 - PROJECT

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

Taylor Mill Water Treatment Plant Advanced Treatment Improvements.

ARTICLE 3 - ENGINEER

3.01 The Project has been designed by Malcolm Pirnie Inc., (Engineer), who is to perform duties assigned to Engineer in the Supplementary Conditions in connection with the completion of the Work in accordance with the Contract Documents.

3.02 The Project Construction Administration will be performed by the Owner. As the Construction Contract Administrator, the Owner assumes all duties and responsibilities, and has the rights and authority assigned to the Construction Contract Administrator in the Contract Documents in connection with the completion of the Work in accordance with the Contract Documents.

ARTICLE 4 - CONTRACT TIMES

4.01 Time of the Essence

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

4.02 Days to Achieve Substantial Completion and Final Payment

- A. The Work will be substantially completed within 946 days after the date when the Contract Times commence to run as provided in Paragraph 2.03 of the General Conditions, and completed and ready for final payment in accordance with Paragraph 14.07 of the General Conditions within 1007 days from the date when the Contract Times commence to run.

4.03 Liquidated Damages

- A. 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 4.02.A 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 \$1,500.00 for each day that expires after the time specified in paragraph 4.02.A 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) \$1,000.00 for each day that expires after the time specified in paragraph 4.02.A for completion and readiness for final payment until the Work is completed and ready for final payment.

In addition to any other remedies available at law or equity or under the Contract Documents 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.

4.04 Delays and Damages

- A. 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 the General Conditions and Supplementary Conditions. Owner shall not be responsible or liable for any acceleration costs or damages.

ARTICLE 5 - CONTRACT PRICE

- 5.01 Owner shall pay Contractor, in current funds, for completion of the Work in accordance with the Contract Documents. All specific cash allowances are included in the above price and have been computed in accordance with Paragraph 11.02 of the General Conditions.

Total Contract Amount for Base Bid Work including allowances, a sum of:

_____ Dollars and
 _____ (words)
 _____ Cents (\$ _____).
 _____ (numerals)

The above Contract amount reflects Owner's adoption or not adoption of the following alternates:

1. ALTERNATE NO. 1 - SKY LIGHT ACCESS ON GAC FEED PUMP STATION

Circle one: ADOPTED : NOT ADOPTED

2. ALTERNATE NO. 2 – DUKE ENERGY ONE TO CONSTRUCT 69 KV TRANSMISSION SUBSTATION

Circle one: ADOPTED : NOT ADOPTED

3. ALTERNATE NO. 3 – DUKE ENERGY ONE TO DEMOLISH THE EXISTING ELECTRICAL SUBSTATION

Circle one: ADOPTED : NOT ADOPTED

4. ALTERNATE NO. 4 – 732 DAYS FOR SUBSTANTIAL COMPLETION

Circle one: ADOPTED : NOT ADOPTED

ARTICLE 6 - PAYMENT PROCEDURES

6.01 Submittal and Processing of Payments

- A. Contractor shall submit Applications for Payment in accordance with Article 14 of the General Conditions. Applications for Payment will be processed as provided in the General Conditions.

6.02 Progress Payments and Retainage

- A. Owner shall make monthly progress payments on account of the Contract Price on the basis of Contractor's Applications for Payment as recommended by Engineer. All progress payments will be on the basis of the progress of the Work measured by the schedule of values provided for in Paragraph 2.07.A of the General Conditions (and in the case of Unit Price Work, based on the number of units completed) or, in the event there is no schedule of values, as provided in the General Requirements.
 - 1. Retainage. In addition to any amounts withheld from payment in accordance with Paragraph 14.02 of the General Conditions, Owner shall retain from progress payments amounts equal to the following percentages:
 - a. Ten percent 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 Complete; and

- b. Ten percent 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 14.02.A.1 of the General Conditions.
2. Subject to any rights of setoff or similar rights granted to Owner under the Contract Documents or at law all retainage will be paid to Contractor when the Work is completed and ready for final payment in accordance with paragraph 14.07.C 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.

6.03 Final Payment:

- A. Upon final completion and acceptance of the Work in accordance with Paragraph 14.07 of the General Conditions, Owner shall pay the remainder of the Contract Price as recommended by Engineer as provided in said Paragraph 14.07.

ARTICLE 7 – INTEREST – (NOT USED)

ARTICLE 8 - CONTRACTOR'S REPRESENTATIONS

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

- E. Contractor has obtained and carefully studied (or assumes responsibility for having done so) all additional or supplementary examinations, investigations, explorations, tests, studies and data concerning conditions (surface, subsurface and Underground Facilities) at or contiguous to the Site which may effect 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 expressly required by the Contract Documents to be employed by Contractor, and safety precautions and programs incident thereto.
- F. Contractor does not consider that any further examinations, investigations, explorations, tests, studies or data are necessary for the performance of the Work at the Contract Price, within the Contract Times and in accordance with the other terms and conditions of the Contract Documents.
- G. Contractor is aware of the general nature of work to be performed by Owner and others at the Site that relates to the Work as indicated in the Contract Documents.
- H. Contractor has correlated the information known to Contractor, information and observations obtained from visits to the Site, reports and drawings identified in the Contract Documents and all additional examinations, investigations, explorations, tests, studies and data with the Contract Documents.
- I. Contractor has given Engineer written notice of all conflicts, errors, ambiguities, or discrepancies that Contractor has discovered in the Contract Documents and the written resolution thereof by Engineer is acceptable to Contractor.
- J. The Contract Documents are generally sufficient to indicate and convey understanding of all terms and conditions for the performance of the Work.
- K. All representations and warranties of the Contractor contained in the Contract Documents are true and accurate in all material respects and Contractor shall indemnify and hold harmless Owner, Engineer and all officers, commissioners, employees and agents from all losses, damages, liabilities, expenses and the like including reasonable attorney's fees incurred as a result of any failure of truth or accuracy.

ARTICLE 9 - CONTRACT DOCUMENTS

9.01 The Contract Documents consist of the following:

- A. This Agreement (10 pages).

- B. Performance Bond (2 pages).
 - C. Payment Bond (4 pages).
 - D. General Conditions (74 pages).
 - E. Supplementary Conditions (32 pages).
 - F. Supplemental Conditions for State Revolving Fund EPA Special Appropriations Grants (60 pages).
 - G. Wage Rates (18 pages)
 - H. Specifications, as listed in the table of contents of the Project Manual.
 - I. The Drawings comprising a set entitled “Taylor Mill Water Treatment Plant Advanced Treatment Improvements”, dated March 2011.
 - J. Addenda consisting of Numbers____ to _____, inclusive.
 - K. Exhibits to the Agreement enumerated as follows:
 - 1. Contractor’s Bid including Supplements to Bid Form (pages _____ to _____, inclusive).
 - L. The following, which may be delivered or issued on or after the Effective Date of the Agreement, and are not attached hereto:
 - 1. Notice to Proceed
 - 2. Work Change Directives
 - 3. Change Order(s)
- 9.02 The documents listed in Paragraph 9.01 above are attached to this Agreement (except as expressly noted otherwise above). Documents not attached are incorporated by reference. There are no Contract Documents other than those listed in this Article 9.
- 9.03 The Contract Documents may only be amended or supplemented as provided in Paragraph 3.04 of the General Conditions.

ARTICLE 10 – COMPLIANCE WITH KENTUCKY LAW

10.01 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 11 – EQUAL OPPORTUNITY

11.01 Unless exempted under KRS 45.590, during the performance of this Agreement, 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 12 - MISCELLANEOUS

12.01 Terms

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

12.02 Assignment of Contract

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

12.03 Successors and Assigns

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

12.04 Severability

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

12.05 Waiver

- A. The waiver by the Owner of any breach or violation of any term, covenant, or condition of this Agreement or of any Law or Regulation shall not be deemed to be a waiver of any other term, covenant, condition, or Law or Regulation or of any subsequent breach or violation of the same or of any other term, covenant, condition, or Law or Regulation. The subsequent payment of any monies or fee by the Owner which may become due hereunder shall not be deemed to be a waiver of any preceding breach or violation by Contractor of any term, covenant, condition of this Agreement or of any applicable Law or Regulation.

IN WITNESS WHEREOF, Owner and Contractor have signed this Agreement on the day and year first written above.

This Agreement will be effective on _____, 20____ (which is the Effective Date of the Agreement).

Owner: _____ Contractor: _____

Signature: _____ Signature: _____

Name: _____ Name: _____

Title: _____ Title: _____

[CORPORATE SEAL]

[CORPORATE SEAL]

Attest _____

Attest _____

Title: _____

Title: _____

Address for giving notices

Address for giving notices

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

License No. _____
(where applicable)

Agent for service of process: _____

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

Designated Representative:

Designated Representative:

Signature: _____

Signature: _____

Name: _____

Name: _____

Title: _____

Title: _____

Address: _____

Address: _____

Phone No.: _____

Phone No.: _____

Fax No.: _____

Fax No.: _____

++END OF AGREEMENT++

(This page was left blank intentionally.)

NOTICE OF INTENT TO AWARD

To: Contractor: _____ Date: _____, 20____
Street:
City, State, Zip Code:

Description of Work:

Construction of the Taylor Mill Water Treatment Plant Advanced Treatment Improvements Project consisting of Preliminary Treatment/Granular Activated Carbon (GAC) Building with rapid mix basins, flocculation basins, sedimentation basins, plate settlers, residuals collection system and GAC pressure vessels. Construction of a GAC feed pump station. Relocation of the existing UV system. Installation of an electrical substation and two backup generators. Demolition of existing flocculation basins, sedimentation basins and tunnel structure. General piping demolition, modifications, new piping installation and all other miscellaneous work as indicated in the drawings and specifications.

The Owner represented by the undersigned has considered the Bid submitted by you for the above described work and any adopted alternatives in response to its Invitation to Bid and Instructions to Bidders dated _____

It appearing that it is to the best interest of said Owner to accept your Base Bid and any adopted alternatives in the amount of (\$ _____), you are hereby notified that your Base Bid has been accepted for the above referenced project. You are required by the Instructions to Bidders to execute the formal Agreement with the undersigned Owner and to furnish the required Contractor's Performance Bond and Payment Bond and proper Insurance Certificate within fifteen (15) days from the date of delivery of this Notice to you. **You are required to return an acknowledged copy of this Notice of Intent to Award and all copies of the signed Agreement (leave dates blank) to the Owner for execution.**

If you fail to execute said Agreement and to furnish said bonds and certificates within 15 days from the date of delivery of this Notice, said Owner will be entitled to consider all your rights arising out of the Owner's acceptance of your Proposal as abandoned and as a forfeiture of your Bid Security. The Owner will be entitled to such other rights as may be granted by law and to award the work covered by your Proposal to another, or to re-advertise the work or otherwise dispose thereof as the Owner may see fit.

Dated this ____ day of _____, 20____.

Owner
Northern Kentucky Water District

By: _____
Richard Harrison
V.P. Engineering & Distribution

ACCEPTANCE OF NOTICE

Receipt of the above Notice of Intent to Award is hereby acknowledged this

_____ day of _____, 20____.

By: _____

(This page was left blank intentionally.)

NOTICE TO PROCEED

To: Contractor:

Street:

City, State, Zip Code:

Project Description. Construction of the Taylor Mill Water Treatment Plant Advanced Treatment Improvements Project consisting of Preliminary Treatment/Granular Activated Carbon (GAC) Building with rapid mix basins, flocculation basins, sedimentation basins, plate settlers, residuals collection system and GAC pressure vessels. Construction of a GAC feed pump station. Relocation of the existing UV system. Installation of an electrical substation and two backup generators. Demolition of existing flocculation basins, sedimentation basins and tunnel structure. General piping demolition, modifications, new piping installation and all other miscellaneous work as indicated in the drawings and specifications.

You are hereby notified to commence WORK in accordance with the agreement dated _____ on or before _____, 20__.

The Work will need to be substantially completed within _____ calendar days after the date when the Contract Times commence to run as provided in paragraph 2.03 of the General Conditions, and completed and ready for final payment in accordance with paragraph 14.07.B of the General Conditions within _____ calendar days after the date when the Contract Times commence to run. The date of substantial completion of the WORK is _____, 20__ and the date of final completion of all WORK is therefore _____, 20__.

OWNER

Northern Kentucky Water District

By:

Richard Harrison
V.P. Engineering & Distribution

ACCEPTANCE OF NOTICE
Receipt of the above NOTICE TO
PROCEED is hereby acknowledged
this the _____ day of

_____, 20__.

By: _____

Title

(This page was left blank intentionally.)

Section 00610
PERFORMANCE BOND

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

CONTRACTOR (Name and Address):

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

OWNER (Name and Address):

CONTRACT

Date:

Amount:

Description (Name and Location):

BOND

Bond Number:

Date (Not earlier than Contract Date):

Amount:

Modifications to this Bond Form:

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

CONTRACTOR AS PRINCIPAL

Company:

Signature: _____ (Seal)

Name and Title:

SURETY

(Seal)

Surety's Name and Corporate Seal

By: _____

Signature and Title

(Attach Power of Attorney)

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

Attest: _____

Signature and Title

CONTRACTOR AS PRINCIPAL

Company:

Signature: _____ (Seal)

Name and Title:

SURETY

(Seal)

Surety's Name and Corporate Seal

By: _____

Signature and Title

(Attach Power of Attorney)

Attest: _____

Signature and Title:

EJCDC No. C-610 (2002 Edition)

Originally prepared through the joint efforts of the Surety Association of America, Engineers Joint Contract Documents Committee, the Associated General Contractors of America, and the American Institute of Architects.

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

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

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

3.1. Owner has notified Contractor and Surety, at the addresses described in Paragraph 10 below, that Owner is considering declaring a Contractor Default and has requested and attempted to arrange a conference with Contractor and Surety to be held not later than 15 days after receipt of such notice to discuss methods of performing the Contract. If Owner, Contractor and Surety agree, Contractor shall be allowed a reasonable time to perform the Contract, but such an agreement shall not waive Owner's right, if any, subsequently to declare a Contractor Default; and

3.2. Owner has declared a Contractor Default and formally terminated Contractor's right to complete the Contract. Such Contractor Default shall not be declared earlier than 20 days after Contractor and Surety have received notice as provided in Paragraph 3.1; and

3.3. Owner has agreed to pay the Balance of the Contract Price to:

1. Surety in accordance with the terms of the Contract;
2. Another contractor selected pursuant to Paragraph 4.3 to perform the Contract.

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

4.1. Arrange for Contractor, with consent of Owner, to perform and complete the Contract; or

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

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

1. After investigation, determine the amount for which it may be liable to Owner and, as soon as practicable after the amount is determined, tender payment therefor to Owner; or
2. Deny liability in whole or in part and notify Owner citing reasons therefor.

5. If Surety does not proceed as provided in Paragraph 4 with reasonable promptness, Surety shall be deemed to be in default on this Bond 15 days after receipt of an additional written notice from Owner to Surety demanding that Surety perform its obligations under this Bond, and Owner shall be entitled to enforce any remedy available to Owner. If Surety proceeds as provided in Paragraph 4.4, and Owner refuses the payment tendered or Surety has denied liability, in whole or in part, without further notice Owner shall be entitled to enforce any remedy available to Owner.

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

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

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

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

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

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

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

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

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

12. Definitions.

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

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

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

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

FOR INFORMATION ONLY – Name, Address and Telephone
Surety Agency or Broker
Owner's Representative (engineer or other party)

Section 00615
PAYMENT BOND

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

CONTRACTOR (*Name and Address*):

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

OWNER (*Name and Address*):

CONTRACT

Effective Date of Agreement:

Amount:

Description (*Name and Location*):

BOND

Bond Number:

Date (*Not earlier than Effective Date of Agreement*):

Amount:

Modifications to this Bond Form:

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

CONTRACTOR AS PRINCIPAL

SURETY

Contractor's Name and Corporate Seal (Seal)

Surety's Name and Corporate Seal (Seal)

By: _____
Signature

By: _____
Signature (Attach Power of Attorney)

Print Name

Print Name

Title

Title

Attest: _____
Signature

Attest: _____
Signature

Title

Title

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

1. Contractor and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors, and assigns to Owner to pay for labor, materials, and equipment furnished by Claimants for use in the performance of the Contract, which is incorporated herein by reference.
2. With respect to Owner, this obligation shall be null and void if Contractor:
 - 2.1 Promptly makes payment, directly or indirectly, for all sums due Claimants, and
 - 2.2 Defends, indemnifies, and holds harmless Owner from all claims, demands, liens, or suits alleging non-payment by Contractor by any person or entity who furnished labor, materials, or equipment for use in the performance of the Contract, provided Owner has promptly notified Contractor and Surety (at the addresses described in Paragraph 12) of any claims, demands, liens, or suits and tendered defense of such claims, demands, liens, or suits to Contractor and Surety, and provided there is no Owner Default.
3. With respect to Claimants, this obligation shall be null and void if Contractor promptly makes payment, directly or indirectly, for all sums due.
4. Surety shall have no obligation to Claimants under this Bond until:
 - 4.1 Claimants who are employed by or have a direct contract with Contractor have given notice to Surety (at the address described in Paragraph 12) and sent a copy, or notice thereof, to Owner, stating that a claim is being made under this Bond and, with substantial accuracy, the amount of the claim.
 - 4.2 Claimants who do not have a direct contract with Contractor:
 1. Have furnished written notice to Contractor and sent a copy, or notice thereof, to Owner, within 90 days after having last performed labor or last furnished materials or equipment included in the claim stating, with substantial accuracy, the amount of the claim and the name of the party to whom the materials or equipment were furnished or supplied, or for whom the labor was done or performed; and
 2. Have either received a rejection in whole or in part from Contractor, or not received within 30 days of furnishing the above notice any communication from Contractor by which Contractor had indicated the claim will be paid directly or indirectly; and
 3. Not having been paid within the above 30 days, have sent a written notice to Surety (at the address described in Paragraph 12) and sent a copy, or notice thereof, to Owner, stating that a claim is being made under this Bond and enclosing a copy of the previous written notice furnished to Contractor.
5. If a notice by a Claimant required by Paragraph 4 is provided by Owner to Contractor or to Surety, that is sufficient compliance.
6. (Not Used.)
7. Surety's total obligation shall not exceed the amount of this Bond, and the amount of this Bond shall be credited for any payments made in good faith by Surety.
8. Amounts owed by Owner to Contractor under the Contract shall be used for the performance of the Contract and to satisfy claims, if any, under any performance bond. By Contractor furnishing and Owner accepting this Bond, they agree that all funds earned by Contractor in the performance of the Contract are dedicated to satisfy obligations of Contractor and Surety under this Bond, subject to Owner's priority to use the funds for the completion of the Work.
9. Surety shall not be liable to Owner, Claimants, or others for obligations of Contractor that are unrelated to the Contract. Owner shall not be liable for payment of any costs or expenses of any Claimant under this Bond, and shall have under this Bond no obligations to make payments to, give notices on behalf of, or otherwise have obligations to Claimants under this Bond.

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

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

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

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

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

15. Definitions

15.1 Claimant: An individual or entity having a direct contract with Contractor, or with a first-tier subcontractor of Contractor, to furnish labor, materials, or equipment for use in the performance of the Contract. The intent of this Bond shall be to include without limitation in the terms "labor, materials or equipment" that part of water, gas, power, light, heat, oil, gasoline, telephone service, or rental equipment used in the Contract, architectural and engineering services required for performance of the Work of Contractor and Contractor's subcontractors, and all other items for which a mechanic's lien may be asserted in the jurisdiction where the labor, materials, or equipment were furnished.

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

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

FOR INFORMATION ONLY – *(Name, Address, and Telephone)*

Surety Agency or Broker:

Owner's Representative *(Engineer or other)*:

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GENERAL CONDITIONS
OF THE CONSTRUCTION CONTRACT

Adapted from EJCDC C-700, Standard General Conditions
of the Construction Contract (2007 Edition)

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GENERAL CONDITIONS

ARTICLE 1 – DEFINITIONS AND TERMINOLOGY

1.01 *Defined Terms*

- A. Wherever used in the Bidding Requirements or Contract Documents and printed with initial capital letters, the terms listed below will have the meanings indicated which are applicable to both the singular and plural thereof. In addition to terms specifically defined, terms with initial capital letters in the Contract Documents include references to identified articles and paragraphs, and the titles of other documents or forms.
1. *Addenda* – Written or graphic instruments issued prior to the opening of Bids which clarify, correct, or change the Bidding Requirements or the proposed Contract Documents.
 2. *Agreement* – The written instrument which is evidence of the agreement between Owner and Contractor covering the Work.
 3. *Application for Payment* – The form acceptable to Engineer which is to be used by Contractor during the course of the Work in requesting progress or final payments and which is to be accompanied by such supporting documentation as is required by the Contract Documents.
 4. *Asbestos* – Any material that contains more than one percent asbestos and is friable or is releasing asbestos fibers into the air above current action levels established by the United States Occupational Safety and Health Administration.
 5. *Bid* – The offer or proposal of a Bidder submitted on the prescribed form setting forth the prices for the Work to be performed.
 6. *Bidder* – The individual or entity who submits a Bid directly to Owner.
 7. *Bidding Documents* – The Bidding Requirements and the proposed Contract Documents (including all Addenda).
 8. *Bidding Requirements* – The Advertisement or Invitation to Bid, Instructions to Bidders, bid security of acceptable form, if any, and the Bid Form with any supplements.
 9. *Change Order* – A document recommended by Engineer which is signed by Contractor and Owner and authorizes an addition, deletion, or revision in the Work or an adjustment in the Contract Price or the Contract Times, issued on or after the Effective Date of the Agreement.

10. *Claim* – A demand or assertion by Owner or Contractor seeking an adjustment of Contract Price or Contract Times, or both, or other relief with respect to the terms of the Contract. A demand for money or services by a third party is not a Claim.
11. *Contract* – The entire and integrated written agreement between the Owner and Contractor concerning the Work. The Contract supersedes prior negotiations, representations, or agreements, whether written or oral.
12. *Contract Documents* – Those items so designated in the Agreement. Only printed or hard copies of the items listed in the Agreement are Contract Documents. Approved Shop Drawings, other Contractor’s submittals, and the reports and drawings of subsurface and physical conditions are not Contract Documents.
13. *Contract Price* – The moneys payable by Owner to Contractor for completion of the Work in accordance with the Contract Documents as stated in the Agreement (subject to the provisions of Paragraph 11.03 in the case of Unit Price Work).
14. *Contract Times* – The number of days or the dates stated in the Agreement to: (i) achieve Milestones, if any, (ii) achieve Substantial Completion; and (iii) complete the Work so that it is ready for final payment as evidenced by Engineer’s written recommendation of final payment.
15. *Contractor* or *CONTRACTOR* – The individual or entity with whom Owner has entered into the Agreement.
16. *Cost of the Work* – See Paragraph 11.01.A for definition.
17. *Drawings* – That part of the Contract Documents prepared or approved by Engineer which graphically shows the scope, extent, and character of the Work to be performed by Contractor. Shop Drawings and other Contractor submittals are not Drawings as so defined.
18. *Effective Date of the Agreement* – The date indicated in the Agreement on which it becomes effective, but if no such date is indicated, it means the date on which the Agreement is signed and delivered by the last of the two parties to sign and deliver.
19. *Engineer* or *ENGINEER* – The individual or entity named as such in the Agreement.
20. *Field Order* – A written order issued by Engineer which requires minor changes in the Work but which does not involve a change in the Contract Price or the Contract Times.
21. *General Requirements* – Sections of Division 01 of the Specifications.

22. *Hazardous Environmental Condition* – The presence at the Site of Asbestos, PCBs, Petroleum, Hazardous Waste, or Radioactive Material in such quantities or circumstances that may present a substantial danger to persons or property exposed thereto.
23. *Hazardous Waste* – The term Hazardous Waste shall have the meaning provided in Section 1004 of the Solid Waste Disposal Act (42 USC Section 6903) as amended from time to time.
24. *Laws and Regulations; Laws or Regulations* – Any and all applicable laws, rules, regulations, ordinances, codes, and orders of any and all governmental bodies, agencies, authorities, and courts having jurisdiction.
25. *Liens* – Charges, security interests, or encumbrances upon Project funds, real property, or personal property.
26. *Milestone* – A principal event specified in the Contract Documents relating to an intermediate completion date or time prior to Substantial Completion of all the Work.
27. *Notice of Award* – The written notice by Owner to the Successful Bidder stating that upon timely compliance by the Successful Bidder with the conditions precedent listed therein, Owner will sign and deliver the Agreement.
28. *Notice to Proceed* – A written notice given by Owner to Contractor fixing the date on which the Contract Times will commence to run and on which Contractor shall start to perform the Work under the Contract Documents.
29. *Owner* or *OWNER* – The individual or entity with whom Contractor has entered into the Agreement and for whom the Work is to be performed.
30. *PCBs* – Polychlorinated biphenyls.
31. *Petroleum* – Petroleum, including crude oil or any fraction thereof which is liquid at standard conditions of temperature and pressure (60 degrees Fahrenheit and 14.7 pounds per square inch absolute), such as oil, petroleum, fuel oil, oil sludge, oil refuse, gasoline, kerosene, and oil mixed with other non-Hazardous Waste and crude oils.
32. *Progress Schedule* – A schedule, prepared and maintained by Contractor, describing the sequence and duration of the activities comprising the Contractor's plan to accomplish the Work within the Contract Times.
33. *Project* – The total construction of which the Work to be performed under the Contract Documents may be the whole, or a part.

34. *Project Manual* – The bound documentary information prepared for bidding and constructing the Work. A listing of the contents of the Project Manual, which may be bound in one or more volumes, is contained in the table(s) of contents.
35. *Radioactive Material* – Source, special nuclear, or byproduct material as defined by the Atomic Energy Act of 1954 (42 USC Section 2011 et seq.) as amended from time to time.
36. *Resident Project Representative* – The authorized representative of Engineer who may be assigned to the Site or any part thereof.
37. *Samples* – Physical examples of materials, equipment, or workmanship that are representative of some portion of the Work and which establish the standards by which such portion of the Work will be judged.
38. *Schedule of Submittals* – A schedule, prepared and maintained by Contractor, of required submittals and the time requirements to support scheduled performance of related construction activities.
39. *Schedule of Values* – A schedule, prepared and maintained by Contractor, allocating portions of the Contract Price to various portions of the Work and used as the basis for reviewing Contractor's Applications for Payment.
40. *Shop Drawings* – All drawings, diagrams, illustrations, schedules, and other data or information which are specifically prepared or assembled by or for Contractor and submitted by Contractor to illustrate some portion of the Work.
41. *Site* – Lands or areas indicated in the Contract Documents as being furnished by Owner upon which the Work is to be performed, including rights-of-way and easements for access thereto, and such other lands furnished by Owner which are designated for the use of Contractor.
42. *Specifications* – That part of the Contract Documents consisting of written requirements for materials, equipment, systems, standards and workmanship as applied to the Work, and certain administrative requirements and procedural matters applicable thereto.
43. *Subcontractor* – An individual or entity having a direct contract with Contractor or with any other Subcontractor for the performance of a part of the Work at the Site.
44. *Substantial Completion* – The time at which the Work (or a specified part thereof) has progressed to the point where, in the opinion of Engineer, the Work (or a specified part thereof) is sufficiently complete, in accordance with the Contract Documents, so that the Work (or a specified part thereof) can be utilized

for the purposes for which it is intended. The terms “substantially complete” and “substantially completed” as applied to all or part of the Work refer to Substantial Completion thereof.

45. *Successful Bidder* – The Bidder submitting a responsive Bid to whom Owner makes an award.
46. *Supplementary Conditions* – That part of the Contract Documents which amends or supplements these General Conditions.
47. *Supplier* – A manufacturer, fabricator, supplier, distributor, materialman, or vendor having a direct contract with Contractor or with any Subcontractor to furnish materials or equipment to be incorporated in the Work by Contractor or Subcontractor.
48. *Underground Facilities* – All underground pipelines, conduits, ducts, cables, wires, manholes, vaults, tanks, tunnels, or other such facilities or attachments, and any encasements containing such facilities, including those that convey electricity, gases, steam, liquid petroleum products, telephone or other communications, cable television, water, wastewater, storm water, other liquids or chemicals, or traffic or other control systems.
49. *Unit Price Work* – Work to be paid for on the basis of unit prices.
50. *Work* – The entire construction or the various separately identifiable parts thereof required to be provided under the Contract Documents. Work includes and is the result of performing or providing all labor, services, and documentation necessary to produce such construction, and furnishing, installing, and incorporating all materials and equipment into such construction, all as required by the Contract Documents.
51. *Work Change Directive* – A written statement to Contractor issued on or after the Effective Date of the Agreement and signed by Owner and recommended by Engineer ordering an addition, deletion, or revision in the Work, or responding to differing or unforeseen subsurface or physical conditions under which the Work is to be performed or to emergencies. A Work Change Directive will not change the Contract Price or the Contract Times but is evidence that the parties expect that the change ordered or documented by a Work Change Directive will be incorporated in a subsequently issued Change Order following negotiations by the parties as to its effect, if any, on the Contract Price or Contract Times.

1.02 Terminology

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

B. *Intent of Certain Terms or Adjectives*

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

C. *Day*

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

D. *Defective*

1. The word “defective,” when modifying the word “Work,” refers to Work that is unsatisfactory, faulty, or deficient in that it:
 - a. Does not conform to the Contract Documents, or
 - b. Does not meet the requirements of any applicable inspection, reference standard, test, or approval referred to in the Contract Documents, or
 - c. Has been damaged prior to Engineer’s recommendation of final payment (unless responsibility for the protection thereof has been assumed by Owner at Substantial Completion in accordance with Paragraph 14.04 or 14.05).

E. *Furnish, Install, Perform, Provide*

1. The word “furnish,” when used in connection with services, materials, or equipment, shall mean to supply and deliver said services, materials, or equipment to the Site (or some other specified location) ready for use or installation and in usable or operable condition.
2. The word “install,” when used in connection with services, materials, or equipment, shall mean to put into use or place in final position said services, materials, or equipment complete and ready for intended use.

3. The words “perform” or “provide,” when used in connection with services, materials, or equipment, shall mean to furnish and install said services, materials, or equipment complete and ready for intended use.
 4. When “furnish,” “install,” “perform,” or “provide” is not used in connection with services, materials, or equipment in a context clearly requiring an obligation of Contractor, “provide” is implied.
- F. Unless stated otherwise in the Contract Documents, words or phrases that have a well-known technical or construction industry or trade meaning are used in the Contract Documents in accordance with such recognized meaning.

ARTICLE 2 – PRELIMINARY MATTERS

2.01 *Delivery of Bonds and Evidence of Insurance*

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

2.02 *Copies of Documents*

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

2.03 *Commencement of Contract Times; Notice to Proceed*

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

2.04 *Starting the Work*

- A. Contractor shall start to perform the Work on the date when the Contract Times

commence to run. No Work shall be done at the Site prior to the date on which the Contract Times commence to run.

2.05 *Before Starting Construction*

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

2.06 *Preconstruction Conference; Designation of Authorized Representative*

- A. Before any Work at the Site is started, a conference attended by Owner, Contractor, Engineer, and others as appropriate will be held to establish a working understanding among the parties as to the Work and to discuss the schedules referred to in Paragraph 2.05.A, procedures for handling Shop Drawings and other submittals, processing Applications for Payment, and maintaining required records.
- B. At this conference Owner and Contractor each shall designate in writing, a specific individual to act as its authorized representative with respect to the services and responsibilities under the Contract. Such individuals shall have the authority to transmit instructions, receive information, render decisions relative to the Contract and otherwise act on behalf of each respective party.

2.07 *Initial Acceptance of Schedules*

- A. At least 10 days before submission of the first Application for Payment a conference attended by Contractor, Engineer, and others as appropriate will be held to review for acceptability to Engineer as provided below the schedules submitted in accordance with Paragraph 2.05.A. Contractor shall have an additional 10 days to make corrections and adjustments and to complete and resubmit the schedules. No progress payment shall be made to Contractor until acceptable schedules are submitted to Engineer.
1. The Progress Schedule will be acceptable to Engineer if it provides an orderly progression of the Work to completion within the Contract Times. Such acceptance will not impose on Engineer responsibility for the Progress Schedule,

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

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

ARTICLE 3 – CONTRACT DOCUMENTS: INTENT, AMENDING, REUSE

3.01 *Intent*

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

3.02 *Reference Standards*

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

Work or any duty or authority to undertake responsibility inconsistent with the provisions of the Contract Documents.

3.03 *Reporting and Resolving Discrepancies*

A. Reporting Discrepancies

1. *Contractor's Review of Contract Documents Before Starting Work:* Before undertaking each part of the Work, Contractor shall carefully study and compare the Contract Documents and check and verify pertinent figures therein and all applicable field measurements. Contractor shall promptly report in writing to Engineer any conflict, error, ambiguity, or discrepancy which Contractor discovers or has actual knowledge of and shall obtain a written interpretation or clarification from Engineer before proceeding with any Work affected thereby.
2. *Contractor's Review of Contract Documents During Performance of Work:* If, during the performance of the Work, Contractor discovers any conflict, error, ambiguity, or discrepancy within the Contract Documents or between the Contract Documents and

- a) Any applicable Law or Regulation,
- b) Any standard, specification, manual or code, or,
- c) Any instruction of any Supplier

then Contractor shall promptly report it to Engineer in writing. Contractor shall not proceed with the Work affected thereby (except in an emergency as required by Paragraph 6.16.A) until an amendment or supplement to the Contract Documents has been issued by one of the methods indicated in Paragraph 3.04.

3. Contractor shall not be liable to Owner or Engineer for failure to report any conflict, error, ambiguity, or discrepancy in the Contract Documents unless Contractor had actual knowledge thereof.

B. *Resolving Discrepancies*

1. Except as may be otherwise specifically stated in the Contract Documents, the provisions of the Contract Documents shall take precedence in resolving any conflict, error, ambiguity, or discrepancy between the provisions of the Contract Documents and:
 - a. The provisions of any standard, specification, manual, code, or the instruction of any Supplier (whether or not specifically incorporated by reference in the Contract Documents); or

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

3.04 *Amending and Supplementing Contract Documents*

- A. The Contract Documents may be amended to provide for additions, deletions, and revisions in the Work or to modify the terms and conditions thereof by either a Change Order or a Work Change Directive.
- B. The requirements of the Contract Documents may be supplemented, and minor variations and deviations in the Work may be authorized, by one or more of the following ways:
 - 1. A Field Order;
 - 2. Engineer's approval of a Shop Drawing or Sample; (subject to the provisions of Paragraph 6.17.D.3); or
 - 3. Engineer's written interpretation or clarification.

3.05 *Reuse of Documents*

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

3.06 *Electronic Data*

- A. Unless otherwise stated in the Supplementary Conditions, the data furnished by Owner or Engineer to Contractor or by Contractor to Owner or Engineer that may be relied upon are limited to the printed copies (also known as hard copies). Files in electronic media format of text, data, graphics, or other types are furnished only for the convenience of the receiving party. Any conclusion or information obtained or derived from such electronic files will be at the user's sole risk. If there is a discrepancy between the electronic files and the hard copies, the hard copies govern.

- B. Because data stored in electronic media format can deteriorate or be modified inadvertently or otherwise without authorization of the data's creator, the party receiving electronic files agrees that it will perform acceptance tests or procedures within 60 days, after which the receiving party shall be deemed to have accepted the data thus transferred. Any errors detected within the 60-day acceptance period will be corrected by the transferring party.
- C. When transferring documents in electronic media format, the transferring party makes no representations as to long term compatibility, usability, or readability of documents resulting from the use of software application packages, operating systems, or computer hardware differing from those used by the data's creator.

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

4.01 *Availability of Lands*

- A. Owner shall furnish the Site. Owner shall notify Contractor of any encumbrances or restrictions not of general application but specifically related to use of the Site with which Contractor must comply in performing the Work. Owner will obtain in a timely manner and pay for easements for permanent structures or permanent changes in existing facilities. If Contractor and Owner are unable to agree on entitlement to or on the amount or extent, if any, of any adjustment in the Contract Price or Contract Times, or both, as a result of any delay in Owner's furnishing the Site or a part thereof, Contractor may make a Claim therefor as provided in Paragraph 10.05.
- B. Contractor shall provide for all additional lands and access thereto that may be required for temporary construction facilities or storage of materials and equipment.

4.02 *Subsurface and Physical Conditions*

- A. *Reports and Drawings:* The Supplementary Conditions identify:
 1. Those reports of explorations and tests of subsurface conditions at or contiguous to the Site; that Engineer has used in preparing the Contract Documents; and
 2. Those drawings of physical conditions in or relating to existing surface or subsurface at or contiguous to the Site (except Underground Facilities) that Engineer has used in preparing the Contract Documents.
- B. *Limited Reliance by Contractor on Technical Data Authorized:* Contractor may rely on the general accuracy of the "technical data" contained in such reports and drawings, but such reports and drawings are not Contract Documents. Such "technical data" is identified in the Supplementary Conditions. Except for such reliance on such "technical data," Contractor may not rely upon or make any claim against Owner or Engineer, or any of their officers, directors, members, partners, employees, agents, consultants or subcontractors with respect to:

1. The completeness of such reports and drawings for Contractor's purposes, including, but not limited to, any aspects of the means, methods, techniques, sequences, and procedures of construction to be employed by Contractor, and safety precautions and programs incident thereto; or
2. Other data, interpretations, opinions, and information contained in such reports or shown or indicated in such drawings; or
3. Any Contractor interpretation of or conclusion drawn from any "technical data" or any such other data, interpretations, opinions, or information.

4.03 *Differing Subsurface or Physical Conditions*

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

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

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

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

C. *Possible Price and Times Adjustments*

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

- a. Such condition must meet any one or more of the categories described in Paragraph 4.03.A; and
 - b. With respect to Work that is paid for on a unit price basis, any adjustment in Contract Price will be subject to the provisions of Paragraphs 9.07 and 11.03.
2. Contractor shall not be entitled to any adjustment in the Contract Price or Contract Times if:
- a. Contractor knew of the existence of such conditions at the time Contractor made a final commitment to Owner with respect to Contract Price and Contract Times by the submission of a Bid or becoming bound under a negotiated contract; or
 - b. The existence of such condition could reasonably have been discovered or revealed as a result of any examination, investigation, exploration, test, or study of the Site and contiguous areas required by the Bidding Requirements or Contract Documents to be conducted by or for Contractor prior to Contractor's making such final commitment; or
 - c. Contractor failed to give the written notice as required by Paragraph 4.03.A.
3. If Owner and Contractor are unable to agree on entitlement to or on the amount or extent, if any, of any adjustment in the Contract Price or Contract Times, or both, a Claim may be made therefor as provided in Paragraph 10.05. However, neither Owner or Engineer, or any of their officers, directors, members, partners, employees, agents, consultants or subcontractors shall be liable to Contractor for any claims, costs, losses, or damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) sustained by Contractor on or in connection with any other project or anticipated project.

4.04 *Underground Facilities*

- A. *Shown or Indicated:* The information and data shown or indicated in the Contract Documents with respect to existing Underground Facilities at or contiguous to the Site is based on information and data furnished to Owner or Engineer by the owners of such Underground Facilities, including Owner, or by others. Unless it is otherwise expressly provided in the Supplementary Conditions:
1. Owner and Engineer shall not be responsible for the accuracy or completeness of any such information or data provided by others; and
 2. The cost of all of the following will be included in the Contract Price, and Contractor shall have full responsibility for:

- a. reviewing and checking all such information and data,
- b. Locating all Underground Facilities shown or indicated in the Contract Documents,
- c. Coordination of the Work with the owners of such Underground Facilities, including Owner, during construction, and
- d. The safety and protection of all such Underground Facilities and repairing any damage thereto resulting from the Work.

B. *Not Shown or Indicated*

1. If an Underground Facility is uncovered or revealed at or contiguous to the Site which was not shown or indicated, or not shown or indicated with reasonable accuracy in the Contract Documents, Contractor shall, promptly after becoming aware thereof and before further disturbing conditions affected thereby or performing any Work in connection therewith (except in an emergency as required by Paragraph 6.16.A), identify the owner of such Underground Facility and give written notice to that owner and to Owner and Engineer. Engineer will promptly review the Underground Facility and determine the extent, if any, to which a change is required in the Contract Documents to reflect and document the consequences of the existence or location of the Underground Facility. During such time, Contractor shall be responsible for the safety and protection of such Underground Facility.
2. If Engineer concludes that a change in the Contract Documents is required, a Work Change Directive or a Change Order will be issued to reflect and document such consequences. An equitable adjustment shall be made in the Contract Price or Contract Times, or both, to the extent that they are attributable to the existence or location of any Underground Facility that was not shown or indicated or not shown or indicated with reasonable accuracy in the Contract Documents and that Contractor did not know of and could not reasonably have been expected to be aware of or to have anticipated. If Owner and Contractor are unable to agree on entitlement to or on the amount or extent, if any, of any such adjustment in Contract Price or Contract Times, Owner or Contractor may make a Claim therefor as provided in Paragraph 10.05.

4.05 *Reference Points*

- A. Owner shall provide engineering surveys to establish reference points for construction which in Engineer's judgment are necessary to enable Contractor to proceed with the Work. Contractor shall be responsible for laying out the Work, shall protect and preserve the established reference points and property monuments, and shall make no changes or relocations without the prior written approval of Owner. Contractor shall

report to Engineer whenever any reference point or property monument is lost or destroyed or requires relocation because of necessary changes in grades or locations, and shall be responsible for the accurate replacement or relocation of such reference points or property monuments by professionally qualified personnel.

4.06 *Hazardous Environmental Condition at Site*

- A. *Reports and Drawings:* The Supplementary Conditions identify those reports and drawings known to Owner relating to Hazardous Environmental Conditions that have been identified at the Site.,
- B. *Limited Reliance by Contractor on Technical Data Authorized:* Contractor may rely upon the accuracy of the “technical data” contained in such reports and drawings, but such reports and drawings are not Contract Documents. Such “technical data” is identified in the Supplementary Conditions. Except for such reliance on such “technical data,” Contractor may not rely upon or make any claim against Owner or Engineer, or any of their officers, directors, members, partners, employees, agents, consultants or subcontractors with respect to:
 - 1. The completeness of such reports and drawings for Contractor’s purposes, including, but not limited to, any aspects of the means, methods, techniques, sequences and procedures of construction to be employed by Contractor and safety precautions and programs incident thereto; or
 - 2. Other data, interpretations, opinions and information contained in such reports or shown or indicated in such drawings; or
 - 3. Any Contractor interpretation of or conclusion drawn from any “technical data” or any such other data, interpretations, opinions or information.
- C. Contractor shall not be responsible for any Hazardous Environmental Condition uncovered or revealed at the Site which was not shown or indicated in Drawings or Specifications or identified in the Contract Documents to be within the scope of the Work. Contractor shall be responsible for a Hazardous Environmental Condition created with any materials brought to the Site by Contractor, Subcontractors, Suppliers, or anyone else for whom Contractor is responsible.
- D. If Contractor encounters a Hazardous Environmental Condition or if Contractor or anyone for whom Contractor is responsible creates a Hazardous Environmental Condition, Contractor shall immediately: (i) secure or otherwise isolate such condition; (ii) stop all Work in connection with such condition and in any area affected thereby (except in an emergency as required by Paragraph 6.16.A); and (iii) notify Owner and Engineer (and promptly thereafter confirm such notice in writing). Owner shall promptly consult with Engineer concerning the necessity for Owner to retain a qualified expert to evaluate such condition or take corrective action, if any. Promptly after consulting with Engineer, Owner shall take such actions as are

necessary to permit Owner to timely obtain required permits and provide Contractor the written notice required by Paragraph 4.06.E.

- E. Contractor shall not be required to resume Work in connection with such condition or in any affected area until after Owner has obtained any required permits related thereto and delivered to Contractor written notice:: (i) specifying that such condition and any affected area is or has been rendered safe for the resumption of Work; or (ii) specifying any special conditions under which such Work may be resumed safely. If Owner and Contractor cannot agree as to entitlement to or on the amount or extent, if any, of any adjustment in Contract Price or Contract Times, or both, as a result of such Work stoppage or such special conditions under which Work is agreed to be resumed by Contractor, either party may make a Claim therefor as provided in Paragraph 10.05.
- F. If after receipt of such written notice Contractor does not agree to resume such Work based on a reasonable belief it is unsafe, or does not agree to resume such Work under such special conditions, then Owner may order the portion of the Work that is in the area affected by such condition to be deleted from the Work. If Owner and Contractor cannot agree as to entitlement to or on the amount or extent, if any, of an adjustment in Contract Price or Contract Times as a result of deleting such portion of the Work, then either party may make a Claim therefor as provided in Paragraph 10.05. Owner may have such deleted portion of the Work performed by Owner's own forces or others in accordance with Article 7.
- G. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to a Hazardous Environmental Condition created by Contractor or by anyone for whom Contractor is responsible. Nothing in this Paragraph 4.06.G shall obligate Contractor to indemnify any individual or entity from and against the consequences of that individual's or entity's own negligence.
- H. The provisions of Paragraphs 4.02, 4.03, and 4.04 do not apply to a Hazardous Environmental Condition uncovered or revealed at the Site.

ARTICLE 5 – BONDS AND INSURANCE

5.01 *Performance, Payment, and Other Bonds*

- A. Contractor shall furnish performance and payment bonds, each in an amount at least equal to the Contract Price as security for the faithful performance and payment of all of Contractor's obligations under the Contract Documents. These bonds shall remain

in effect until one year after the date when final payment becomes due or until completion of the correction period specified in Paragraph 13.07, whichever is later, except as provided otherwise by Laws or Regulations or by the Contract Documents. Contractor shall also furnish such other bonds as are required by the Contract Documents.

- B. All bonds shall be in the form prescribed by the Contract Documents except as provided otherwise by Laws or Regulations, and shall be executed by such sureties as are named in the list of “Companies Holding Certificates of Authority as Acceptable Sureties on Federal Bonds and as Acceptable Reinsuring Companies” as published in Circular 570 (amended) by the Financial Management Service, Surety Bond Branch, U.S. Department of the Treasury. All bonds signed by an agent or attorney-in-fact must be accompanied by a certified copy of that individual’s authority to bind the surety. The evidence of authority shall show that it is effective on the date the agent or attorney-in-fact signed each bond.
- C. If the surety on any bond furnished by Contractor is declared bankrupt or becomes insolvent or its right to do business is terminated in any state where any part of the Project is located or it ceases to meet the requirements of Paragraph 5.01.B, Contractor shall promptly notify Owner and Engineer and shall, within 20 days after the event giving rise to such notification, provide another bond and surety, both of which shall comply with the requirements of Paragraphs 5.01.B and 5.02.

5.02 *Licensed Sureties and Insurers*

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

5.03 *Certificates of Insurance*

- A. Contractor shall deliver to Owner, with copies to each additional insured and loss payee identified in the Supplementary Conditions, certificates of insurance (and other evidence of insurance requested by Owner or any other additional insured) which Contractor is required to purchase and maintain.
- B. Owner shall deliver to Contractor, with copies to each additional insured and loss payee identified in the Supplementary Conditions, certificates of insurance (and other evidence of insurance requested by Contractor or any other additional insured) which Owner is required to purchase and maintain.
- C. Failure of Owner to demand such certificates or other evidence of Contractor’s full compliance with these insurance requirements or failure of Owner to identify a

deficiency in compliance from the evidence provided shall not be construed as a waiver of Contractor's obligation to maintain such insurance.

- D. Owner does not represent that insurance coverage and limits established in this Contract necessarily will be adequate to protect Contractor.
- E. The insurance and insurance limits required herein shall not be deemed as a limitation on Contractor's liability under the indemnities granted to Owner in the Contract Documents.

5.04 *Contractor's Liability Insurance*

- A. Contractor shall purchase and maintain such insurance as is appropriate for the Work being performed and as will provide protection from claims set forth below which may arise out of or result from Contractor's performance of the Work and Contractor's other obligations under the Contract Documents, whether it is to be performed by Contractor, any Subcontractor or Supplier, or by anyone directly or indirectly employed by any of them to perform any of the Work, or by anyone for whose acts any of them may be liable:
 - 1. Claims under workers' compensation, disability benefits, and other similar employee benefit acts;
 - 2. Claims for damages because of bodily injury, occupational sickness or disease, or death of Contractor's employees;
 - 3. Claims for damages because of bodily injury, sickness or disease, or death of any person other than Contractor's employees;
 - 4. Claims for damages insured by reasonably available personal injury liability coverage which are sustained:
 - a. By any person as a result of an offense directly or indirectly related to the employment of such person by Contractor, or
 - b. By any other person for any other reason;
 - 5. Claims for damages, other than to the Work itself, because of injury to or destruction of tangible property wherever located, including loss of use resulting therefrom; and
 - 6. Claims for damages because of bodily injury or death of any person or property damage arising out of the ownership, maintenance or use of any motor vehicle.
- B. The policies of insurance required by this Paragraph 5.04 shall:

1. With respect to insurance required by Paragraphs 5.04.A.3 through 5.04.A.6 inclusive, be written on an occurrence basis, include as additional insureds (subject to any customary exclusion regarding professional liability) Owner and Engineer, and any other individuals or entities identified in the Supplementary Conditions, all of whom shall be listed as additional insureds, and include coverage for the respective officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of all such additional insureds, and the insurance afforded to these additional insureds shall provide primary coverage for all claims covered thereby;
2. Include at least the specific coverages and be written for not less than the limits of liability provided in the Supplementary Conditions or required by Laws or Regulations, whichever is greater;
3. Include contractual liability insurance covering Contractor's indemnity obligations under Paragraphs 6.11 and 6.20;
4. Contain a provision or endorsement that the coverage afforded will not be canceled, materially changed or renewal refused until at least 30 days prior written notice has been given to Owner and Contractor and to each other additional insured identified in the Supplementary Conditions to whom a certificate of insurance has been issued (and the certificates of insurance furnished by the Contractor pursuant to Paragraph 5.03 will so provide);
5. Remain in effect at least until final payment and at all times thereafter when Contractor may be correcting, removing, or replacing defective Work in accordance with Paragraph 13.07; and
6. Include completed operations insurance;
 - a. Such insurance shall remain in effect for at least two years after final payment, and
 - b. Contractor shall furnish Owner and each other additional insured identified in the Supplementary Conditions, to whom a certificate of insurance has been issued, evidence satisfactory to Owner and any such additional insured of continuation of such insurance at final payment and one year thereafter.

5.05 *Owner's Liability Insurance*

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

5.06 (Not Used)

5.07 (Not Used)

5.08 (Not Used)

5.09 (Not Used)

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

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

ARTICLE 6 – CONTRACTOR'S RESPONSIBILITIES

6.01 *Supervision and Superintendence*

- A. Contractor shall supervise, inspect, and direct the Work competently and efficiently, devoting such attention thereto and applying such skills and expertise as may be necessary to perform the Work in accordance with the Contract Documents. Contractor shall be solely responsible for the means, methods, techniques, sequences, and procedures of construction. Contractor shall not be responsible for the negligence of Owner or Engineer in the design or specification of a specific means, method, technique, sequence, or procedure of construction which is shown or indicated in and expressly required by the Contract Documents.
- B. At all times during the progress of the Work, Contractor shall assign a competent resident superintendent who shall not be replaced without written notice to Owner and Engineer except under extraordinary circumstances. Unless the Owner shall otherwise agree in writing, the superintendent will be Contractor's representative at the Site and shall have authority to act on behalf of Contractor. All communications given to or received from the superintendent shall be binding on Contractor.

6.02 *Labor; Working Hours*

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

6.03 *Services, Materials, and Equipment*

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

6.04 *Progress Schedule*

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

6.05 *Substitutes and “Or-Equals”*

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

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

a. In the exercise of reasonable judgment Engineer determines that:

- 1) It is at least equal in materials of construction, quality, durability, appearance, strength, and design characteristics; and
- 2) It will reliably perform at least equally well the function and achieve the results imposed by the design concept of the completed Project as a functioning whole; and
- 3) It has a proven record of performance and availability of responsive service; and

b. Contractor certifies that, if approved and incorporated into the Work:

- 1) There will be no increase in cost to the Owner or increase in Contract Times; and
- 2) It will conform substantially to the detailed requirements of the item named in the Contract Documents.

2. *Substitute Items*

a. If in Engineer’s sole discretion an item of material or equipment proposed by Contractor does not qualify as an “or-equal” item under Paragraph 6.05.A.1, it will be considered a proposed substitute item.

- b. Contractor shall submit sufficient information as provided below to allow Engineer to determine if the item of material or equipment proposed is essentially equivalent to that named and an acceptable substitute therefor. Requests for review of proposed substitute items of material or equipment will not be accepted by Engineer from anyone other than Contractor.
- c. The requirements for review by Engineer will be as set forth in Paragraph 6.05.A.2.d, as supplemented by the General Requirements and as Engineer may decide is appropriate under the circumstances.
- d. Contractor shall make written application to Engineer for review of a proposed substitute item of material or equipment that Contractor seeks to furnish or use. The application:
 - 1) Shall certify that the proposed substitute item will:
 - a) Perform adequately the functions and achieve the results called for by the general design,
 - b) Be similar in substance to that specified, and
 - c) Be suited to the same use as that specified;
 - 2) Will state:
 - a) The extent, if any, to which the use of the proposed substitute item will prejudice Contractor's achievement of Substantial Completion on time,
 - b) Whether use of the proposed substitute item in the Work will require a change in any of the Contract Documents (or in the provisions of any other direct contract with Owner for other work on the Project) to adapt the design to the proposed substitute item, and
 - c) Whether incorporation or use of the proposed substitute item in connection with the Work is subject to payment of any license fee or royalty;
 - 3) Will identify:
 - a) All variations of the proposed substitute item from that specified, and
 - b) Available engineering, sales, maintenance, repair, and replacement services; and

- 4) Shall contain an itemized estimate of all costs or credits that will result directly or indirectly from use of such substitute item, including costs of redesign and claims of other contractors affected by any resulting change.
- B. *Substitute Construction Methods or Procedures:* If a specific means, method, technique, sequence, or procedure of construction is expressly required by the Contract Documents, Contractor may furnish or utilize a substitute means, method, technique, sequence, or procedure of construction approved by Engineer. Contractor shall submit sufficient information to allow Engineer, in Engineer's sole discretion, to determine that the substitute proposed is equivalent to that expressly called for by the Contract Documents. The requirements for review by Engineer will be similar to those provided in Paragraph 6.05.A.2.
- C. *Engineer's Evaluation:* Engineer will be allowed a reasonable time within which to evaluate each proposal or submittal made pursuant to Paragraphs 6.05.A and 6.05.B. Engineer may require Contractor to furnish additional data about the proposed substitute item. Engineer will be the sole judge of acceptability. No "or equal" or substitute will be ordered, installed or utilized until Engineer's review is complete, which will be evidenced by a Change Order in the case of a substitute and an approved Shop Drawing for an "or equal." Engineer will advise Contractor in writing of any negative determination.
- D. *Special Guarantee:* Owner may require Contractor to furnish at Contractor's expense a special performance guarantee or other surety with respect to any substitute.
- E. *Engineer's Cost Reimbursement:* Engineer will record Engineer's costs in evaluating a substitute proposed or submitted by Contractor pursuant to Paragraphs 6.05.A.2 and 6.05.B. Whether or not Engineer approves a substitute so proposed or submitted by Contractor, Contractor shall reimburse Owner for the reasonable charges of Engineer for evaluating each such proposed substitute. Contractor shall also reimburse Owner for the reasonable charges of Engineer for making changes in the Contract Documents (or in the provisions of any other direct contract with Owner) resulting from the acceptance of each proposed substitute.
- F. *Contractor's Expense:* Contractor shall provide all data in support of any proposed substitute or "or-equal" at Contractor's expense.
- 6.06 *Concerning Subcontractors, Suppliers, and Others*
- A. Contractor shall not employ any Subcontractor, Supplier, or other individual or entity (including those acceptable to Owner as indicated in Paragraph 6.06.B), whether initially or as a replacement, against whom Owner may have reasonable objection. Contractor shall not be required to employ any Subcontractor, Supplier, or other individual or entity to furnish or perform any of the Work against whom Contractor has reasonable objection.

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

Whenever any such agreement is with a Subcontractor or Supplier who is listed as a loss payee on the property insurance provided in Paragraph 5.06, the agreement between the Contractor and the Subcontractor or Supplier will contain provisions whereby the Subcontractor or Supplier waives all rights against Owner, Contractor, Engineer, and all other individuals or entities identified in the Supplementary Conditions to be listed as insureds or loss payees (and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them) for all losses and damages caused by, arising out of, relating to, or resulting from any of the perils or causes of loss covered by such policies and any other property insurance applicable to the Work. If the insurers on any such policies require separate waiver forms to be signed by any Subcontractor or Supplier, Contractor will obtain the same.

6.07 *Patent Fees and Royalties*

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

6.08 *Permits*

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

6.09 *Laws and Regulations*

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

6.10 *Taxes*

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

6.11 *Use of Site and Other Areas*

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

- 1. Contractor shall confine construction equipment, the storage of materials and equipment, and the operations of workers to the Site and other areas permitted by Laws and Regulations, and shall not unreasonably encumber the Site and other areas with construction equipment or other materials or equipment. Contractor shall assume full responsibility for any damage to any such land or area, or to the owner or occupant thereof, or of any adjacent land or areas resulting from the performance of the Work.
- 2. Should any claim be made by any such owner or occupant because of the performance of the Work, Contractor shall promptly settle with such other party by negotiation or otherwise resolve the claim by arbitration or other dispute resolution proceeding or at law.
- 3. To the fullest extent permitted by Laws and Regulations, Contractor shall

indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to any claim or action, legal or equitable, brought by any such owner or occupant against Owner, Engineer, or any other party indemnified hereunder to the extent caused by or based upon Contractor's performance of the Work.

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

6.12 *Record Documents*

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

6.13 *Safety and Protection*

- A. Contractor shall be solely responsible for initiating, maintaining and supervising all safety precautions and programs in connection with the Work. Such responsibility does not relieve Subcontractors of their responsibility for the safety of persons and property in the performance of their work nor for compliance with applicable safety Laws and Regulations. Contractor shall take all necessary precautions for the safety of, and shall provide the necessary protection to prevent damage, injury or loss to:
 - 1. All persons on the Site or who may be affected by the Work;

2. All the Work and materials and equipment to be incorporated therein, whether in storage on or off the Site; and
 3. Other property at the Site or adjacent thereto, including trees, shrubs, lawns, walks, pavements, roadways, structures, utilities, and Underground Facilities not designated for removal, relocation, or replacement in the course of construction.
- B. Contractor shall comply with all applicable Laws and Regulations relating to the safety of persons or property, or to the protection of persons or property from damage, injury, or loss; and shall erect and maintain all necessary safeguards for such safety and protection. Contractor shall notify owners of adjacent property and of Underground Facilities and other utility owners when prosecution of the Work may affect them, and shall cooperate with them in the protection, removal, relocation, and replacement of their property.
 - C. Contractor shall comply with the applicable requirements of Owner's safety programs that are applicable to the Work.
 - D. Contractor shall inform Owner and Engineer of the specific requirements of Contractor's safety programs with which Owner's and Engineer's employees and representatives must comply while at the Site.
 - E. All damage, injury, or loss to any property referred to in Paragraph 6.13.A.2 or 6.13.A.3 caused, directly or indirectly, in whole or in part, by Contractor, any Subcontractor, Supplier, or any other individual or entity directly or indirectly employed by any of them to perform any of the Work, or anyone for whose acts any of them may be liable, shall be remedied by Contractor (except damage or loss attributable to the fault of Drawings or Specifications or to the acts or omissions of Owner or Engineer or anyone employed by any of them, or anyone for whose acts any of them may be liable, and not attributable, directly or indirectly, in whole or in part, to the fault or negligence of Contractor or any Subcontractor, Supplier, or other individual or entity directly or indirectly employed by any of them).
 - F. Contractor's duties and responsibilities for safety and for protection of the Work shall continue until such time as all the Work is completed and Engineer has issued a notice to Owner and Contractor in accordance with Paragraph 14.07.B that the Work is acceptable (except as otherwise expressly provided in connection with Substantial Completion).

6.14 *Safety Representative*

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

6.15 *Hazard Communication Programs*

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

6.16 *Emergencies*

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

6.17 *Shop Drawings and Samples*

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

1. *Shop Drawings*

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

2. *Samples*

- a. Submit number of Samples specified in the Specifications.
- b. Clearly identify each Sample as to material, Supplier, pertinent data such as catalog numbers, the use for which intended and other data as Engineer may require to enable Engineer to review the submittal for the limited purposes required by Paragraph 6.17.D.

- B. Where a Shop Drawing or Sample is required by the Contract Documents or the Schedule of Submittals, any related Work performed prior to Engineer's review and approval of the pertinent submittal will be at the sole expense and responsibility of

Contractor.

C. *Submittal Procedures*

1. Before submitting each Shop Drawing or Sample, Contractor shall have:
 - a. Reviewed and coordinated each Shop Drawing or Sample with other Shop Drawings and Samples and with the requirements of the Work and the Contract Documents.;
 - b. Determined and verified all field measurements, quantities, dimensions, specified performance and design criteria, installation requirements, materials, catalog numbers, and similar information with respect thereto;
 - c. Determined and verified the suitability of all materials offered with respect to indicated use, fabrication, shipping, handling, storage, assembly, and installation pertaining to the performance of the Work; and
 - d. Determined and verified all information relative to Contractor's responsibilities for means, methods, techniques, sequences, and procedures of construction, and safety precautions and programs incident thereto.
2. Each submittal shall bear a stamp or specific written certification that Contractor has satisfied Contractor's obligations under the Contract Documents with respect to Contractor's review and approval of that submittal.
3. With each submittal, Contractor shall give Engineer specific written notice of any variations, that the Shop Drawing or Sample may have from the requirements of the Contract Documents. This notice shall be both a written communication separate from the Shop Drawing or Sample submittal; and, in addition, by a specific notation made on each Shop Drawing or Sample submitted to Engineer for review and approval of each such variation.

D. *Engineer's Review*

1. Engineer will provide timely review of Shop Drawings and Samples in accordance with the Schedule of Submittals acceptable to Engineer. Engineer's review and approval will be only to determine if the items covered by the submittals will, after installation or incorporation in the Work, conform to the information given in the Contract Documents and be compatible with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents.
2. Engineer's review and approval will not extend to means, methods, techniques, sequences, or procedures of construction (except where a particular means,

method, technique, sequence, or procedure of construction is specifically and expressly called for by the Contract Documents) or to safety precautions or programs incident thereto. The review and approval of a separate item as such will not indicate approval of the assembly in which the item functions.

3. Engineer's review and approval shall not relieve Contractor from responsibility for any variation from the requirements of the Contract Documents unless Contractor has complied with the requirements of Paragraph 6.17.C.3 and Engineer has given written approval of each such variation by specific written notation thereof incorporated in or accompanying the Shop Drawing or Sample. Engineer's review and approval shall not relieve Contractor from responsibility for complying with the requirements of Paragraph 6.17.C.1.

E. *Resubmittal Procedures*

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

6.18 *Continuing the Work*

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

6.19 *Contractor's General Warranty and Guarantee*

- A. Contractor warrants and guarantees to Owner that all Work will be in accordance with the Contract Documents and will not be defective. Engineer and its officers, directors, members, partners, employees, agents, consultants and subcontractors shall be entitled to rely on representation of Contractor's warranty and guarantee.
- B. Contractor's warranty and guarantee hereunder excludes defects or damage caused by:
 1. Abuse, modification, or improper maintenance or operation by persons other than Contractor, Subcontractors, Suppliers, or any other individual or entity for whom Contractor is responsible; or
 2. Normal wear and tear under normal usage.
- C. Contractor's obligation to perform and complete the Work in accordance with the Contract Documents shall be absolute. None of the following will constitute an acceptance of Work that is not in accordance with the Contract Documents or a

release of Contractor's obligation to perform the Work in accordance with the Contract Documents:

1. Observations by Engineer;
2. Recommendation by Engineer or payment by Owner of any progress or final payment;
3. The issuance of a certificate of Substantial Completion by Engineer or any payment related thereto by Owner;
4. Use or occupancy of the Work or any part thereof by Owner;
5. Any review and approval of a Shop Drawing or Sample submittal or the issuance of a notice of acceptability by Engineer;
6. Any inspection, test, or approval by others; or
7. Any correction of defective Work by Owner.

6.20 *Indemnification*

- A. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to the performance of the Work, provided that any such claim, cost, loss, or damage:
 1. Is attributable to bodily injury, sickness, disease, or death, or to injury to or destruction of real or personal property (other than the Work itself), including the loss of use resulting therefrom; and
 2. Is caused by any act or omission of Contractor, any Subcontractor, any Supplier, or any individual or entity directly or indirectly employed by any of them to perform any of the Work or anyone for whose acts any of them may be liable, regardless of whether or not caused in part by an individual or entity indemnified hereunder or whether liability is imposed upon such indemnified party by Laws or Regulations.
- B. In any and all claims against Owner or Engineer or any of their , officers, directors, members, partners, employees, agents, consultants, or subcontractors by any employee (or the survivor or personal representative of such employee) of Contractor, any Subcontractor, any Supplier, or any individual or entity directly or indirectly employed by any of them to perform any of the Work, or anyone for whose acts any

of them may be liable, the indemnification obligation under Paragraph 6.20.A shall not be limited in any way by any limitation on the amount or type of damages, compensation, or benefits payable by or for Contractor or any such Subcontractor, Supplier, or other individual or entity under workers' compensation acts, disability benefit acts, or other employee benefit acts.

- C. The indemnification obligations of Contractor under Paragraph 6.20.A shall not be limited in any way by the amount or types of insurance provided by Contractor under Article 5 of the General Conditions.
- D. The indemnification obligations of Contractor under Paragraph 6.20.A shall not extend to the sole negligence or willful misconduct of Owner or Engineer or to the officers, directors, members, partners, employees, agents, and consultants and subcontractors of each and any of them.

6.21 *Delegation of Professional Design Services*

- A. Contractor will not be required to provide professional design services unless such services are specifically required by the Contract Documents for a portion of the Work or unless such services are required to carry out Contractor's responsibilities for construction means, methods, techniques, sequences and procedures. Contractor shall not be required to provide professional services in violation of applicable law.
- B. If professional design services or certifications by a design professional related to systems, materials or equipment are specifically required of Contractor by the Contract Documents, Owner and Engineer will specify all performance and design criteria that such services must satisfy. Contractor shall cause such services or certifications to be provided by a properly licensed professional, whose signature and seal shall appear on all drawings, calculations, specifications, certifications, Shop Drawings and other submittals prepared by such professional. Shop Drawings and other submittals related to the Work designed or certified by such professional, if prepared by others, shall bear such professional's written approval when submitted to Engineer.
- C. Owner and Engineer shall be entitled to rely upon the adequacy, accuracy and completeness of the services, certifications or approvals performed by such design professionals, provided Owner and Engineer have specified to Contractor all performance and design criteria that such services must satisfy.
- D. Pursuant to this Paragraph 6.21, Engineer's review and approval of design calculations and design drawings will be only for the limited purpose of checking for conformance with performance and design criteria given and the design concept expressed in the Contract Documents. Engineer's review and approval of Shop Drawings and other submittals (except design calculations and design drawings) will be only for the purpose stated in Paragraph 6.17.D.1.

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

ARTICLE 7 – OTHER WORK AT THE SITE

7.01 *Related Work at Site*

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

7.02 *Legal Relationships*

- A. Paragraph 7.01.A is not applicable for utilities not under the control of Owner.

- B. Each other direct contract of Owner under Paragraph 7.01.A shall provide that the other contractor is liable to Owner and Contractor for the reasonable direct delay and disruption costs incurred by Contractor as a result of the other contractor's actions or inactions.
- C. Contractor shall be liable to Owner and any other contractor under direct contract to Owner for the reasonable direct delay and disruption costs incurred by such other contractor as a result of Contractor's action or inactions.

ARTICLE 8 – OWNER'S RESPONSIBILITIES

8.01 *Communications to Contractor*

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

8.02 *Furnish Data*

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

8.03 *Pay When Due*

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

8.04 *Lands and Easements; Reports and Tests*

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

8.05 *Insurance*

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

8.06 *Change Orders*

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

8.07 *Inspections, Tests, and Approvals*

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

8.08 *Limitations on Owner's Responsibilities*

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

8.09 *Undisclosed Hazardous Environmental Condition*

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

8.10 *Evidence of Financial Arrangements*

- A. If and to the extent Owner has agreed to furnish Contractor reasonable evidence that financial arrangements have been made to satisfy Owner's obligations under the Contract Documents, Owner's responsibility in respect thereof will be as set forth in the Supplementary Conditions.

8.11 *Compliance With Safety Programs*

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

ARTICLE 9 – ENGINEER'S STATUS DURING CONSTRUCTION

9.01 *Owner's Representative*

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

9.02 *Visits to Site*

- A. Engineer will make visits to the Site at intervals appropriate to the various stages of construction as Engineer deems necessary in order to observe as an experienced and qualified design professional the progress that has been made and the quality of the

various aspects of Contractor's executed Work. Based on information obtained during such visits and observations, Engineer, for the benefit of Owner, will determine, in general, if the Work is proceeding in accordance with the Contract Documents. Engineer will not be required to make exhaustive or continuous inspections on the Site to check the quality or quantity of the Work. Engineer's efforts will be directed toward providing for Owner a greater degree of confidence that the completed Work will conform generally to the Contract Documents. On the basis of such visits and observations, Engineer will keep Owner informed of the progress of the Work and will endeavor to guard Owner against defective Work.

- B. Engineer's visits and observations are subject to all the limitations on Engineer's authority and responsibility set forth in Paragraph 9.09. Particularly, but without limitation, during or as a result of Engineer's visits or observations of Contractor's Work, Engineer will not supervise, direct, or have control over Contractor's Work, nor shall Engineer have authority over or responsibility for the means, methods, techniques, sequences, or procedures of construction selected by Contractor, for safety precautions and programs incident to Contractor's Work in progress, nor for any failure of Contractor to comply with Laws and Regulations applicable to Contractor's furnishing and performing the Work.

9.03 *Project Representative*

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

9.04 *Authorized Variations in Work*

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

9.05 *Rejecting Defective Work*

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

9.06 *Shop Drawings, Change Orders and Payments*

- A. In connection with Engineer's authority, and limitations thereof, as to Shop Drawings and Samples, see Paragraph 6.17.
- B. In connection with Engineer's authority, and limitations thereof, if any,
 - 1. As to design calculations and design drawings submitted in response to a delegation of professional design services, if any, see Paragraph 6.21;
 - 2. As to Change Orders, see Articles 10, 11, and 12; and
 - 3. As to Applications for Payment, see Article 14.

9.07 *Determinations for Unit Price Work*

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

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

- A. Engineer will be the initial interpreter of the requirements of the Contract Documents and judge of the acceptability of the Work thereunder. All matters in question and other matters between Owner and Contractor arising prior to the date final payment is due relating to the acceptability of the Work, and the interpretation of the requirements of the Contract Documents pertaining to the performance of the Work, will be referred initially to Engineer in writing within 30 days of the event giving rise to the question.
- B. Engineer will, with reasonable promptness, render a written decision on the issue referred. If Owner or Contractor believes that any such decision entitles them to an adjustment in the Contract Price or Contract Times or both, a Claim may be made

under Paragraph 10.05. The date of Engineer's decision shall be the date of the event giving rise to the issues referenced for the purposes of Paragraph 10.05.B.

- C. Engineer's written decision on the issue referred will be final and binding on Owner and Contractor, subject to the provisions of Paragraph 10.05.
- D. When functioning as interpreter and judge under this Paragraph 9.08, Engineer will not show partiality to Owner or Contractor and will not be liable in connection with any interpretation or decision rendered in good faith in such capacity.

9.09 *Limitations on Engineer's Authority and Responsibilities*

- A. Neither Engineer's authority or responsibility under this Article 9 or under any other provision of the Contract Documents nor any decision made by Engineer in good faith either to exercise or not exercise such authority or responsibility or the undertaking, exercise, or performance of any authority or responsibility by Engineer shall create, impose, or give rise to any duty in contract, tort, or otherwise owed by Engineer to Contractor, any Subcontractor, any Supplier, any other individual or entity, or to any surety for or employee or agent of any of them.
- B. Engineer will not supervise, direct, control, or have authority over or be responsible for Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work. Engineer will not be responsible for Contractor's failure to perform the Work in accordance with the Contract Documents.
- C. Engineer will not be responsible for the acts or omissions of Contractor or of any Subcontractor, any Supplier, or of any other individual or entity performing any of the Work.
- D. Engineer's review of the final Application for Payment and accompanying documentation and all maintenance and operating instructions, schedules, guarantees, bonds, certificates of inspection, tests and approvals, and other documentation required to be delivered by Paragraph 14.07.A will only be to determine generally that their content complies with the requirements of, and in the case of certificates of inspections, tests, and approvals that the results certified indicate compliance with the Contract Documents.
- E. The limitations upon authority and responsibility set forth in this Paragraph 9.09 shall also apply to the Resident Project Representative, if any, and assistants, if any.

9.10 *Compliance with Safety Programs*

- A. While on the Site, Engineer's employees and representatives shall comply with the specific applicable requirements of the Contractor's safety programs of which Engineer

has been informed pursuant to Paragraph 6.13.C.

ARTICLE 10 – CHANGES IN THE WORK; CLAIMS

10.01 *Authorized Changes in the Work*

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

10.02 *Unauthorized Changes in the Work*

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

10.03 *Execution of Change Orders*

- A. Owner and Contractor shall execute appropriate Change Orders recommended by Engineer covering:
 - 1. Changes in the Work which are:
 - a) Ordered by Owner pursuant to Paragraph 10.01.A,
 - b) Required because of acceptance of defective Work under Paragraph 13.08.A or Owner's correction of defective Work under Paragraph 13.09, or
 - c) Agreed to by the parties;
 - 2. Changes in the Contract Price or Contract Times which are agreed to by the parties, including any undisputed sum or amount of time for Work actually performed in accordance with a Work Change Directive; and
 - 3. Changes in the Contract Price or Contract Times which embody the substance of

any written decision rendered by Engineer pursuant to Paragraph 10.05; provided that, in lieu of executing any such Change Order, an appeal may be taken from any such decision in accordance with the provisions of the Contract Documents and applicable Laws and Regulations, but during any such appeal, Contractor shall carry on the Work and adhere to the Progress Schedule as provided in Paragraph 6.18.A.

10.04 *Notification to Surety*

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

10.05 *Claims*

- A. *Engineer's Decision Required:* All Claims, except those waived pursuant to Paragraph 14.09, shall be referred to the Engineer for decision. A decision by Engineer shall be required as a condition precedent to any exercise by Owner or Contractor of any rights or remedies either may otherwise have under the Contract Documents or by Laws and Regulations in respect of such Claims.
- B. *Notice:* Written notice stating the general nature of each Claim shall be delivered by the claimant to Engineer and the other party to the Contract promptly (but in no event later than 30 days) after the start of the event giving rise thereto. The responsibility to substantiate a Claim shall rest with the party making the Claim. Notice of the amount or extent of the Claim, with supporting data shall be delivered to the Engineer and the other party to the Contract within 60 days after the start of such event (unless Engineer allows additional time for claimant to submit additional or more accurate data in support of such Claim). A Claim for an adjustment in Contract Price shall be prepared in accordance with the provisions of Paragraph 12.01.B. A Claim for an adjustment in Contract Times shall be prepared in accordance with the provisions of Paragraph 12.02.B. Each Claim shall be accompanied by claimant's written statement that the adjustment claimed is the entire adjustment to which the claimant believes it is entitled as a result of said event. The opposing party shall submit any response to Engineer and the claimant within 30 days after receipt of the claimant's last submittal (unless Engineer allows additional time).
- C. *Engineer's Action:* Engineer will review each Claim and, within 30 days after receipt of the last submittal of the claimant or the last submittal of the opposing party, if any, take one of the following actions in writing:
 - 1. Deny the Claim in whole or in part,
 - 2. Approve the Claim, or

3. Notify the parties that the Engineer is unable to resolve the Claim if, in the Engineer's sole discretion, it would be inappropriate for the Engineer to do so. For purposes of further resolution of the Claim, such notice shall be deemed a denial.
- D. In the event that Engineer does not take action on a Claim within said 30 days, the Claim shall be deemed denied.
- E. Engineer's written action under Paragraph 10.05.C or denial pursuant to Paragraphs 10.05.C.3 or 10.05.D will be final and binding upon Owner and Contractor, unless Owner or Contractor invoke the dispute resolution procedure set forth in Article 16 within 30 days of such action or denial.
- F. No Claim for an adjustment in Contract Price or Contract Times will be valid if not submitted in accordance with this Paragraph 10.05.

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

11.01 *Cost of the Work*

- A. *Costs Included:* The term Cost of the Work means the sum of all costs, except those excluded in Paragraph 11.01.B, necessarily incurred and paid by Contractor in the proper performance of the Work. When the value of any Work covered by a Change Order or when a Claim for an adjustment in Contract Price is determined on the basis of Cost of the Work, the costs to be reimbursed to Contractor will be only those additional or incremental costs required because of the change in the Work or because of the event giving rise to the Claim. Except as otherwise may be agreed to in writing by Owner, such costs shall be in amounts no higher than those prevailing in the locality of the Project, shall not include any of the costs itemized in Paragraph 11.01.B, and shall include only the following items:
 1. Payroll costs for employees in the direct employ of Contractor in the performance of the Work under schedules of job classifications agreed upon by Owner and Contractor. Such employees shall include, without limitation, superintendents, foremen, and other personnel employed full time on the Work. Payroll costs for employees not employed full time on the Work shall be apportioned on the basis of their time spent on the Work. Payroll costs shall include, but not be limited to, salaries and wages plus the cost of fringe benefits, which shall include social security contributions, unemployment, excise, and payroll taxes, workers' compensation, health and retirement benefits, bonuses, sick leave, vacation and holiday pay applicable thereto. The expenses of performing Work outside of regular working hours, on Saturday, Sunday, or legal holidays, shall be included in the above to the extent authorized by Owner.
 2. Cost of all materials and equipment furnished and incorporated in the Work,

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

3. Payments made by Contractor to Subcontractors for Work performed by Subcontractors. If required by Owner, Contractor shall obtain competitive bids from subcontractors acceptable to Owner and Contractor and shall deliver such bids to Owner, who will then determine, with the advice of Engineer, which bids, if any, will be acceptable. If any subcontract provides that the Subcontractor is to be paid on the basis of Cost of the Work plus a fee, the Subcontractor's Cost of the Work and fee shall be determined in the same manner as Contractor's Cost of the Work and fee as provided in this Paragraph 11.01.
4. Costs of special consultants (including but not limited to Engineers, architects, testing laboratories, surveyors, attorneys, and accountants) employed for services specifically related to the Work.
5. Supplemental costs including the following:
 - a. The proportion of necessary transportation, travel, and subsistence expenses of Contractor's employees incurred in discharge of duties connected with the Work.
 - b. Cost, including transportation and maintenance, of all materials, supplies, equipment, machinery, appliances, office, and temporary facilities at the Site, and hand tools not owned by the workers, which are consumed in the performance of the Work, and cost, less market value, of such items used but not consumed which remain the property of Contractor.
 - c. Rentals of all construction equipment and machinery, and the parts thereof whether rented from Contractor or others in accordance with rental agreements approved by Owner with the advice of Engineer, and the costs of transportation, loading, unloading, assembly, dismantling, and removal thereof. All such costs shall be in accordance with the terms of said rental agreements. The rental of any such equipment, machinery, or parts shall cease when the use thereof is no longer necessary for the Work.
 - d. Sales, consumer, use, and other similar taxes related to the Work, and for which Contractor is liable, imposed by Laws and Regulations.
 - e. Deposits lost for causes other than negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or

for whose acts any of them may be liable, and royalty payments and fees for permits and licenses.

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

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

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

liable, including but not limited to, the correction of defective Work, disposal of materials or equipment wrongly supplied, and making good any damage to property.

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

11.02 *Allowances*

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

by Engineer to reflect actual amounts due Contractor on account of Work covered by allowances, and the Contract Price shall be correspondingly adjusted.

11.03 *Unit Price Work*

- A. Where the Contract Documents provide that all or part of the Work is to be Unit Price Work, initially the Contract Price will be deemed to include for all Unit Price Work an amount equal to the sum of the unit price for each separately identified item of Unit Price Work times the estimated quantity of each item as indicated in the Agreement.
- B. The estimated quantities of items of Unit Price Work are not guaranteed and are solely for the purpose of comparison of Bids and determining an initial Contract Price. Determinations of the actual quantities and classifications of Unit Price Work performed by Contractor will be made by Engineer subject to the provisions of Paragraph 9.07.
- C. Each unit price will be deemed to include an amount considered by Contractor to be adequate to cover Contractor's overhead and profit for each separately identified item.
- D. Owner or Contractor may make a Claim for an adjustment in the Contract Price in accordance with Paragraph 10.05 if:
 - 1. The quantity of any item of Unit Price Work performed by Contractor differs materially and significantly from the estimated quantity of such item indicated in the Agreement; and
 - 2. There is no corresponding adjustment with respect to any other item of Work; and
 - 3. Contractor believes that Contractor is entitled to an increase in Contract Price as a result of having incurred additional expense or Owner believes that Owner is entitled to a decrease in Contract Price and the parties are unable to agree as to the amount of any such increase or decrease.

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

12.01 *Change of Contract Price*

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

- B. The value of any Work covered by a Change Order or of any Claim for an adjustment in the Contract Price will be determined as follows:
1. Where the Work involved is covered by unit prices contained in the Contract Documents, by application of such unit prices to the quantities of the items involved (subject to the provisions of Paragraph 11.03); or
 2. Where the Work involved is not covered by unit prices contained in the Contract Documents, by a mutually agreed lump sum (which may include an allowance for overhead and profit not necessarily in accordance with Paragraph 12.01.C.2); or
 3. Where the Work involved is not covered by unit prices contained in the Contract Documents and agreement to a lump sum is not reached under Paragraph 12.01.B.2, on the basis of the Cost of the Work (determined as provided in Paragraph 11.01) plus a Contractor's fee for overhead and profit (determined as provided in Paragraph 12.01.C).
- C. *Contractor's Fee:* The Contractor's fee for overhead and profit shall be determined as follows:
1. A mutually acceptable fixed fee; or
 2. If a fixed fee is not agreed upon, then a fee based on the following percentages of the various portions of the Cost of the Work:
 - a. For costs incurred under Paragraphs 11.01.A.1 and 11.01.A.2, the Contractor's fee shall be 15 percent;
 - b. For costs incurred under Paragraph 11.01.A.3, the Contractor's fee shall be five percent;
 - c. Where one or more tiers of subcontracts are on the basis of Cost of the Work plus a fee and no fixed fee is agreed upon, the intent of Paragraph 12.01.C.2.a and 12.01.C.2.b is that the Subcontractor who actually performs the Work, at whatever tier, will be paid a fee of 15 percent of the costs incurred by such Subcontractor under Paragraphs 11.01.A.1 and 11.01.A.2 and that any higher tier Subcontractor and Contractor will each be paid a fee of five percent of the amount paid to the next lower tier Subcontractor;
 - d. No fee shall be payable on the basis of costs itemized under Paragraphs 11.01.A.4, 11.01.A.5, and 11.01.B;
 - e. The amount of credit to be allowed by Contractor to Owner for any change which results in a net decrease in cost will be the amount of the actual net decrease in cost plus a deduction in Contractor's fee by an amount equal to

five percent of such net decrease; and

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

12.02 *Change of Contract Times*

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

12.03 *Delays*

- A. Where Contractor is prevented from completing any part of the Work within the Contract Times due to delay beyond the control of Contractor, the Contract Times will be extended in an amount equal to the time lost due to such delay if a Claim is made therefor as provided in Paragraph 12.02.A. Delays beyond the control of Contractor shall include, but not be limited to, acts or neglect by Owner, acts or neglect of utility owners or other contractors performing other work as contemplated by Article 7, fires, floods, epidemics, abnormal weather conditions, or acts of God.
- B. Contractor shall not be entitled to an adjustment in Contract Price or Contract Times for delays within the control of Contractor. Delays attributable to and within the control of a Subcontractor or Supplier shall be deemed to be delays within the control of Contractor.
- C. If Owner, Engineer, or utility owners performing other work for Owner as contemplated by Article 7, or anyone for whom Owner is responsible, delays, disrupts, or interferes with the performance or progress of the Work, then Contractor shall be entitled to an equitable adjustment in the Contract Price or the Contract Times, or both. Contractor's entitlement to an adjustment of the Contract Times is conditioned on such adjustment being essential to Contractor's ability to complete the Work within the Contract Times.
- D. If Contractor is delayed in the performance or progress of the Work by fire, flood, epidemic, abnormal weather conditions, acts of God, acts or failures to act of other contractors or utility owners, or other causes not the fault of and beyond control of Owner and Contractor, then Contractor shall be entitled to an equitable adjustment in Contract Times, if such adjustment is essential to Contractor's ability to complete the Work within the Contract Times. Such an adjustment shall be Contractor's sole and

exclusive remedy for the delays described in this Paragraph 12.03.D.

- E. Owner and Engineer and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each of them shall not be liable to Contractor for any claims, costs, losses, or damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) sustained by Contractor on or in connection with any other project or anticipated project.

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

13.01 *Notice of Defects*

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

13.02 *Access to Work*

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

13.03 *Tests and Inspections*

- A. Contractor shall give Engineer timely notice of readiness of the Work for all required inspections, tests, or approvals and shall cooperate with inspection and testing personnel to facilitate required inspections or tests.
- B. Owner shall employ and pay for the services of an independent testing laboratory to perform all inspections, tests, or approvals required by the Contract Documents except:
 - 1. For inspections, tests, or approvals covered by Paragraphs 13.03.C and 13.03.D below;
 - 2. That costs incurred in connection with tests or inspections conducted pursuant to Paragraph 13.04.B shall be paid as provided in said Paragraph 13.04.C; and
 - 3. As otherwise specifically provided in the Contract Documents.

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

13.04 *Uncovering Work*

- A. If any Work is covered contrary to the written request of Engineer, it must, if requested by Engineer, be uncovered for Engineer's observation and replaced at Contractor's expense.
- B. If Engineer considers it necessary or advisable that covered Work be observed by Engineer or inspected or tested by others, Contractor, at Engineer's request, shall uncover, expose, or otherwise make available for observation, inspection, or testing as Engineer may require, that portion of the Work in question, furnishing all necessary labor, material, and equipment.
- C. If it is found that the uncovered Work is defective, Contractor shall pay all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such uncovering, exposure, observation, inspection, and testing, and of satisfactory replacement or reconstruction (including but not limited to all costs of repair or replacement of work of others); and Owner shall be entitled to an appropriate decrease in the Contract Price. If the parties are unable to agree as to the amount thereof, Owner may make a Claim therefor as provided in Paragraph 10.05.
- D. If, the uncovered Work is not found to be defective, Contractor shall be allowed an

increase in the Contract Price or an extension of the Contract Times, or both, directly attributable to such uncovering, exposure, observation, inspection, testing, replacement, and reconstruction. If the parties are unable to agree as to the amount or extent thereof, Contractor may make a Claim therefore as provided in Paragraph 10.05.

13.05 *Owner May Stop the Work*

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

13.06 *Correction or Removal of Defective Work*

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

13.07 *Correction Period*

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

3. If the defective Work has been rejected by Owner, remove it from the Project and replace it with Work that is not defective, and
 4. Satisfactorily correct or repair or remove and replace any damage to other Work, to the work of others or other land or areas resulting therefrom.
- B. If Contractor does not promptly comply with the terms of Owner's written instructions, or in an emergency where delay would cause serious risk of loss or damage, Owner may have the defective Work corrected or repaired or may have the rejected Work removed and replaced. All claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such correction or repair or such removal and replacement (including but not limited to all costs of repair or replacement of work of others) will be paid by Contractor.
- C. In special circumstances where a particular item of equipment is placed in continuous service before Substantial Completion of all the Work, the correction period for that item may start to run from an earlier date if so provided in the Specifications.
- D. Where defective Work (and damage to other Work resulting therefrom) has been corrected or removed and replaced under this Paragraph 13.07, the correction period hereunder with respect to such Work will be extended for an additional period of one year after such correction or removal and replacement has been satisfactorily completed.
- E. Contractor's obligations under this Paragraph 13.07 are in addition to any other obligation or warranty. The provisions of this Paragraph 13.07 shall not be construed as a substitute for or a waiver of the provisions of any applicable statute of limitation or repose.

13.08 *Acceptance of Defective Work*

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

accepted. If the parties are unable to agree as to the amount thereof, Owner may make a Claim therefor as provided in Paragraph 10.05. If the acceptance occurs after such recommendation, an appropriate amount will be paid by Contractor to Owner.

13.09 *Owner May Correct Defective Work*

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

ARTICLE 14 – PAYMENTS TO CONTRACTOR AND COMPLETION

14.01 *Schedule of Values*

- A. The Schedule of Values established as provided in Paragraph 2.07.A will serve as the

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

14.02 *Progress Payments*

A. Applications for Payments

1. At least 20 days before the date established in the Agreement for each progress payment (but not more often than once a month), Contractor shall submit to Engineer for review an Application for Payment filled out and signed by Contractor covering the Work completed as of the date of the Application and accompanied by such supporting documentation as is required by the Contract Documents. If payment is requested on the basis of materials and equipment not incorporated in the Work but delivered and suitably stored at the Site or at another location agreed to in writing, the Application for Payment shall also be accompanied by a bill of sale, invoice, or other documentation warranting that Owner has received the materials and equipment free and clear of all Liens and evidence that the materials and equipment are covered by appropriate property insurance or other arrangements to protect Owner's interest therein, all of which must be satisfactory to Owner.
2. Beginning with the second Application for Payment, each Application shall include an affidavit of Contractor stating that all previous progress payments received on account of the Work have been applied on account to discharge Contractor's legitimate obligations associated with prior Applications for Payment.
3. The amount of retainage with respect to progress payments will be as stipulated in the Agreement.

B. *Review of Applications*

1. Engineer will, within 10 days after receipt of each Application for Payment, either indicate in writing a recommendation of payment and present the Application to Owner or return the Application to Contractor indicating in writing Engineer's reasons for refusing to recommend payment. In the latter case, Contractor may make the necessary corrections and resubmit the Application.
2. Engineer's recommendation of any payment requested in an Application for Payment will constitute a representation by Engineer to Owner, based on Engineer's observations of the executed Work as an experienced and qualified design professional and on Engineer's review of the Application for Payment and the accompanying data and schedules, that to the best of Engineer's knowledge, information and belief:

- a. The Work has progressed to the point indicated;
 - b. The quality of the Work is generally in accordance with the Contract Documents (subject to an evaluation of the Work as a functioning whole prior to or upon Substantial Completion, to the results of any subsequent tests called for in the Contract Documents, to a final determination of quantities and classifications for Unit Price Work under Paragraph 9.07, and to any other qualifications stated in the recommendation); and
 - c. The conditions precedent to Contractor's being entitled to such payment appear to have been fulfilled in so far as it is Engineer's responsibility to observe the Work.
3. By recommending any such payment Engineer will not thereby be deemed to have represented that:
 - a. Inspections made to check the quality or the quantity of the Work as it has been performed have been exhaustive, extended to every aspect of the Work in progress, or involved detailed inspections of the Work beyond the responsibilities specifically assigned to Engineer in the Contract Documents; or
 - b. There may not be other matters or issues between the parties that might entitle Contractor to be paid additionally by Owner or entitle Owner to withhold payment to Contractor.
4. Neither Engineer's review of Contractor's Work for the purposes of recommending payments nor Engineer's recommendation of any payment, including final payment, will impose responsibility on Engineer:
 - a. To supervise, direct, or control the Work, or
 - b. For the means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or
 - c. For Contractor's failure to comply with Laws and Regulations applicable to Contractor's performance of the Work, or
 - d. To make any examination to ascertain how or for what purposes Contractor has used the moneys paid on account of the Contract Price, or
 - e. To determine that title to any of the Work, materials, or equipment has passed to Owner free and clear of any Liens.
5. Engineer may refuse to recommend the whole or any part of any payment if, in Engineer's opinion, it would be incorrect to make the representations to Owner

stated in Paragraph 14.02.B.2. Engineer may also refuse to recommend any such payment or, because of subsequently discovered evidence or the results of subsequent inspections or tests, revise or revoke any such payment recommendation previously made, to such extent as may be necessary in Engineer's opinion to protect Owner from loss because:

- a. The Work is defective, or completed Work has been damaged, requiring correction or replacement;
- b. The Contract Price has been reduced by Change Orders;
- c. Owner has been required to correct defective Work or complete Work in accordance with Paragraph 13.09; or
- d. Engineer has actual knowledge of the occurrence of any of the events enumerated in Paragraph 15.02.A.

C. *Payment Becomes Due*

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

D. *Reduction in Payment*

1. Owner may refuse to make payment of the full amount recommended by Engineer because:
 - a. Claims have been made against Owner on account of Contractor's performance or furnishing of the Work;
 - b. Liens have been filed in connection with the Work, except where Contractor has delivered a specific bond satisfactory to Owner to secure the satisfaction and discharge of such Liens;
 - c. There are other items entitling Owner to a set-off against the amount recommended; or
 - d. Owner has actual knowledge of the occurrence of any of the events enumerated in Paragraphs 14.02.B.5.a through 14.02.B.5.c or Paragraph 15.02.A.
2. If Owner refuses to make payment of the full amount recommended by Engineer, Owner will give Contractor immediate written notice (with a copy to Engineer) stating the reasons for such action and promptly pay Contractor any amount

remaining after deduction of the amount so withheld. Owner shall promptly pay Contractor the amount so withheld, or any adjustment thereto agreed to by Owner and Contractor, when Contractor remedies the reasons for such action.

3. Upon a subsequent determination that Owner's refusal of payment was not justified, the amount wrongfully withheld shall be treated as an amount due as determined by Paragraph 14.02.C.1 and subject to interest as provided in the Agreement.

14.03 *Contractor's Warranty of Title*

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

14.04 *Substantial Completion*

- A. When Contractor considers the entire Work ready for its intended use Contractor shall notify Owner and Engineer in writing that the entire Work is substantially complete (except for items specifically listed by Contractor as incomplete) and request that Engineer issue a certificate of Substantial Completion.
- B. Promptly after Contractor's notification, Owner, Contractor, and Engineer shall make an inspection of the Work to determine the status of completion. If Engineer does not consider the Work substantially complete, Engineer will notify Contractor in writing giving the reasons therefor.
- C. If Engineer considers the Work substantially complete, Engineer will deliver to Owner a tentative certificate of Substantial Completion which shall fix the date of Substantial Completion. There shall be attached to the certificate a tentative list of items to be completed or corrected before final payment. Owner shall have seven days after receipt of the tentative certificate during which to make written objection to Engineer as to any provisions of the certificate or attached list. If, after considering such objections, Engineer concludes that the Work is not substantially complete, Engineer will within 14 days after submission of the tentative certificate to Owner notify Contractor in writing, stating the reasons therefor. If, after consideration of Owner's objections, Engineer considers the Work substantially complete, Engineer will within said 14 days execute and deliver to Owner and Contractor a definitive certificate of Substantial Completion (with a revised tentative list of items to be completed or corrected) reflecting such changes from the tentative certificate as Engineer believes justified after consideration of any objections from Owner.
- D. At the time of delivery of the tentative certificate of Substantial Completion, Engineer will deliver to Owner and Contractor a written recommendation as to division of responsibilities pending final payment between Owner and Contractor with respect to security, operation, safety, and protection of the Work, maintenance, heat, utilities, insurance, and warranties and guarantees. Unless Owner and Contractor agree

otherwise in writing and so inform Engineer in writing prior to Engineer's issuing the definitive certificate of Substantial Completion, Engineer's aforesaid recommendation will be binding on Owner and Contractor until final payment.

- E. Owner shall have the right to exclude Contractor from the Site after the date of Substantial Completion subject to allowing Contractor reasonable access to remove its property and complete or correct items on the tentative list.

14.05 *Partial Utilization*

- A. Prior to Substantial Completion of all the Work, Owner may use or occupy any substantially completed part of the Work which has specifically been identified in the Contract Documents, or which Owner, Engineer, and Contractor agree constitutes a separately functioning and usable part of the Work that can be used by Owner for its intended purpose without significant interference with Contractor's performance of the remainder of the Work, subject to the following conditions.

1. Owner at any time may request Contractor in writing to permit Owner to use or occupy any such part of the Work which Owner believes to be ready for its intended use and substantially complete. If and when Contractor agrees that such part of the Work is substantially complete, Contractor, Owner and Engineer will follow the procedures of Paragraph 14.04.A through D for that part of the Work.
2. Contractor at any time may notify Owner and Engineer in writing that Contractor considers any such part of the Work ready for its intended use and substantially complete and request Engineer to issue a certificate of Substantial Completion for that part of the Work.
3. Within a reasonable time after either such request, Owner, Contractor, and Engineer shall make an inspection of that part of the Work to determine its status of completion. If Engineer does not consider that part of the Work to be substantially complete, Engineer will notify Owner and Contractor in writing giving the reasons therefor. If Engineer considers that part of the Work to be substantially complete, the provisions of Paragraph 14.04 will apply with respect to certification of Substantial Completion of that part of the Work and the division of responsibility in respect thereof and access thereto.
4. No use or occupancy or separate operation of part of the Work may occur prior to compliance with the requirements of Paragraph 5.10 regarding property insurance.

14.06 *Final Inspection*

- A. Upon written notice from Contractor that the entire Work or an agreed portion thereof is complete, Engineer will promptly make a final inspection with Owner and Contractor and will notify Contractor in writing of all particulars in which this

inspection reveals that the Work is incomplete or defective. Contractor shall immediately take such measures as are necessary to complete such Work or remedy such deficiencies.

14.07 *Final Payment*

A. *Application for Payment*

1. After Contractor has, in the opinion of Engineer, satisfactorily completed all corrections identified during the final inspection and has delivered, in accordance with the Contract Documents, all maintenance and operating instructions, schedules, guarantees, bonds, certificates or other evidence of insurance, certificates of inspection, marked-up record documents (as provided in Paragraph 6.12), and other documents, Contractor may make application for final payment following the procedure for progress payments.
2. The final Application for Payment shall be accompanied (except as previously delivered) by:
 - a. All documentation called for in the Contract Documents, including but not limited to the evidence of insurance required by Paragraph 5.04.B.6;
 - b. Consent of the surety, if any, to final payment;
 - c. A list of all Claims against Owner that Contractor believes are unsettled; and
 - d. Complete and legally effective releases or waivers (satisfactory to Owner) of all Lien rights arising out of or Liens filed in connection with the Work.
3. In lieu of the releases or waivers of Liens specified in Paragraph 14.07.A.2 and as approved by Owner, Contractor may furnish receipts or releases in full and an affidavit of Contractor that:
 - 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.

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

1. If, on the basis of Engineer's observation of the Work during construction and

final inspection, and Engineer's review of the final Application for Payment and accompanying documentation as required by the Contract Documents, Engineer is satisfied that the Work has been completed and Contractor's other obligations under the Contract Documents have been fulfilled, Engineer will, within ten days after receipt of the final Application for Payment, indicate in writing Engineer's recommendation of payment and present the Application for Payment to Owner for payment. At the same time Engineer will also give written notice to Owner and Contractor that the Work is acceptable subject to the provisions of Paragraph 14.09. Otherwise, Engineer will return the Application for Payment to Contractor, indicating in writing the reasons for refusing to recommend final payment, in which case Contractor shall make the necessary corrections and resubmit the Application for Payment.

C. *Payment Becomes Due*

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

14.08 *Final Completion Delayed*

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

14.09 *Waiver of Claims*

- A. The making and acceptance of final payment will constitute:
 1. A waiver of all Claims by Owner against Contractor, except Claims arising from unsettled Liens, from defective Work appearing after final inspection pursuant to Paragraph 14.06, from failure to comply with the Contract Documents or the terms of any special guarantees specified therein, or from Contractor's continuing obligations under the Contract Documents; and

2. A waiver of all Claims by Contractor against Owner other than those previously made in accordance with the requirements herein and expressly acknowledged by Owner in writing as still unsettled.

ARTICLE 15 – SUSPENSION OF WORK AND TERMINATION

15.01 *Owner May Suspend Work*

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

15.02 *Owner May Terminate for Cause*

- A. The occurrence of any one or more of the following events will justify termination for cause:
 1. Contractor's persistent failure to perform the Work in accordance with the Contract Documents (including, but not limited to, failure to supply sufficient skilled workers or suitable materials or equipment or failure to adhere to the Progress Schedule established under Paragraph 2.07 as adjusted from time to time pursuant to Paragraph 6.04);
 2. Contractor's disregard of Laws or Regulations of any public body having jurisdiction;
 3. Contractor's disregard of the authority of Engineer; or
 4. Contractor's repeated violation in any substantial way of any provisions of the Contract Documents.
- B. If one or more of the events identified in Paragraph 15.02.A occur, Owner may, after giving Contractor (and surety) seven days written notice of its intent to terminate the services of Contractor:
 1. Exclude Contractor from the Site, and take possession of the Work and of all Contractor's tools, appliances, construction equipment, and machinery at the Site, and use the same to the full extent they could be used by Contractor (without liability to Contractor for trespass or conversion);
 2. Incorporate in the Work all materials and equipment stored at the Site or for

which Owner has paid Contractor but which are stored elsewhere; and

3. Complete the Work as Owner may deem expedient.
- C. If Owner proceeds as provided in Paragraph 15.02.B, Contractor shall not be entitled to receive any further payment until the Work is completed. If the unpaid balance of the Contract Price exceeds all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) sustained by Owner arising out of or relating to completing the Work, such excess will be paid to Contractor. If such claims, costs, losses, and damages exceed such unpaid balance, Contractor shall pay the difference to Owner. Such claims, costs, losses, and damages incurred by Owner will be reviewed by Engineer as to their reasonableness and, when so approved by Engineer, incorporated in a Change Order. When exercising any rights or remedies under this Paragraph Owner shall not be required to obtain the lowest price for the Work performed.
 - D. Notwithstanding Paragraphs 15.02.B and 15.02.C, Contractor's services will not be terminated if Contractor begins within seven days of receipt of notice of intent to terminate to correct its failure to perform and proceeds diligently to cure such failure within no more than 30 days of receipt of said notice.
 - E. Where Contractor's services have been so terminated by Owner, the termination will not affect any rights or remedies of Owner against Contractor then existing or which may thereafter accrue. Any retention or payment of moneys due Contractor by Owner will not release Contractor from liability.
 - F. If and to the extent that Contractor has provided a performance bond under the provisions of Paragraph 5.01.A, the termination procedures of that bond shall supersede the provisions of Paragraphs 15.02.B, and 15.02.C.

15.03 *Owner May Terminate For Convenience*

- A. Upon seven days written notice to Contractor and Engineer, Owner may, without cause and without prejudice to any other right or remedy of Owner, terminate the Contract. In such case, Contractor shall be paid for (without duplication of any items):
 1. Completed and acceptable Work executed in accordance with the Contract Documents prior to the effective date of termination, including fair and reasonable sums for overhead and profit on such Work;
 2. Expenses sustained prior to the effective date of termination in performing services and furnishing labor, materials, or equipment as required by the Contract Documents in connection with uncompleted Work, plus fair and reasonable sums for overhead and profit on such expenses;

3. All claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) incurred in settlement of terminated contracts with Subcontractors, Suppliers, and others; and
 4. Reasonable expenses directly attributable to termination.
- B. Contractor shall not be paid on account of loss of anticipated profits or revenue or other economic loss arising out of or resulting from such termination.

15.04 *Contractor May Stop Work or Terminate*

- A. If, through no act or fault of Contractor, (i) the Work is suspended for more than 90 consecutive days by Owner or under an order of court or other public authority, or (ii) Engineer fails to act on any Application for Payment within 30 days after it is submitted, or (iii) Owner fails for 30 days to pay Contractor any sum finally determined to be due, then Contractor may, upon seven days written notice to Owner and Engineer, and provided Owner or Engineer do not remedy such suspension or failure within that time, terminate the Contract and recover from Owner payment on the same terms as provided in Paragraph 15.03.
- B. In lieu of terminating the Contract and without prejudice to any other right or remedy, if Engineer has failed to act on an Application for Payment within 30 days after it is submitted, or Owner has failed for 30 days to pay Contractor any sum finally determined to be due, Contractor may, seven days after written notice to Owner and Engineer, stop the Work until payment is made of all such amounts due Contractor, including interest thereon. The provisions of this Paragraph 15.04 are not intended to preclude Contractor from making a Claim under Paragraph 10.05 for an adjustment in Contract Price or Contract Times or otherwise for expenses or damage directly attributable to Contractor's stopping the Work as permitted by this Paragraph.

ARTICLE 16 – DISPUTE RESOLUTION

16.01 *Methods and Procedures*

- A. Dispute resolution methods and procedures, if any, shall be as set forth in the Supplementary Conditions. If no method and procedure has been set forth, and subject to the provisions of Paragraph 10.05, Owner and Contractor may exercise such rights or remedies as either may otherwise have under the Contract Documents or by Laws or Regulations in respect of any dispute.

ARTICLE 17 – MISCELLANEOUS

17.01 *Giving Notice*

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

17.02 *Computation of Times*

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

17.03 *Cumulative Remedies*

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

17.04 *Survival of Obligations*

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

17.05 *Controlling Law*

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

17.06 *Headings*

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

++ END OF GENERAL CONDITIONS ++

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SECTION 00800

SUPPLEMENTARY CONDITIONS

SCOPE

These Supplementary Conditions amend or supplement the General Conditions of the Construction Contract. All provisions of the General Conditions that are not so amended or supplemented remain in full force and effect.

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

The address system used in these Supplementary Conditions conforms to the address system used in the General Conditions, with the prefix "SC" added thereto.

SC-1.01.A.19. Add the following new sentences at the end of the Paragraph:

Where ever the terms "Engineer" or "Engineer's" appears in these Contract Documents it shall be understood that the terms apply to the position of the Construction Contract Administrator. Exceptions to this are where both "Engineer" and "Construction Contract Administrator" appear in the same sentence or where referring to the following activities: review of technical submittals such as shop drawings, preparation of the overall project operations manual that will incorporate equipment manuals from the Contractor, and configuration of controls software and operations screens. Engineer will assist Construction Contract Administrator in review of Change Orders, Field Orders, Work Change Directives, and requests for information. The terms "Construction Contract Administrator" or "Construction Contract Administrator's" have been inserted in the Contract Documents in some places, but the terms "Engineer" or "Engineer's" are frequently used in these Contract Documents.

The Engineer will retain full responsibility for its design. The Construction Contract Administrator is not authorized to change the design intent without Engineer's written approval.

SC-1.01.A.44. Delete Paragraph 1.01.A.44 in its entirety and insert the following in its place

44. *Substantial Completion* – The time at which the WORK of the entire project has progressed to the point where, in the opinion of

Engineer, the WORK of the entire project is sufficiently complete, in accordance with the Contract Documents, so that the WORK of the entire project can be utilized for the purposes for which it is intended. The terms “substantially complete” and “substantially completed” as applied to all or part of the WORK refer to Substantial Completion thereof. Substantial Completion is further defined as (i) that degree of completion of the entire Project’s operating facilities or systems sufficient to provide Owner the full time, uninterrupted, and continuous beneficial operation of the WORK of the entire project; and (ii) all required functional, performance and acceptance or startup testing has been successfully demonstrated for all components, devices, equipment, and instrumentation and control to the satisfaction of Construction Contract Administrator in accordance with the requirements of the Specifications. Final paving and installation of vegetated roof shall be completed but seeding and landscape planting are not required to be completed for Substantial Completion.

Partial utilization of any portion of the project by the Owner will not constitute Substantial Completion of that portion of the WORK that is being operated by the Owner until the entire WORK has been issued substantial completion.

SC-1.01.A.52. Add the new definitions immediately following Paragraph 1.01.A.51, that is to read as follows:

SC-1.01.A.52 *Construction Contract Administrator (CCA)*: The individual or entity with whom the Owner has entered into an agreement or selected for administration of construction activities. The term Construction Contract Administrator (CCA) is understood to be substituted for the word “Engineer” everywhere in these Contract Documents except where both terms appear in the same sentence or where the duties described are those set forth for the Engineer in paragraph SC-1.01.A.19.

SC-1.01. Add the following language at the end of Article 1:

G. Construction Contract Administrator 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, directed, specified, authorized, ordered, given, designated, indicated, considered necessary, deemed necessary, permitted, reserved, suspended, established, approval, approved, disapproved, acceptable, unacceptable, suitable, satisfactory, sufficient, insufficient, rejected or condemned,” it shall be understood as if the expression were followed by the words, “by the Construction Contract Administer”, “to the

Construction Contract Administrator”, and/or “by the Engineer” or “to the Engineer” depending on whether the activity is of the type to be performed by the Engineer.

SC-1.02 Delete Paragraph 1.02.D.1.C in its entirety and insert the following in its place:

c. has been damaged prior to Engineer’s recommendation of final payment.

SC-2.02. Amend Paragraph 2.02. (by making the following revision):

In the first line delete the word “ten”, add the word “five”.

SC-2.03. *Commencement of Contract Times; Notice to Proceed* Delete Paragraph 2.03.A in its entirety and insert the following in its place:

A. The Contract Times will commence to run on the date in the Notice to Proceed.

SC-2.06. Amend Paragraph 2.06.A (by making the following revision):

In the first line after the word “Contractor”, add the word “Construction Contract Administrator”.

SC-3.03.A.3 Amend Paragraph 3.03.A.3 (by making the following revision):

In the first line after the word “Owner” add the words “Construction Contract Administrator,”.

SC-3.06.A. Amend Paragraph 3.06.A (by making the following revision):

In the first and second lines after the word “Owner” add the words “Construction Contract Administrator,”

SC-4.01. Add the following new paragraph immediately after Paragraph 4.01.B:

C. 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 that 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.

SC-4.02. Add a new Paragraph immediately after Paragraph 4.02.B that is to read as follows:

SC-4.02.C in the preparation of the Drawings and Specifications, Engineer has relied upon:

1. The following report of explorations and tests of subsurface conditions at the Site.
 - a. Report dated September 2010 prepared by Thelen Associates, Inc, 1398 Cox Avenue, Erlanger, KY, entitled "Geotechnical Exploration Advanced Treatment Facilities Taylor Mill Treatment Plant, Grand Avenue, Taylor Mill, Kentucky".
 - b. A copy of the above report is available for review at office of Malcolm Pirnie, Inc., 8600 Governor's Hill Drive, Suite 210, Cincinnati, Ohio 45249, upon 48 hours' notice to ENGINEER.
 - c. An electronic copy in Adobe Acrobat .pdf format of the geotechnical report may be requested from Malcolm Pirnie, Inc., 8600 Governor's Hill Drive, Suite 210, Cincinnati, Ohio 45249, (513) 677-8380, at no additional cost.

SC-4.02. D In preparation of Drawings and Specifications, Engineer or Related Entities relied upon the following drawings of physical conditions in or relating to existing surface and subsurface structures (except Underground Facilities) which are at or contiguous to the Site:

4.02.D.1 Water Treatment Plant, contact No. 3, dated September 1953 by Alfred LeFeber and Associates.

4.02.D.2 Taylor Mill Water Treatment Plant Improvements, dated June 1987 by Burgess & Niple, Limited.

4.02.D.3 Taylor Mill Water Treatment Plant Improvements, dated November 1987 by Burgess & Niple, Limited.

4.02.D.4 Taylor Mill Plant, Chemical Building, Clarifier, and Clearwell Improvements, dated October 1999 by CH2M Hill.

4.02.D.5 Taylor Mill Water Treatment Plant, Filter to Waste System, dated September 2003 by Black & Veatch.

4.02.D.6 Taylor Mill Water Treatment Plant, UV Disinfection dated November 2006 by Black & Veatch.

SC-4.02. E Copies of reports and drawings itemized in SC-4.02.C and SC-4.02.D that are not included with Bidding Documents may be examined at Northern Kentucky Water District, 2835 Crescent Springs Road, Erlanger, KY 41018 during regular business hours. These reports and drawings are not part of the Contract Documents, but the “technical data” contained therein upon which Contactor may rely, except for specific locations of buried piping systems, electrical systems and topographic surveys. Contractor is not entitled to rely upon information and data utilized by Engineer and Related Entities in the preparation of Drawings and Specifications.

SC-4.03.C.3. Amend Paragraph 4.03.C.3 (by making the following revision):
In the fourth line after the word “Owner”, add the words “Construction Contract Administrator,”

SC-4.04.A.2.d. Amend Paragraph 4.04.A.2.d (by making the following revision):
Add the paragraph “1) The Contractor shall alert immediately the occupants of nearby premises as to any emergency that it may create or discover at or near such premises.”

SC-4.04.A. Amend Article 4.04.A.(by making the following revisions):

After paragraph 4.04.A.2.d.add the following paragraphs,

3. The Contractor shall have full responsibility for coordination of the WORK with owners of such underground facilities during construction, for the safety and protection thereof as provided in paragraph 6.13 and repairing any damage there to resulting from the WORK, the cost of which will be considered as having been included in the Contract Price.

4. Where existing utilities and structures are indicated as being in the line of the proposed improvement; the Contractor shall expose them sufficiently in advance of the construction operations to permit adjustments in line or grade, if required, to eliminate interferences.

5. Existing pipes or conduits crossing a trench, or otherwise exposed, shall be adequately braced and supported to prevent movement during construction.

6. Broken Underground Facilities.

a. Underground Facilities broken or damaged shall be repaired at once to avoid inconvenience to customers and utility owners.

b. Temporary arrangements, as approved by the Construction Contract Administrator, may be used until any damaged items can be permanently repaired.

c. All items damaged or destroyed by construction and subsequently repaired must be properly maintained by the Contractor.

d. Contractor must WORK 24 hours a day until service is restored to a damaged utility.

7. Existing Utility Relocation.

a. Where it is necessary to relocate an existing utility or structure, the WORK shall be done in such manner as is necessary to restore it to a condition equal to that of the original utility or structure.

b. No such relocation shall be done until approval is received from the authority responsible for the utility or structure being changed.”

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

SC -4.06.A. The following reports are known to Owner as relating to Hazardous Environmental Conditions that have been identified at the Site.

1. The existing main substation transformer has been tested and contains PCBs. See faxed report sent from Power Plus Engineering, Inc. to the Owner dated June 1, 2009. A copy of the report is available for review at the office of Malcolm Pirnie, Inc., 8600 Governor’s Hill Drive, Suite 210 Cincinnati, OH 45249, upon 48 hours notice to ENGINEER. An electronic copy in Adobe Acrobat .pdf format of the report may be requested from Malcolm Pirnie (513) 677-8380 at no additional cost.
2. The existing coating systems in the tunnel and at key locations on the existing preliminary treatment structure have been tested for high levels of lead in the paint. Some of the paint has been identified as containing high levels of lead. See “Limited Lead Containing Paint Inspection, Taylor Mill Water Treatment Plant” report dated December 6, 2010 prepared by ATC Associates Incorporated. A copy of the report is available for review at the office of Malcolm Pirnie, Inc., 8600 Governor’s Hill Drive, Suite 210 Cincinnati, OH 45249, upon 48 hours notice to ENGINEER. An electronic copy in Adobe Acrobat .pdf format of the report

may be requested from Malcolm Pirnie (513) 677-8380 at no additional cost.

SC-4.06.B. There is no technical data which can be relied upon.

SC-4.06.C. Amend Article 4.06.C (by making the following revision):

In the fourth line after the words “Environmental Condition” add the words, “that is created by, or”

SC-4.06.G. Amend Article 4.06.G (by making the following revisions):

In the second line after the word “Subcontractors”, add the words “Construction Contract Administrator,” and starting in line seven delete the words“(i) was not shown or indicated in the Drawings or Specifications or identified in the Contract Documents to be included within the scope of the WORK, and (ii) was not created by the Contractor or by anyone for whom the Contractor is responsible. Nothing in this Paragraph 4.06 G shall obligate the Owner to indemnify any individual or entity from and against the consequences of that individual’s or entities own negligence.”

and replace with the words

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

SC-5.01.A. Modify the first part of the second sentence of Paragraph 5.01.A of the General Conditions to read:

“The payment bond shall remain in effect for one year and the performance bond shall remain in effect for one year after the date when final payment becomes due...”

SC-5.02. Add the following new paragraph immediately after Paragraph 5.02.A:

SC-5.02.B. Surety from which the bonds for this Project are purchased shall be listed by the US Treasury Department and the insurance companies from which the insurance for this Project is purchased from shall have an AM Best’s rating of no less than A in addition to other requirements specified herein.

SC-5.04A.7. Add the following new paragraph immediately after Paragraph 5.04.A.6

“7. 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.”

SC-5.04.B.1. Change the second and third lines of Paragraph 5.04.B.1 by replacing the term, “Owner and” with the term, “Owner, Engineer, and Related Entities,”

SC-5.04. Add the following language after Paragraph 5.04.B.1:

Include the following Related Entities as additional insured:

5.04.B.1.a Northern Kentucky Water District, 2835 Crescent Springs Road, Erlanger, Kentucky 41018

5.04.B.1.b Malcolm Pirnie, Inc., 8600 Governor’s Hill Drive, Suite 210 Cincinnati, Ohio 45249

5.04.B.1.c GRW, Inc., 801 Corporate Drive, Lexington, Kentucky 40503

5.04.B.1.d CDP, Inc., 3250 Blazer Parkway, Lexington, Kentucky 40509

5.04.B.1.e Strand, Inc., 1525 Bull Lea Road, Suite 100, Lexington, Kentucky 40511

5.04.B.1.f Thelen Associates, Inc. 1398 Cox Avenue, Erlanger Kentucky 41018

SC-5.04. Add a new paragraph immediately after Paragraph 5.04.B that is to read as follows:

“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 insurers 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, Contractor shall require its

insurance carriers to waive all rights of subrogation against Owner, Construction Contract Administrator, Engineer, Related Entities, and their respective officers, directors, partners, employees, and agents.”

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

1. Workers’ compensation, and related coverage’s under Paragraphs 5.04.A.1. and 5.04.A.2.
 - a. Applicable Federal or State: Statutory
 - b. Maritime Not Required
 - c. Railroad Not Required
 - d. Employer's Liability \$1,000,000 Each Accident

2. For Contractor’s General Liability insurance under Paragraphs 5.04.A.3 through 5.04.A.6 and Paragraph 5.04.B which shall include Premises-Operations, Independent Contractor’s Protection, Products and Completed Operations, Broad Form Property Damage, Contractual Liability) and shall protect Contractor, Owner, Construction Contract Administrator, Related Entities, and Engineer, as additional insured, against claims arising from injuries, sickness, disease, or death of any person or damage to property arising out of performance of the WORK:
 - a. Bodily Injury:
\$1,000,000 Each Occurrence
\$2,000,000 Annual Aggregate

 - b. Property Damage:
\$1,000,000 Each Occurrence
\$2,000,000 Annual Aggregate

 - c. Property Damage liability insurance shall provide Explosion, Collapse and Underground coverage’s.

3. For Contractor’s Automobile Liability under Paragraph 5.04.A.6:
 - a. Bodily Injury:
\$1,000,000 Each Person
\$1,000,000 Each Accident

 - b. Property Damage:
\$1,000,000 Each Occurrence

 - c. Combined Single Limit of: \$1,000,000

4. Umbrella Liability insurance shall protect Contractor, Owner, Construction Contract Administrator, Related Entities, and Engineer as additional insured, against claims in excess of the limits provided under workers' compensation and employer's liability, comprehensive automobile liability, and commercial general liability policies. The umbrella policy shall follow the forms of the primary insurance, including the application of the primary limits. The liability limits shall be not less than:

a. Bodily injury and Property damage	\$4,000,000 combined single limit for Each Occurrence
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SC-5.05. Delete paragraph 5.05 in its entirety and insert the following in its place:

5.05 Owner's Liability Insurance

Owner's Liability Insurance: This insurance shall be obtained by Contractor and issued in the name of Owner, and shall protect and defend Owner, Construction Contract Administrator, Related Entities, and Engineer against claims arising as a result of the operations of Contractors or Contractor's Subcontractors. The liability limits shall be not less than:

a. Bodily Injury:	
\$1,000,000	Each Occurrence
\$1,000,000	Annual Aggregate
b. Property Damage:	
\$1,000,000	Each Occurrence
\$1,000,000	Annual Aggregate

SC-5.06. Add Paragraph 5.06. in its entirety:

5.06 Property Insurance

A. 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 interest of Owner, Contractor, Subcontractors, Engineer, Related Entities, and any other individuals or entities identified in the Supplementary Conditions, and the officers, directors, commissioners, partners, members, managers, 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.

B. Contractor shall be responsible for any deductible or self-insured retention.

C. All the policies of insurance (and the certificates or other evidence thereof) required to be purchased and maintained in accordance with paragraph 5.06 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 5.07.

D. If Owner requests in writing that other special insurance be included in the property insurance policies provided under paragraph 5.06, Contractor shall, if possible, include such insurance and the cost thereof will be charged to Owner by appropriate Change Order or Written Amendment. Prior to

commencement of the WORK at the site, Contractor shall in writing advise Owner whether or not Contractor has procured such other special insurance.

SC-5.07. Add Paragraph 5.06. in its entirety:

5.07. Waiver of Rights

- A. Owner and Contractor intend that all policies purchased in accordance with Paragraph 5.06 will protect Owner, Contractor, Subcontractor, Construction Contract Administrator, Related Entities, and Engineer, and all other individuals or entities identified in the Supplementary Conditions as loss payees (and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them) in such policies and will provide primary coverage for all losses and damages caused by the perils or causes of loss covered thereby. All such policies shall contain provisions to the effect that in the event of payment of any loss or damage the insurer will have no rights of recovery against any of the insured or loss payees there under. Owner and Contractor waive all rights against each other and their respective officers, directors, members, partners, employees, agents, consultant and subcontractors of each and any of them for all losses and damages caused by, arising out of or resulting from any of the perils or causes of loss covered by such policies and any other property insurance applicable to the WORK; and, in addition, waive all such rights against Subcontractors, Construction Contractor Administrator, and Engineer, and all other individuals or entities identified in the Supplementary Conditions as loss payees (and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them) under such policies for losses and damages so caused. None of the above waivers shall expend to the rights that any party making such waiver may have to the proceeds of insurance held by Owner as trustee or otherwise payable under any policy so issued.
- B. Owner waives all rights against Contractor, Subcontractor, Construction Contract Administrator, and Engineer, and the officer, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them for:
1. Loss due to business interruption, loss of use, or other consequential loss extending beyond direct physical loss or damage to Owner's property or the WORK caused by, arising out of, or resulting from fire or other perils whether or not insured by Owner; and
 2. Loss or damage to the completed Project or part thereof caused by, arising out of, or resulting from fire or other insured peril or cause of loss covered by any property insurance maintained on the completed

Project or part thereof by Owner during partial utilization pursuant to Paragraph 14.05, after Substantial Completion pursuant to Paragraph 14.04, or after final payment pursuant to Paragraph 14.07

- C. Any insurance policy maintained by Owner covering any loss, damage or consequential loss referred to in Paragraph 5.07.B shall contain provisions to the effect that in the event of payment of any such loss, damage, or consequential loss, the insurers will have no rights of recovery against Contractor, Subcontractor, Construction Contract Administrator, or Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them.

SC-5.08. Add Paragraph 5.08. in its entirety:

5.08. Receipt and Application of Insurance Proceeds

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

SC-5.09. Add Paragraph 5.09. in its entirety:

5.09. Acceptance of Bonds and Insurance; Option to Replace

- A. If either Owner or Contractor has any objection to the coverage afforded by or other provisions of the bonds or insurance required to be

purchased and maintained by the other party in accordance with Article 5 on the basis of non-conformance with the Contract Documents, the objecting party shall so notify the other party in writing within 10 days after receipt of the certificates (or other evidence requested) required by Paragraph 2.01.B. Owner and Contractor shall each provide to the other such additional information in respect of insurance provided as the other may reasonable request. If either party does not purchase or maintain all of the bonds and insurance required of such party by the Contract Documents, such party shall notify the other party in writing of such failure to purchase prior to the start of the WORK, or of such failure to maintain prior to any change in the required coverage. Without prejudice to any other right or remedy, the other party may elect to obtain equivalent bonds or insurance to protect such other party's interests at the expense of the party who was required to provide such coverage, and a Change Order shall be issued to adjust the Contract Price accordingly.

SC-5.010. Add Paragraph 5.010. in its entirety:

5.10. Partial Utilization, Acknowledgement of Property Insurer

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

SC-6.02. Add the following language at the end of Paragraph 6.02.B:

- C. In accordance with Kentucky Revised Statute 337.540, no laborer, worker, or mechanic shall be permitted to Work more than 8 hours in 1 day or more than 40 hours in 1 week except in cases of emergency caused by fire, flood, or damage to life or property. This shall not prohibit any laborer, worker, or mechanic from working more than 8 hours in 1 day, but not more than 10 hours in 1 day, where the employee and employer enter into an agreement prior to the working of any 1 day in excess of 8 hours, or where provided for in a collective bargaining agreement. Owner shall determine when an emergency exists. Any time worked in excess of 8 hours per day or 40 hours per week shall be paid at least 1-1/2 times the basic hourly rate. No Work shall be done between 6:00 p.m. and 7:00 a.m. without permission of

Owner. However, emergency work may be done without prior permission

D. Any laborer, worker, or mechanic worked in excess of 8 hours in 1 day or 40 hours in 1 week, except in cases of emergency shall be paid at not less than 1 -1/2 times the basic hourly rate for all overtime worked. In a case where the agreement between the employee and employer provides for not more than 10 hours in 1 day, any hours worked in excess of 10 hours in 1 day or 40 hours in 1 week, except in cases of emergency, shall be paid at not less than 1-1/2 times the basic hourly rate for all overtime worked.

E. Night Work may be undertaken as a regular procedure with the permission of Owner: such permission, however, may be revoked at any time by Owner if Contractor fails to maintain adequate equipment and supervision for the proper prosecution and control of the Work at Night.

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

6.02.C. Contractor shall reimburse Owner for Engineer's additional extraordinary costs for onsite personnel overtime work resulting from Contractor's overtime operations. Overtime work is work in excess of 40 hours per week Reimbursement shall be on the cost basis defined in Paragraph 14.02.D.4 of these Supplementary Conditions.

SC-6.05.A. 2.d Add the following new paragraph immediately after Paragraph 6.05.A.2.d.

“a. 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, changes in the controls software development and operator screens, etc., shall be at the expense of the Contractor proposing the substitute unless otherwise agreed to by the Owner.”

SC-6.05.E. Delete Paragraph 6.05.E and replace with the following:

"E. *Construction Contract Administrator's and Engineer's Cost Reimbursement:* Construction Contract Administrator will record Construction Contract Administrator's and Engineer's costs in evaluating a substitute proposed or submitted by the Contractor pursuant to Paragraphs 6.05A.2 and 6.05.B. Whether or not the Construction Contract Administrator approves a substitute so proposed or submitted by the Contractor, Contractor shall reimburse Owner for the reasonable charges of Construction Contract Administrator and Engineer for evaluating each such proposed substitute. Contractor shall also reimburse Owner for the reasonable charges of Construction Contract Administrator and 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.

Reimbursement rates for Engineer or Related Entities for evaluation of proposed substitutes shall be on the basis as established in Paragraph 14.02.D.4 of these Supplementary Conditions. Insert the term "Construction Contract Administrator" between the words "Owner and Engineer" or the words "Owner or Engineer". Insert the term "Construction Contract Administrator" between the words "Owner and Engineer" or the words "Owner or Engineer".

SC-6.07. Add the following new paragraphs immediately after Paragraph 6.07.B:

6.07.D. Contractor shall, at its sole expense, defend and pay all damages, fees, royalties, and costs awarded in any proceeding brought against Owner, its employees and Engineer, Construction Contract Administrator, and Related Entities, in which it is claimed that the use of any treatment process, material, equipment, or parts thereof furnished constitutes an infringement of any patent or other proprietary information right, provided Contractor is promptly notified of the commencement of any such proceedings. Contractor's indemnity applies only when infringement occurs from the normal use for which such treatment process, material, or equipment were designed. Owner may, at its option, be represented at any such proceeding. If use is held in any such proceeding to constitute an infringement and is enjoined, Contractor, at its expense, shall either procure for Owner the right to use such treatment process, material and equipment or manufacture and sell product generated from the use of the treatment process; or pay the costs for damages, fees, or royalties.

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

6.08.B. Owner will obtain and pay for the following construction permits and licenses if needed:

6.08.B.1. Road and Highway Encroachment Permits

6.08.B.2. Kentucky Division of Water Construction Application For Drinking Water Treatment.

6.08.B.3. Kentucky Division of Water 401/404 Permit

6.08B.4. NKAPC Plumbing Permit

6.08B.5. NKAPC Building Permits

6.08B.6. Sanitation District No.1 Land Disturbance Permit

6.08B.7. Stream Construction Permit

6.08B.8. KPDES Permit

6.08B.9. Fuel Tank Permit

6.08.C. A copy of each permit is available at Owner's office. Contractor shall examine the permits and conform to the requirements contained therein, including the purchase of additional bonds or insurance as specified therein, and such requirements are hereby made a part of these Contract Documents as fully and completely as though the same were set forth herein. Failure to examine the permit(s) will not relieve Contractor from compliance with the requirements stated therein. Within 15 days after the date of signing the Agreement, Contractor shall confer with an agent of the permitting agency so that insurance requirements and similar matters can be arranged prior to the time set for that portion of the WORK.

Insert the term "Construction Contract Administrator" between the words "Owner or Engineer".

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

6.09.D. While not intended to be inclusive of all Laws or Regulations for which Contractor may be responsible under Paragraph 6.09, the following Laws or Regulations are included as mandated by statute or for the convenience of Contractor:

6.09.D.1. Prevailing Wages: All laborers, workmen, and mechanics performing WORK under the Contract shall be paid not less than the prevailing hourly rate of wages as determined by the Commissioner of Workplace Standards. Wage rates are provided at the end of this section.

6.09.D.2. Contractor agrees as follows:

6.09.D.2.a. Contractor will not discriminate against any employee or applicant for employment because of race, color, religion, sex, age, or national origin;

6.09.D.2.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, or national origin; however, when layoffs occur, employees shall be laid off according to seniority with the youngest employee being laid off first. When employees are recalled, this shall be done in the reverse of the way the employees were laid off;

6.09.D.2.c. Contractor will state in all solicitations or advertisements for employees placed by or on behalf of the Contractor that all qualified applicants will receive consideration for employment without regard to race, color, religion, sex, age, or national origin;

6.09.D.2.d. Contractor will post notices in conspicuous places, available to employees and applicants for employment, setting forth the provisions of nondiscrimination clauses; and

6.09.D.2.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 the Contractor's commitments under the nondiscrimination clauses.

6.09.D.2.f Employment requirements shall be as specified herein and in the attachments at the end of Supplementary Conditions.

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

B. Portions of this project may be exempt from taxes. It is the Contractor's responsibility to determine any applicable exemptions.

SC-6.11. Add the following language to the end of Paragraph 6.11.A.1:

Contractor shall not enter upon nor use property not under Owner control until appropriate easements have been executed and a copy is on file at the Site.

SC-6.11. Amend Paragraph 6.11.A.3 (by making the following revisions):

In lines two and seven, insert the term "Construction Contract Administrator" between the words "Owner, Engineer".

SC-6.12. Amend Paragraph 6.12 (by making the following revisions):

In the fifth line after the words “available to” add the term “Owner, Construction Contract Administrator, and”.

SC-6.13. Delete Paragraph 6.13.D. and replace with the following:

“D. Contractor shall inform Owner, Construction Contract Administrator, and Engineer of the specific requirements of Contractor’s safety program with which Owner’s, Construction Contract Administrator’s and Engineer’s employees and representatives must comply while at the site.”

SC-6.13. Amend Paragraph 6.13.E. (by making the following revision):

Insert the term “Construction Contract Administrator” between the words “Owner or Engineer”.

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

G. The Contractor shall be in compliance with all applicable safety Laws and Regulations including OSHA (P.L. 91-596) and the Contract Work Hours and Safety Standards Act (P.L. 91-54).

SC-6.17.D. Amend paragraphs 6.17.D and 6.17.E (by making the following revisions):

Where ever the word “Engineer” appears, insert the term “Construction Contract Administrator and” before “Engineer”.

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

6.17.E.2. Contractor shall furnish required submittals with sufficient information and accuracy in order to obtain required approval of an item with no more than the number of submittals specified in Paragraph 14.02.D.4 of these Supplementary Conditions. Construction Contract Administrator and Engineer will record time for reviewing subsequent submittals of Shop Drawings, samples or other items requiring approval and Contractor shall reimburse Owner for Construction Contract Administrator and Engineer’s charges for such time in accordance with Paragraph 14.02.D.4 of these Supplementary Conditions.

6.17.E.3. In the event that Contractor requests a substitution for a previously approved item, Contractor shall reimburse Owner for Construction Contractor and Engineer’s charges for such time, unless the need for such substitution is beyond the control of Contractor.

SC-6.19.C. Delete Paragraph 6.19.C in its entirety and replace with the following:

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

1. Observations by Construction Contract Administrator or Engineer;
2. Review of daily inspection reports by Construction Contract Administrator or Engineer;
3. Recommendation by Construction Contract Administrator for, or payment by Owner of any progress or final payment;
4. The issuance of a certificate of Substantial Completion by Construction Contract Administrator or any payment related thereto by Owner;
5. Use or occupancy of the Work or any part thereof by Owner;
6. Any review and approval of a Shop Drawing or Sample submittal or the issuance of a notice of acceptability by Construction Contract Administrator or Engineer;
7. Any inspection, test, or approval by others;
8. Any correction of defective WORK by Owner; or
9. Any expiration of a correction period

SC-6.20.A. Amend paragraph 6.20.A (by making the following revisions):

Where the word "Engineer" appears, add the phrase "Construction Contract Administrator, or Related Entities," and before the word "Engineer".

SC-6.20.B. Amend Paragraph 6.20.B (by making the following revisions):

In the first line add the phrase "Construction Contract Administrator Related Entities, or" before the word "Engineer".

SC-6.20.C. Amend Paragraph 6.20.C (by making the following revisions):

Where the word "Engineer" appears, add the phrase "Construction Contract Administrator, Related Entities, and" before the word "Engineer"

and where the word “Engineer’s” appears add the term “Construction Contract Administrator’s, Related Entities, and” before the word “Engineer’s).

SC-7.04. Add the following new paragraph immediately after Paragraph 7.03:

SC-7.04. Claims between Contractors:

7.04.A Should Contractor cause damage to the WORK or property of any other contractor at the Site, or should any claim arising out of Contractor’s performance of the WORK at the Site be made by any other contractor against Contractor, Owner, Construction Contract Administrator, Engineer, or the construction coordinator, Contractor shall promptly attempt to settle with such other contractor by agreement, or to otherwise resolve the dispute by arbitration or at law.

7.04.B Contractor shall, to the fullest extent permitted by Laws and Regulations, indemnify and hold harmless Owner, Construction Contract Administrator, Engineer, Related Entities, the Construction Coordinator (if applicable) and the officers, directors, partners, employees, agents and other consultants and subcontractors of each and any of them from and against all Claims, costs, losses and damages (including, but not limited to, fees and charges of engineers, architects, attorneys, and other professionals and court and arbitration costs) arising directly, indirectly or consequentially out of any action, legal or equitable, brought by any other contractor against Owner, Construction Contract Administrator, Engineer, Related Entities, or the Construction Coordinator (if applicable) to the extent said Claim is based on or arises out of Contractor’s performance of the WORK. Should another contractor cause damage to the WORK or property of Contractor or should the performance of WORK by any other contractor at the Site give rise to any other Claim, Contractor shall not institute any action, legal or equitable, against Owner, Construction Contract Administrator, Engineer, or the Construction Coordinator (if applicable) or permit any action against any of them to be maintained and continued in its name or for its benefit in any court or before any arbiter which seeks to impose liability on or to recover damages from Owner, Construction Contract Administrator, Engineer, or the Construction Coordinator (if applicable) on account of any such damage or Claim.

7.04.C If Contractor is delayed at any time in performing the WORK by any act or neglect of another contractor, and Owner and Contractor are unable to agree as to the extent of any adjustment in Contract Times attributable thereto, Contractor may make a Claim for an extension of times in accordance with Article 12. An extension of the Contract Times shall be Contractor’s exclusive remedy with respect to Owner, Construction Contract Administrator, or Engineer, for any delay,

disruption, interference, or hindrance caused by any other contractor. This paragraph does not prevent recovery from Owner, Construction Contract Administrator, or Engineer, for activities that are their respective responsibilities.

SC-8.01.A. Delete the Paragraph in its entirety and replace with the following:

A. Except as otherwise provided in these General Conditions, Owner shall issue all communications to Contractor through Construction Contract Administrator.

SC-9.01. Amend Paragraph 9.01.A. (by making the following revision):

Where the word “Engineer” appears, add the term “Construction Contract Administrator or” before the word “Engineer”.

SC-9.02. Insert the following Paragraph after Paragraph 9.02.B:

C. Construction Contract Administrator and Engineer will make visits to the site as described in Paragraph 9.02 but communications by Engineer with Contractor will be transmitted through Construction Contract Administrator

SC-9.03. Add the following new paragraphs immediately after Paragraph 9.03.A:

9.03.B Resident Project Representative (RPR) will be furnished by Construction Contract Administrator. The responsibilities, authority, and limitations of the RPR are limited to those of Engineer in accordance with Paragraph 9.09 and as set forth elsewhere in the Contract Documents and are further limited and described below.

9.03.C. Responsibilities and Authority:

9.03.C.1 Schedules: Review and monitor Progress Schedule, Schedule of Submittals, and Schedule of Values prepared by Contractor and consult with Engineer concerning acceptability.

9.03.C.2 Conferences and Meetings: Conduct or attend meetings with Contractor, such as preconstruction conferences, progress meetings, Work Conferences and other Project related meetings.

9.03.C.3 Liaison: (i) Serve as Construction Contract Administrator’s liaison with Contractor, working principally through Contractor’s superintendent and assist in understanding the intent of the Contract Documents; (ii) assist Construction Contract Administrator in serving as Owner’s liaison with Contractor when Contractor’s operations affect

Owner's onsite operations; (iii) assist in obtaining from Owner additional details or information when required for proper execution of the WORK.

9.03.C.4 Submittals: Receive Submittals that are furnished at the Site by Contractor, and notify Construction Contract Administrator and Engineer of availability for examination. Advise Construction Contract Administrator, Engineer, and Contractor of the commencement of any WORK or arrival of Products at Site, when recognized, requiring a Shop Drawing or Sample if the Submittal has not been approved by Construction Contract Administrator or Engineer.

9.03.C.5 Review of WORK, Rejection of defective WORK, Inspections
and

Tests: (i) Conduct onsite observations of the WORK in progress to assist Construction Contract Administrator in determining if the WORK is in general proceeding in accordance with the Contract Documents; (ii) inform Engineer and Contractor whenever RPR believes that any WORK is defective; (iii) advise Engineer whenever RPR believes that any WORK will not produce a completed Project that conforms generally to the Contract Documents or will prejudice the integrity of the design concept of the completed Project as a functioning whole as indicated in the Contract Documents, or whenever RPR believes WORK should be uncovered for observation, or requires special testing, inspection, or approval; (iv) monitor that tests, equipment and systems startups and operating and maintenance training are conducted in the presence of appropriate personnel, and that Contractor maintains adequate records thereof; (v) observe, record and report to Construction Contract Administrator appropriate details relative to the test procedures and startups; and (vi) accompany visiting inspectors representing public or other agencies having jurisdiction over the Project, record the results of these inspections and report to Construction Contract Administrator.

9.03.C.6 Interpretation of Contract Documents: Inform Construction Contract Administrator when clarifications and interpretations of the Contract Documents are needed and transmit to Contractor clarifications and interpretations as issued by Construction Contract Administrator and approved by Engineer.

9.03.C.7 Modifications: Consider and evaluate Contractor's suggestions for modifications in Drawings or Specifications and provide recommendations to Engineer; transmit to Contractor the decisions issued by Engineer.

9.03.C.8 Records: (i) maintain at the Site files for correspondence, Conference records, Submittals including Shop Drawings and Samples,

reproductions of original Contract Documents including all Addenda, signed Agreement, Work Change Directives, Change Orders, Field Orders, additional Drawings issued after the Effective Date of the Agreement, Construction Contract Administrator's written clarifications and interpretations, progress reports, and other Project related documents; (ii) keep a diary or log book recording pertinent Site conditions, activities, decisions and events.

9.03.C.9 Reports: (i) Furnish Construction Contract Administrator periodic reports of progress of the WORK and of Contractor's compliance with the Progress Schedule and Schedule of Submittals; (ii) consult with Construction Contract Administrator in advance of scheduled major tests, inspections or start of important phases of the WORK; and (iii) assist in drafting proposed Change Orders, Work Change Directives, and Field Orders, obtain backup material from Contractor as appropriate.

9.03.C.10 Payment Requests: Review applications for payment with Contractor for compliance with the established procedure for their submission and forward with recommendations to Construction Contract Administrator, noting particularly the relationship of the payment requested to the Schedule of Values, WORK completed and materials and equipment delivered at the Site but not incorporated in the WORK.

9.03.C.11 Certificates, Operation and Maintenance Manuals, Record Documents, and Site Records: During the course of the WORK, monitor that these documents and other data required to be assembled, maintained, and furnished by Contractor are applicable to the items actually installed and in accordance with the Contract Documents, and have this material delivered to Construction Contract Administrator and Engineer as appropriate for review and forwarding to Owner prior to final payment for the WORK.

9.03.C.12 Substantial Completion: (i) Conduct an inspection in the company of Construction Contract Administrator, Engineer, Owner, and Contractor and prepare a list of items to be completed or corrected; (ii) submit to Construction Contract Administrator a list of observed items requiring completion or correction.

9.03.C.13 Completion: (i) conduct final inspection in the company of Construction Contract Administrator, Engineer, Owner and Contractor, and (ii) notify Contractor and Engineer in writing of all particulars in which this inspection reveals that the WORK is incomplete or defective; and (iii) observe that all items on final list have been completed, corrected, or accepted by Owner and make recommendations to Construction Contract Administrator concerning acceptance.

- 9.03.D. Limitations of Authority: Resident Project Representative will not:
- 9.03.D.1 Have authority to authorize any deviation from the Contract Documents or substitution of materials or equipment, unless authorized by Construction Contract Administrator and Engineer; or
 - 9.03.D.2 Undertake any of the responsibilities of Contractor, Subcontractors, or Contractor's superintendent; or
 - 9.03.D.3 Accept Submittals from anyone other than Contractor; or
 - 9.03.D.4 Authorize Owner to occupy the Project in whole or in part; or
 - 9.03.D.5 Participate in specialized field or laboratory tests or inspections conducted by others except as specifically authorized by Engineer
- SC-9.10.A. Amend Paragraph 9.10.A (by making the following revision):
- Insert the term "Construction Contract Administrator's and" before the word "Engineer's".
- SC-10.01. Add the following new paragraph immediately after Paragraph 10.01.A:
- 10.01.A.1. In accordance with Kentucky Revised Statute 45A.120, when accepting a Change Order, Contractor shall certify that, to the best of its knowledge and belief, the data submitted is accurate, complete, and current for performing the additional WORK or supplying the additional materials.
- SC-10.01 Add the following new sentence immediately after Paragraph 10.01.B:
- Contractor shall carry on the Work and adhere to the Progress Schedule as provided in Paragraph 6.18.A
- SC-12.01.C. Delete the semicolon at the end of GC 12.01.C.2.c, and add the following:
- provided, however, that on any subcontracted WORK the total maximum fee to be paid by Owner to Contractor under this Paragraph shall be no greater than 27 percent of the costs incurred by the Subcontractor who actually performs the WORK;
- SC-12.01.C Add the following new paragraph immediately after Paragraph 12.01.C:
- D. Change orders to the construction contract shall comply with the Kentucky Department of Water Procurement Guidance for Construction and Equipment Contracts. Change orders exceeding \$100,000 shall be

include the cost, pricing and certifications required by the Kentucky Department of Water Procurement Guidance for Construction and Equipment Contracts.

SC-12.03. Add the following language to the end of Paragraph 12.03.E:

F. In no event shall Owner, Construction Contract Administrator, or Engineer be liable to Contractor, any Subcontractor, any Supplier, or any other person or organization, or to any surety for or employee or agent of any of them, for damages, (including acceleration costs) arising out of or resulting from any delay.”

SC-13.02. Access to WORK. Add the following new paragraph immediately after paragraph 13.02.A:

B. Authorized representatives of the U.S. Environmental Protection Agency, the Kentucky Division of Water, and the Kentucky Infrastructure Authority shall have access to the WORK wherever it is in preparation or progress. Contractor shall provide proper facilities for such access and inspection.

SC-13.03. Amend paragraph 13.03.D (by making the following revision):

In the second line insert the term “Construction Contract Administrator’s” after the word “Owner’s” and in the last line insert the term “Construction Contract Administrator, and” after the word “Owner”.

SC-13.04.A. Amend Paragraphs 13.04.A (by making the following change):

In the second line insert the term “Construction Contract Administrator’s or” before the words “Engineer’s observation”.

SC-13.04.B. Amend Paragraphs 13.04.B (by making the following changes):

In the first and third line in insert the term “Construction Contract Administrator or” before the word “Engineer” wherever the word “Engineer” appears.

SC-13.07 Delete Paragraph 13.07.C in its entirety and insert the following in its place:

C. No warranty period for any individual piece of equipment or material will start prior to the commencement of the correction period even if it has been put into beneficial service prior to Substantial Completion.

SC-13.07. At the end of Paragraph 13.07.E insert the following:

“F. 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 the 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.

G. 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 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. Any transfer of warranties to Owner should have an effective date after the end of the correction period.”

SC-13.09.B. Amend Paragraphs 13.09.B (by making the following change):

In the second to last line insert the term “Construction Contract Administrator, Construction Contract Administrator’s consultant’s” before the words “and Engineer”.

SC-14.02.A. Add the following language to the end of Paragraph 14.02.A.3:

4. Contractor’s Applications for Payment shall be accompanied by the documentation specified.

5. Payments for stored materials and equipment shall be based only upon the actual cost to the 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.

6. 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 drawing schedules, procurement schedules, value of material on hand included in application, and other data specified in Contract Documents or reasonably required by Owner.”

- SC-14.02. Amend Paragraph 14.02.A.1 (by making the following revision):
- Delete the word “Engineer” and replace it with “Construction Contract Administrator”.
- SC-14.02.B Amend Paragraph 14.02.B. (by making the following revision):
- Delete the word “Engineer” and replace it with “Construction Contract Administrator”.
- SC-14.02. Delete Paragraph 14.02.C.1 in its entirety and insert the following in its place:
- 14.02.C.1. Twenty-five days after presentation of the Application for Payment to Owner with Construction Contract Administrator’s recommendation, the amount recommended will (subject to the provisions of Paragraph 14.02.D) become due and when due will be paid by Owner to Contractor.
- SC-14.02. Add the following new paragraph(s) immediately after Paragraph 14.02.D.3:
- 14.02.D.4. Items entitling Owner to retain set-offs from the amount recommended, including but not limited to:
- 14.02.D.4.a. Owner compensation to Construction Contract Administrator or Engineer at an estimated average rate of \$140 per each extra personnel hour for labor plus expenses, if applicable, because of the following Contractor caused events:
- (1). Return visits to manufacturing facilities to witness factory testing or retesting;
 - (2). Submittal review in excess of three reviews by Construction Contract Administrator or Engineer for substantially the same Submittal, in accordance with Paragraph 6.17.E of these Supplementary Conditions;
 - (3). Evaluation of proposed substitutes and in making changes to Contract Documents occasioned thereby, in accordance with Paragraph 6.05. of these Supplementary Conditions;
 - (4). Overtime worked by Contractor necessitating Construction Contract Administrator, Engineer, and Related Entities, Resident Project Representative or Resident Project Representative’s Site

staff, if any, to work extraordinary overtime in accordance with Paragraph 6.02.C. of these Supplementary Conditions.

14.02.D.4.b. Liability for liquidated damages incurred by Contractor as set forth in the Agreement.

SC-14.04.A. Add the following new paragraphs immediately after Paragraph 14.04.A:

1. 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: seeding, placement of sod and landscape planting.

SC-14.05. Delete the 14.05 entirety and insert the following in its place:

“14.05 Partial Utilization

A. Prior to Substantial Completion of all the WORK, Owner may use or occupy any part of the WORK which is generally defined as the proposed pretreatment process and all appurtenances, has specifically been identified in the Contract Documents, or which Owner, Engineer, and Contractor agree constitutes a separately functioning and usable part of the WORK that can be used by Owner for its intended purpose without significant interference with Contractor's performance of the remainder of the WORK, subject to the following conditions.

1. Owner at any time may request Contractor in writing to permit Owner to use or occupy any such part of the WORK which Owner believes to be ready for its intended use. If and when Contractor agrees that such part of the WORK is ready for its intended use, Contractor, Owner and Engineer will follow the procedures of Paragraph 14.04.A through D for that part of the WORK, with the exception that the partial utilization of a part of the WORK will not constitute Substantial Completion for that part of the WORK. The Contractor shall continue to provide all bonds and insurance for the WORK that the Owner is operating until the date specified after Substantial Completion. The correction period as specified in section 13.07 shall not commence on any piece of equipment or Work until the date of Substantial Completion for the entire WORK.
2. Contractor at any time may notify Owner and Engineer in writing that Contractor considers any such part of the WORK ready for its intended use and request Engineer allow Owner to operate 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 operational, Engineer will notify Owner and Contractor in writing giving the reasons therefore. A correction list will be written by the Engineer and shall be corrected by the Contractor. If Engineer considers that part of the WORK to be operational the Owner may operate that part of the WORK.
4. The Contractor shall continue to provide all insurance and bonds while part of the WORK is being operated by the Owner.”

SC-14.07. Add the following sentences to the end of Paragraph 14.07.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 the documents identified in this paragraph;”

SC-15.03.A. Delete the first sentence of Paragraph 15.03.A in its entirety and insert the following in its place:

Upon 7 days written notice to Contractor and Construction Contract Administrator, Owner may, without cause and without prejudice to any other right or remedy of Owner, terminate the Contract or any portion of the Contract.

SC-16.01. Delete Article 16 in its entirety and insert the following new Article in its place:

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

B. Any suit involving any dispute or other matter arising under this Contract may only be brought in the state as federal courts for the county or district in which the project is located. All parties hereby consent to the exercise of personal jurisdiction by any such court with respect to any such proceeding.”

SC-17.07. Add a new paragraph immediately after Paragraph 17.06 that is to read as follows:

17.07 Confidential Information

- A. All Drawings, Specifications, technical data, and other information furnished to Contractor either by Owner or Engineer or developed by Contractor or others in connection with the WORK are, and will remain, the property of Owner or Engineer, and shall not be copied or otherwise reproduced or used in any way except in connection with the WORK, or disclosed to third parties or used in any manner detrimental to the interests of Owner or Engineer.

- B. The following information is not subject to the above confidentiality requirements:
 - 1. Information in the public domain through no action of Contractor in breach of the Contract Documents; or
 - 2. Information lawfully possessed by Contractor before receipt from Owner or Engineer; or
 - 3. Information required to be disclosed by Laws or Regulations, or by a court or agency of competent jurisdiction. However, in the event Contractor shall be so required to disclose such information, Contractor shall, prior to disclosure, provide reasonable notice to Owner and Engineer, who shall have the right to interpose all objections Owner may have to the disclosure of such information.

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SUPPLEMENTAL GENERAL CONDITIONS
FOR
CLEAN WATER STATE REVOLVING FUND
DRINKING WATER STATE REVOLVING FUND
EPA SPECIAL APPROPRIATION GRANTS
(Drinking Water and Wastewater)

Project Name: Taylor Mill Treatment Plant Advanced Treatment

Project Number: 184-457

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

	<u>Attachment No.</u>
SRF/EPA Special Provisions	1
Requirements for Sub-agreements Awarded by Prime Contractors	2
40 CFR 31.36 (Procurement)-grants only	3A
KRS Chapter 45A-Kentucky Model Procurement Code-loans only	3B
Equal Employment Opportunity (EEO) Documents:	
Notice of Requirement for Affirmative Action	4
Contract Specifications (Executive Order 11246)	5
EEO Goals for Region 4 Economic Areas	6
Special Notice #1 - Check List of EEO Documentation	7
Employer Information Report EEO-1 (SF 100)	8
Labor Standards Provisions for Federally Assisted Construction, EPA Form 5720-4	9
Certifications	
Debarment, Suspension and Other Responsibility Matters	10
Anti-lobbying	11
Region 4 Disadvantaged Business Enterprise (DBE)	12
Negotiated Rates as of October 1, 2006	13
Bonds and Insurance	14
Outlay Management Schedule	15
Storm Water General Permit	16
Wage Rates	17

EPA SPECIAL PROVISIONS

- a) The construction of the project shall conform to the applicable requirements for state, territorial and local laws and ordinances to the extent that such requirements do not conflict with Federal laws.
- b) The EPA shall have access to the site and the project.
- c) Any contract(s) awarded under this invitation for Bids are expected to be funded in part by a grant from the U.S. Environmental Protection Agency. Neither the United States nor any of its departments, agencies or employees are or will be a part to this Invitation for Bids or any resulting contract.
- d) The Method of Award is to the lowest responsible responsive bidder.
- e) A statement that the bidder must make positive efforts to use small and minority owned business and women business enterprises.

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.
- (c) 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. To apply, the contractor must submit the "Notice of Intent" form at least 48 hours prior to start of construction. See Attachment 16 for the "Notice of Intent" form.
- (d) Restore disturbed areas to original or better condition.
- (e) 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.
- (f) 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.
- (g) The owner shall provide and maintain competent and adequate supervision and inspection.
- (h) The Kentucky Infrastructure Authority and Kentucky Division of Water shall have access to the site and the project work at all times.
- (i) 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.

GRANT REQUIREMENTS FOR SUB-AGREEMENTS
AWARDED BY A PRIME CONTRACTOR

A contractor must comply with the following provisions in its award of sub-agreements. (This section does not apply to a supplier's procurement of materials to produce equipment, materials and catalog, off-the-shelf, or manufactured items.)

- (a) 40 CFR Part 32 (Debarment and Suspension Under EPA Assistance Programs);
- (b) The limitations and sub-agreement award in 40 CFR 31.35, and 31.36(i) (3,4,6,10,12) ;
- (c) The requirement for small, small rural, minority, women's and labor surplus area business in 40 CFR 31.36(e);
- (d) The specifications requirements of 40 CFR 31.36(c) (1);
- (e) The Federal cost principles in 40 CFR 31.22 and 31.36(f)(3);
- (f) The prohibited types of sub-agreements in 40 CFR 31.36(f)(4);
- (g) 40 CFR Part 34 (Anti-Lobbying under EPA Assistance Programs).

**TITLE 40--PROTECTION OF ENVIRONMENT
CHAPTER I--ENVIRONMENTAL PROTECTION AGENCY**

**PART 31--UNIFORM ADMINISTRATIVE REQUIREMENTS FOR GRANTS AND
COOPERATIVE AGREEMENTS TO STATE AND LOCAL GOVERNMENTS**

Subpart C--Post-Award Requirements

Sec. 31.36 Procurement.

(a) States. When procuring property and services under a grant, a State will follow the same policies and procedures it uses for procurements from its non-Federal funds. The State will ensure that every purchase order or other contract includes any clauses required by Federal statutes and executive orders and their implementing regulations. Other grantees and sub-grantees will follow paragraphs (b) through (i) in this section.

(b) Procurement standards. (1) Grantees and sub-grantees will use their own procurement procedures which reflect applicable State and local laws and regulations, provided that the procurements conform to applicable federal law, the standards identified in this section, and if applicable, Sec. 31.38.

(2) Grantees and sub-grantees will maintain a contract administration system which ensures that contractors perform in accordance with the terms, conditions, and specifications of their contracts or purchase orders.

(3) Grantees and sub-grantees will maintain a written code of standards of conduct governing the performance of their employees engaged in the award and administration of contracts. No employee, officer or agent of the grantee or sub-grantee shall participate in selection, or in the award or administration of a contract supported by Federal funds if a conflict of interest, real or apparent, would be involved. Such a conflict would arise when:

(i) The employee, officer or agent,

(ii) Any member of his immediate family,

(iii) His or her partner, or

(iv) An organization which employs, or is about to employ, any of the above, has a financial or other interest in the firm selected for award. The grantee's or sub-grantee's officers, employees or agents will neither solicit nor accept gratuities, favors or anything of monetary value from contractors, potential contractors, or parties to sub-agreements. Grantee and sub-grantees may set minimum rules where the financial interest is not substantial or the gift is an unsolicited item of nominal intrinsic value. To the extent permitted by State or local law or regulations, such standards or conduct will provide for penalties, sanctions, or other disciplinary actions for violations of such standards by the grantee's and sub-grantee's officers, employees, or agents, or by contractors or their agents. The awarding agency may in regulation provide additional prohibitions relative to real, apparent, or potential conflicts of interest.

(4) Grantee and sub-grantee procedures will provide for a review of proposed procurements to avoid purchase of unnecessary or duplicative items. Consideration should be given to consolidating or breaking out procurements to obtain a more economical purchase. Where appropriate, an analysis will be made of lease versus purchase alternatives, and any other appropriate analysis to determine the most economical approach.

(5) To foster greater economy and efficiency, grantees and sub-grantees are encouraged to enter into State and local intergovernmental agreements for procurement or use of common goods and services.

(6) Grantees and sub-grantees are encouraged to use Federal excess and surplus property in lieu of purchasing new equipment and property whenever such use is feasible and reduces project costs.

- (7) Grantees and sub-grantees are encouraged to use value engineering clauses in contracts for construction projects of sufficient size to offer reasonable opportunities for cost reductions. Value engineering is a systematic and creative analysis of each contract item or task to ensure that its essential function is provided at the overall lower cost.
- (8) Grantees and sub-grantees will make awards only to responsible contractors possessing the ability to perform successfully under the terms and conditions of a proposed procurement. Consideration will be given to such matters as contractor integrity, compliance with public policy, record of past performance, and financial and technical resources.
- (9) Grantees and sub-grantees will maintain records sufficient to detail the significant history of a procurement. These records will include, but are not necessarily limited to the following: rationale for the method of procurement, selection of contract type, contractor selection or rejection, and the basis for the contract price.
- (10) Grantees and sub-grantees will use time and material type contracts only--
- (i) After a determination that no other contract is suitable, and
 - (ii) If the contract includes a ceiling price that the contractor exceeds at its own risk.
- (11) Grantees and sub-grantees alone will be responsible, in accordance with good administrative practice and sound business judgment, for the settlement of all contractual and administrative issues arising out of procurements. These issues include, but are not limited to source evaluation, protests, disputes, and claims. These standards do not relieve the grantee or sub-grantee of any contractual responsibilities under its contracts. Federal agencies will not substitute their judgment for that of the grantee or sub-grantee unless the matter is primarily a Federal concern. Violations of law will be referred to the local, State, or Federal authority having proper jurisdiction.
- (12) Grantees and sub-grantees will have protest procedures to handle and resolve disputes relating to their procurements and shall in all instances disclose information regarding the protest to the awarding agency. A protestor must exhaust all administrative remedies with the grantee and sub-grantee before pursuing a protest with the Federal agency. Reviews of protests by the Federal agency will be limited to:
- (i) Violations of Federal law or regulations and the standards of this section (violations of State or local law will be under the jurisdiction of State or local authorities) and
 - (ii) Violations of the grantee's or sub-grantee's protest procedures for failure to review a complaint or protest. Protests received by the Federal agency other than those specified above will be referred to the grantee or sub-grantee.
- (c) Competition. (1) All procurement transactions will be conducted in a manner providing full and open competition consistent with the standards of Sec. 31.36. Some of the situations considered to be restrictive of competition include but are not limited to:
- (i) Placing unreasonable requirements on firms in order for them to qualify to do business,
 - (ii) Requiring unnecessary experience and excessive bonding,
 - (iii) Noncompetitive pricing practices between firms or between affiliated companies,
 - (iv) Noncompetitive awards to consultants that are on retainer contracts,
 - (v) Organizational conflicts of interest,
 - (vi) Specifying only a "brand name" product instead of allowing "an equal" product to be offered and describing the performance of other relevant requirements of the procurement, and
 - (vii) Any arbitrary action in the procurement process.
- (2) Grantees and sub-grantees will conduct procurements in a manner that prohibits the use of statutorily or administratively imposed in-State or local geographical preferences in the evaluation of bids or proposals, except in those cases where applicable Federal statutes expressly mandate or encourage geographic preference. Nothing in this section preempts State licensing laws. When contracting for architectural and engineering (A/E) services, geographic location may be a selection criteria provided its application leaves an appropriate number of qualified firms, given the nature and size of the project, to compete for the contract.
- (3) Grantees will have written selection procedures for procurement transactions. These

procedures will ensure that all solicitations:

(i) Incorporate a clear and accurate description of the technical requirements for the material, product, or service to be procured. Such description shall not, in competitive procurements, contain features, which unduly restrict competition. The description may include a statement of the qualitative nature of the material, product or service to be procured, and when necessary, shall set forth those minimum essential characteristics and standards to which it must conform if it is to satisfy its intended use. Detailed product specifications should be avoided if at all possible. When it is impractical or uneconomical to make a clear and accurate description of the technical requirements, a "brand name or equal" description may be used as a means to define the performance or other salient requirements of a procurement. The specific features of the named brand which must be met by offerers shall be clearly stated; and

(ii) Identify all requirements which the offerers must fulfill and all other factors to be used in evaluating bids or proposals.

(4) Grantees and sub-grantees will ensure that all pre-qualified lists of persons, firms, or products which are used in acquiring goods and services are current and include enough qualified sources to ensure maximum open and free competition. Also, grantees and sub-grantees will not preclude potential bidders from qualifying during the solicitation period.

(5) Construction grants awarded under Title II of the Clean Water Act are subject to the following "Buy American" requirements in paragraphs (c)(5) (i)-(iii) of this section. Section 215 of the Clean Water Act requires that contractors give preference to the use of domestic material in the construction of EPA-funded treatment works.

(i) Contractors must use domestic construction materials in preference to nondomestic material if it is priced no more than 6 percent higher than the bid or offered price of the nondomestic material, including all costs of delivery to the construction site and any applicable duty, whether or not assessed. The grantee will normally base the computations on prices and costs in effect on the date of opening bids or proposals.

(ii) The award official may waive the Buy American provision based on factors the award official considers relevant, including:

(A) Such use is not in the public interest;

(B) The cost is unreasonable;

(C) The Agency's available resources are not sufficient to implement the provision, subject to the Deputy Administrator's concurrence;

(D) The articles, materials or supplies of the class or kind to be used or the articles, materials or supplies from which they are manufactured are not mined, produced or manufactured in the United States in sufficient and reasonably available commercial quantities or satisfactory quality for the particular project; or

(E) Application of this provision is contrary to multilateral government procurement agreements, subject to the Deputy Administrator's concurrence.

(iii) All bidding documents, subagreements, and, if appropriate, requests for proposals must contain the following "Buy American" provision: In accordance with section 215 of the Clean Water Act (33 U.S.C. 1251 et seq.) and implementing EPA regulations, the contractor agrees that preference will be given to domestic construction materials by the contractor, subcontractors, materialmen and suppliers in the performance of this subagreement.

(d) Methods of procurement to be followed--(1) Procurement by small purchase procedures. Small purchase procedures are those relatively simple and informal procurement methods for securing services, supplies, or other properties that do not cost more than the simplified acquisition threshold fixed at 41 U.S.C. 403(11) (currently set at \$100,000). If small purchase procedures are used, price or rate quotations shall be obtained from an adequate number of qualified sources.

(2) Procurement by sealed bids (formal advertising). Bids are publicly solicited and a firm-fixed-price contract (lump sum or unit price) is awarded to the responsible bidder whose bid, conforming with all the

material terms and conditions of the invitation for bids, is the lowest in price. The sealed bid method is the preferred method for procuring construction, if the conditions in 31.36(d)(2)(i) apply.

(i) In order for sealed bidding to be feasible, the following conditions should be present:

- (A) A complete, adequate, and realistic specification or purchase description is available;
- (B) Two or more responsible bidders are willing and able to compete effectively and for the business; and
- (C) The procurement lends itself to a firm fixed price contract and the selection of the successful bidder can be made principally on the basis of price.

(ii) If sealed bids are used, the following requirements apply:

- (A) The invitation for bids will be publicly advertised and bids shall be solicited from an adequate number of known suppliers, providing them sufficient time prior to the date set for opening the bids;
- (B) The invitation for bids, which will include any specifications and pertinent attachments, shall define the items or services in order for the bidder to properly respond;
- (C) All bids will be publicly opened at the time and place prescribed in the invitation for bids;
- (D) A firm fixed-price contract award will be made in writing to the lowest responsive and responsible bidder. Where specified in bidding documents, factors such as discounts, transportation cost, and life cycle costs shall be considered in determining which bid is lowest. Payment discounts will only be used to determine the low bid when prior experience indicates that such discounts are usually taken advantage of; and
- (E) Any or all bids may be rejected if there is a sound documented reason.

(3) Procurement by competitive proposals. The technique of competitive proposals is normally conducted with more than one source submitting an offer, and either a fixed-price or cost-reimbursement type contract is awarded. It is generally used when conditions are not appropriate for the use of sealed bids. If this method is used, the following requirements apply:

(i) Requests for proposals will be publicized and identify all evaluation factors and their relative importance. Any response to publicized requests for proposals shall be honored to the maximum extent practical;

(ii) Proposals will be solicited from an adequate number of qualified sources;

(iii) Grantees and sub-grantees will have a method for conducting technical evaluations of the proposals received and for selecting awardees;

(iv) Awards will be made to the responsible firm whose proposal is most advantageous to the program, with price and other factors considered; and

(v) Grantees and sub-grantees may use competitive proposal procedures for qualifications-based procurement of architectural/engineering (A/E) professional services whereby competitors' qualifications are evaluated and the most qualified competitor is selected, subject to negotiation of fair and reasonable compensation. The method, where price is not used as a selection factor, can only be used in procurement of A/E professional services. It cannot be used to purchase other types of services though A/E firms are a potential source to perform the proposed effort.

(4) Procurement by noncompetitive proposals is procurement through solicitation of a proposal from only one source, or after solicitation of a number of sources, competition is determined inadequate.

(i) Procurement by noncompetitive proposals may be used only when the award of a contract is infeasible under small purchase procedures, sealed bids or competitive proposals and one of the following circumstances applies:

(A) The item is available only from a single source;

(B) The public exigency or emergency for the requirement will not permit a delay resulting from competitive solicitation;

(C) The awarding agency authorizes noncompetitive proposals; or

(D) After solicitation of a number of sources, competition is determined inadequate.

(ii) Cost analysis, i.e., verifying the proposed cost data, the projections of the data, and the evaluation of the specific elements of costs and profits, is required.

(iii) Grantees and sub-grantees may be required to submit the proposed procurement to the awarding agency for pre-award review in accordance with paragraph (g) of this section.

(e) Contracting with small and minority firms, women's business enterprise and labor surplus area firms.

(1) The grantee and sub-grantee will take all necessary affirmative steps to assure that minority firms, women's business enterprises, and labor surplus area firms are used when possible.

(2) Affirmative steps shall include:

(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 business, and women's business enterprises;

(iv) Establishing delivery schedules, where the requirement permits, which encourage participation by small and minority business, and women's business enterprises;

(v) Using the services and assistance of the Small Business Administration, and the Minority Business Development Agency of the Department of Commerce; and

(vi) Requiring the prime contractor, if subcontracts are to be let, to take the affirmative steps listed in paragraphs (e)(2) (i) through (v) of this section.

(f) Contract cost and price.

(1) Grantees and sub-grantees must perform a cost or price analysis in connection with every procurement action including contract modifications. The method and degree of analysis is dependent on the facts surrounding the particular procurement situation, but as a starting point, grantees must make independent estimates before receiving bids or proposals. A cost analysis must be performed when the offerer is required to submit the elements of his estimated cost, e.g., under professional, consulting, and architectural engineering services contracts. A cost analysis will be necessary when adequate price competition is lacking, and for sole source procurements, including contract modifications or change orders, unless price reasonableness can be established on the basis of a catalog or market price of a commercial product sold in substantial quantities to the general public or based on prices set by law or regulation. A price analysis will be used in all other instances to determine the reasonableness of the proposed contract price.

(2) Grantees and sub-grantees will negotiate profit as a separate element of the price for each contract in which there is no price competition and in all cases where cost analysis is performed.

To establish a fair and reasonable profit, consideration will be given to the complexity of the work to be performed, the risk borne by the contractor, the contractor's investment, the amount of subcontracting, the quality of its record of past performance, and industry profit rates in the surrounding geographical area for similar work.

(3) Costs or prices based on estimated costs for contracts under grants will be allowable only to the extent that costs incurred or cost estimates included in negotiated prices are consistent with Federal cost principles (see Sec. 31.22). Grantees may reference their own cost principles that comply with the applicable Federal cost principles.

(4) The cost plus a percentage of cost and percentage of construction cost methods of contracting shall not be used.

(g) Awarding agency review.

(1) Grantees and sub-grantees must make available, upon request of the awarding agency, technical specifications on proposed procurements where the awarding agency believes such review is needed to ensure that the item and/or service specified is the one being proposed for purchase. This review generally will take place prior to the time the specification is incorporated into a solicitation document. However, if the grantee or sub-grantee desires to have the review accomplished after a solicitation has been developed, the awarding agency may still review the specifications, with such review usually limited to the technical aspects of the proposed purchase.

(2) Grantees and sub-grantees must on request make available for awarding agency pre-award review procurement documents, such as requests for proposals or invitations for bids, independent cost estimates, etc. when:

(i) A grantee's or sub-grantee's procurement procedures or operation fails to comply with the

procurement standards in this section; or

(ii) The procurement is expected to exceed the simplified acquisition threshold and is to be awarded without competition or only one bid or offer is received in response to a solicitation; or

(iii) The procurement, which is expected to exceed the simplified acquisition threshold, specifies a "brand name" product; or

(iv) The proposed award is more than the simplified acquisition threshold and is to be awarded to other than the apparent low bidder under a sealed bid procurement; or

(v) A proposed contract modification changes the scope of a contract or increases the contract amount by more than the simplified acquisition threshold.

(3) A grantee or sub-grantee will be exempt from the pre-award review in paragraph (g)(2) of this section if the awarding agency determines that its procurement systems comply with the standards of this section.

(i) A grantee or sub-grantee may request that its procurement system be reviewed by the awarding agency to determine whether its system meets these standards in order for its system to be certified. Generally, these reviews shall occur where there is a continuous high-dollar funding, and third-party contracts are awarded on a regular basis.

(ii) A grantee or sub-grantee may self-certify its procurement system. Such self-certification shall not limit the awarding agency's right to survey the system. Under a self-certification procedure, awarding agencies may wish to rely on written assurances from the grantee or sub-grantee that it is complying with these standards. A grantee or sub-grantee will cite specific procedures, regulations, standards, etc., as being in compliance with these requirements and have its system available for review.

(h) Bonding requirements. For construction or facility improvement contracts or subcontracts exceeding the simplified acquisition threshold, the awarding agency may accept the bonding policy and requirements of the grantee or sub-grantee provided the awarding agency has made a determination that the awarding agency's interest is adequately protected. If such a determination has not been made, the minimum requirements shall be as follows:

(1) A minimum bid guarantee from each bidder equivalent to five percent of the bid price. The "bid guarantee" shall consist of a firm commitment such as a bid bond, certified check, or other negotiable instrument accompanying a bid as assurance that the bidder will, upon acceptance of his bid, execute such contractual documents as may be required within the time specified.

(2) A performance bond on the part of the contractor for 100 percent of the contract price. A "performance bond" is one executed in connection with a contract to secure fulfillment of all the contractor's obligations under such contract.

(3) A payment bond on the part of the contractor for 100 percent of the contract price. A "payment bond" is one executed in connection with a contract to assure payment as required by law of all persons supplying labor and material in the execution of the work provided for in the contract.

(i) Contract provisions. A grantee's and sub-grantee's contracts must contain provisions in paragraph (i) of this section. Federal agencies are permitted to require changes, remedies, changed conditions, access and records retention, suspension of work, and other clauses approved by the Office of Federal Procurement Policy.

(1) Administrative, contractual, or legal remedies in instances where contractors violate or breach contract terms, and provide for such sanctions and penalties as may be appropriate.

(Contracts more than the simplified acquisition threshold)

(2) Termination for cause and for convenience by the grantee or sub-grantee including the manner by which it will be effected and the basis for settlement. (All contracts in excess of \$10,000)

(3) Compliance with Executive Order 11246 of September 24, 1965, entitled "Equal Employment Opportunity," as amended by Executive Order 11375 of October 13, 1967, and as supplemented in Department of Labor regulations (41 CFR chapter 60). (All construction contracts awarded in excess of \$10,000 by grantees and their contractors or sub-grantees)

(4) Compliance with the Copeland "Anti-Kickback" Act (18 U.S.C. 874) as supplemented in Department of Labor regulations (29 CFR part 3). (All contracts and sub-grants for construction or repair)

- (5) Compliance with the Davis-Bacon Act (40 U.S.C. 276a to 276a-7) as supplemented by Department of Labor regulations (29 CFR part 5). (Construction contracts in excess of \$2000 awarded by grantees and sub-grantees when required by Federal grant program legislation)
- (6) Compliance with Sections 103 and 107 of the Contract Work Hours and Safety Standards Act (40 U.S.C. 327-330) as supplemented by Department of Labor regulations (29 CFR part 5). (Construction contracts awarded by grantees and sub-grantees in excess of \$2000, and in excess of \$2500 for other contracts which involve the employment of mechanics or laborers)
- (7) Notice of awarding agency requirements and regulations pertaining to reporting.
- (8) Notice of awarding agency requirements and regulations pertaining to patent rights with respect to any discovery or invention which arises or is developed in the course of or under such contract.
- (9) Awarding agency requirements and regulations pertaining to copyrights and rights in data.
- (10) Access by the grantee, the sub-grantee, the Federal grantor agency, the Comptroller General of the United States, or any of their duly authorized representatives to any books, documents, papers, and records of the contractor which are directly pertinent to that specific contract for the purpose of making audit, examination, excerpts, and transcriptions.
- (11) Retention of all required records for three years after grantees or sub-grantees make final payments and all other pending matters are closed.
- (12) Compliance with all applicable standards, orders, or requirements issued under section 306 of the Clean Air Act (42 U.S.C. 1857(h)), section 508 of the Clean Water Act (33 U.S.C. 1368), Executive Order 11738, and Environmental Protection Agency regulations (40 CFR part 15). (Contracts, subcontracts, and sub-grants of amounts in excess of \$100,000)
- (13) Mandatory standards and policies relating to energy efficiency which are contained in the State energy conservation plan issued in compliance with the Energy Policy and Conservation Act (Pub. L. 94-163, 89 Stat. 871).
- (j) Payment to consultants.
- (1) EPA will limit its participation in the salary rate (excluding overhead) paid to individual consultants retained by grantees or by a grantee's contractors or subcontractors to the maximum daily rate for a GS-18. (Grantees may, however, pay consultants more than this amount). This limitation applies to consultation services of designated individuals with specialized skills who are paid at a daily or hourly rate. This rate does not include transportation and subsistence costs for travel performed; grantees will pay these in accordance with their normal travel reimbursement practices. (Pub. L. 99-591).
- (2) Sub-agreements with firms for services which are awarded using the procurement requirements in this part are not affected by this limitation.
- (k) Use of the same architect or engineer during construction.
- (1) If the grantee is satisfied with the qualifications and performance of the architect or engineer who provided any or all of the facilities planning or design services for a waste-water treatment works project and wishes to retain that firm or individual during construction of the project, it may do so without further public notice and evaluation of qualifications, provided:
- (i) The grantee received a facilities planning (Step 1) or design grant (Step 2), and selected the architect or engineer in accordance with EPA's procurement regulations in effect when EPA awarded the grant; or
- (ii) The award official approves noncompetitive procurement under Sec. 31.36(d)(4) for reasons other than simply using the same individual or firm that provided facilities planning or design services for the project; or
- (iii) The grantee attests that:
- (A) The initial request for proposals clearly stated the possibility that the firm or individual selected could be awarded a sub-agreement for services during construction; and
- (B) The firm or individual was selected for facilities planning or design services in accordance with procedures specified in this section.
- (C) No employee, officer or agent of the grantee, any member of their immediate families, or their partners have financial or other interest in the firm selected for award; and

(D) None of the grantee's officers, employees or agents solicited or accepted gratuities, favors or anything of monetary value from contractors or other parties to sub-agreements.

(2) However, if the grantee uses the procedures in paragraph (k)(1) of this section to retain an architect or engineer, any Step 3 sub-agreements between the architect or engineer and the grantee must meet all of the other procurement provisions in Sec. 31.36.

[53 FR 8068 and 8087, Mar. 11, 1988, and amended at 53 FR 8075, Mar. 11, 1988; 60 FR 19639, 19644, Apr. 19, 1995; 66 FR 3794, Jan. 16, 2001]

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 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 shall be given a sufficient time prior to the date set forth for the opening of bids. 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. 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 at the time and place designated in the invitation for bids. At the time the bids are opened, 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 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 bids shall be allowed only to the extent permitted by regulations issued by the secretary.

Effective: July 14, 2000

History: 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.

(2) Adequate public notice of the request for proposals 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.

(6) Award shall be made to the responsible offerer 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.

(7) Written or oral discussions shall be conducted with all responsible offerers 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 offerers. Discussions need not be conducted:

(a) With respect to prices, where the prices are fixed by law 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 offerers of the possibility that award may be made on the basis of the initial offers.

Effective: June 24, 2003

History: 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. 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 offerer, all other potential offerers 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: June 24, 2003

History: 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.

(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. 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, 2002

History: 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 6)

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.

3. 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.

4. 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 actions 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, or 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:

056 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.	
057 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.	
058 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.	

**CHECK LIST OF EEO DOCUMENTATION FOR BIDDERS
ON GRANT/LOAN CONSTRUCTION
(Required by 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 within 14 days after the bid opening. The web site for the OFCC is http://www.dol.gov/esa/ofcp_org.htm.

1. Project Number. Project Location. Type of Construction.
2. Proof of registration with the Joint Reporting Commission. (See Attachment Number 8.)
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- 8. 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 or 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 web site at: <http://www.mimdms.com/jrc.html> and select "Filing for the first time" from the box labeled INFORMATION. File 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 Special Appropriations Projects grants 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 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 paragraph (b)(1),(2),(3), and (4) of this section in full in any contract 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 *Section 5.5(a) of this title. 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 work week 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.

(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 \$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 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 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 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 10) and submit to the owner with the bid proposal.

Anti-lobbying Certification

All prime Construction Contractors must certify (Attachment Number 11) 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.

Grant recipient responsibilities:

- Conduct an Availability Analysis and negotiate fair share objectives with EPA (§ 33.411), or adopt the fair share objectives of the oversight state agency revolving loan fund for comparable infrastructure. (§ 33.405(b)(3)).
- Include the Appendix A term and condition in each contract with a primary contractor (§ 3.106). The term and condition is included in the EPA Region 4 contract specifications insert *FEDERAL REQUIREMENTS AND CONTRACT PROVISIONS FOR SPECIAL APPROPRIATION ACT PROJECTS US ENVIRONMENTAL PROTECTION AGENCY, Region III, June 2008*.
- Employ the six Good Faith Efforts during prime contractor procurement (§ 33.301).
- Require prime contractor to comply with the following prime contractor requirements of Title 40 Part 33:
 - To employ the six Good Faith Efforts steps in paragraphs (a) through (e) of § 33.301 if the prime contractor awards subcontracts (§ 33.301(f)).
 - To provide EPA form 6100-2 – *DBE Subcontractor Participation Form* to all DBE subcontractors (§ 33.302(e)).
 - To submit EPA forms 6100-3 – *DBE Program Subcontractor Performance Form* and 6100-4 – *DBE Program Subcontractor Utilization Form* with bid package or proposal. (§ 33.302 (f) and (g)).
 - 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 by its prime contractor 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)).
- Semiannually complete and submit to Charles Hayes, EPA Region 4 DBE Coordinator EPA form 5700-52A summarizing DBE participation achieved during the previous six months (§ 33.502).
- Maintain 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)).

Prime Contractor Responsibilities:

- Employ the six Good Faith Efforts steps in paragraphs (a) through (e) of § 33.301 if the prime contractor awards subcontracts (§ 33.301(f)).
- Provide EPA form number 6100-2 – *DBE Program Subcontractor Participation Form* and form number 6100-3 – *DBE Program Subcontractor Performance Form* to each DBE subcontractor prior to opening of the contractor's bid or proposal (§ 33.302(e) and (f)).
- Complete EPA form number 6100-4 – *DBE Program Subcontractor Utilization Form* (§ 33.302(g)).
- Submit to recipient with its bid package or proposal the completed EPA form number 6100-4, plus an EPA form number 6100-3 for each DBE subcontractor used in the contractor's bid or proposal (§ 33.302(f) and (g)).
- Pay subcontractors for satisfactory performance no more than 30 days from the prime contractor's receipt of payment from the recipient (§ 33.302(a)).
- Notify the recipient in writing prior to prime contractor 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 prime contractor has achieved its fair share objectives under subpart D of Part 33. (§33.302(d)).
- Semiannually inform recipient of DBE participation achieved (§ 33.502).

- Maintain 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)).

Subcontractor Responsibilities:

- May submit EPA form 6100-2 – *DBE Subcontractor Participation Form* to Charles Hayes, EPA Region 4 DBE Coordinator (§ 33.302(e)).
- Must complete EPA form 6100-3 – *DBE Program Subcontractor Performance Form*, and submit it to the prime contractor soliciting services from the subcontractor prior to the opening of bids for the prime contract.

SPAP Requirements:

Form	Requirement	Provided By	Completed By	Submitted To
EPA Form 6100-2	Grant Recipients required to have prime contractors provide form to Subcontractors	Prime Contractors	DBE Subcontractors	EPA Region 4 DBE Coordinator Charles Hayes
EPA Form 6100-3	Grant Recipients required to have prime contractors provide form to Subcontractors	Prime Contractors	DBE Subcontractors	Grant Recipients as part of a bid or proposal package
EPA Form 6100-4	Grant Recipients required to have prime contractors complete the form	Grant Recipients	Prime Contractors	Grant Recipients as part of a bid or proposal package

SRF Requirements:

Form	Requirement	Provided By	Completed By	Submitted To
EPA Form 6100-2	Recipients required to have prime contractors provide form to Subcontractors	Prime Contractors	DBE Subcontractors	DOW Project Administrator
EPA Form 6100-3	Recipients required to have prime contractors provide form to Subcontractors	Prime Contractors	DBE Subcontractors	Dow Project Administrator w/ ATA Package

Form	Requirement	Provided By	Completed By	Submitted To
EPA Form 6100-4	Recipients required to have prime contractors complete the form	Recipients	Prime Contractors	DOW Project Administrator w/ ATA Package
Pay Request DBE Form	Recipients required to have prime contractors complete the form	Recipients	Prime Contractors	DOW Project Administrator w/ EACH PAYMENT



Environmental
Protection Agency

OMB Control No: 2090-0030
Approved: 05/01/2008
Approval Expires: 01/31/2011

**Disadvantaged Business Enterprise Program
DBE Subcontractor Participation Form**

NAME OF SUBCONTRACTOR'	PROJECT NAME
ADDRESS	CONTRACT NO.
TELEPHONE NO.	EMAIL ADDRESS
PRIME CONTRACTOR NAME	

Please use the space below to report any concerns regarding the above EPA-funded project (e.g., reason for termination by prime contractor, late payment, etc.).

CONTRACT ITEM NO.	ITEM OF WORK OR DESCRIPTION OF SERVICES RECEIVED FROM THE PRIME CONTRACTOR	AMOUNT SUBCONTRACTOR WAS PAID BY PRIME CONTRACTOR

Subcontractor Signature

Title/Date

'Subcontractor is defined as a company, firm, joint venture, or individual who enters into an agreement with a contractor to provide services pursuant to an EPA award of financial assistance.

EPA FORM 6100-2 (DBE Subcontractor Participation Form)



Environmental
Protection Agency

OMB Control No: 2090-0030
Approved: 05/01/2008
Approval Expires: 01/31/2011

Disadvantaged Business Enterprise Program DBE Subcontractor Participation Form

The public reporting and recordkeeping burden for this collection of information is estimated to average fifteen (15) minutes. Burden means the total time, effort, or financial resources expended by persons to generate, maintain, retain, or disclose or provide information to or for a Federal agency. This includes the time needed to review instructions; develop, acquire, install, and utilize technology and systems for the purposes of collecting, validating, and verifying information, processing and maintaining information, and disclosing and providing information; adjust the existing ways to comply with any previously applicable instructions and requirements; train personnel to be able to respond to a collection of information; search data sources; complete and review the collection of information; and transmit or otherwise disclose the information. An agency may not conduct or sponsor, and a person is not required to respond to, a collection of information unless it displays a currently valid OMB control number.

Send comments on the Agency's need for this information, the accuracy of the provided burden estimates, and any suggested methods for minimizing respondent burden, including the use of automated collection techniques to the Director, Collection Strategies Division, U.S. Environmental Protection Agency (2822), 1200 Pennsylvania Ave., NW, Washington, D.C. 20460. Include the OMB control number in any correspondence. Do not send the completed EPA DBE Subcontractor Participation Form to this address.

EPA FORM 6100-2 (DBE Subcontractor Participation Form)



Environmental
Protection Agency

OMB Control No: 2090-0030
Approved: 05/01/2008
Approval Expires: 01/31/2011

**Disadvantaged Business Enterprise Program
DBE Subcontractor Performance Form**

NAME OF SUBCONTRACTOR ₁		PROJECT NAME
ADDRESS		BID/PROPOSAL NO.
TELEPHONE NO.		E-MAIL ADDRESS
PRIME CONTRACTOR NAME		
CONTRACT ITEM NO.	ITEM OF WORK OR DESCRIPTION OF SERVICES BID TO PRIME	PRICE OF WORK SUBMITTED TO PRIME CONTRACTOR
Currently certified as an MBE or WBE under EPA's DBE Program? <input type="checkbox"/> Yes <input type="checkbox"/> No Signature of Prime Contractor Date Print Name Title _____ _____ Signature of Subcontractor Date _____ _____ Print Name Title		

¹Subcontractor is defined as a company, firm, joint venture, or individual who enters into an agreement with a contractor to provide services pursuant to an EPA award of financial assistance.

EPA FORM 6100-3 (DBE Subcontractor Performance Form)



Environmental
Protection Agency

OMB Control No: 2090-0030
Approved: 05/01/2008
Approval Expires: 01/31/2011

**Disadvantaged Business Enterprise Program
DBE Subcontractor Performance Form**

The public reporting and recordkeeping burden for this collection of information is estimated to average fifteen (15) minutes. Burden means the total time, effort, or financial resources expended by persons to generate, maintain, retain, or disclose or provide information to or for a Federal agency. This includes the time needed to review instructions; develop, acquire, install, and utilize technology and systems for the purposes of collecting, validating, and verifying information, processing and maintaining information, and disclosing and providing information; adjust the existing ways to comply with any previously applicable instructions and requirements; train personnel to be able to respond to a collection of information; search data sources; complete and review the collection of information; and transmit or otherwise disclose the information. An agency may not conduct or sponsor, and a person is not required to respond to, a collection of information unless it displays a currently valid OMB control number.

Send comments on the Agency's need for this information, the accuracy of the provided burden estimates, and any suggested methods for minimizing respondent burden, including the use of automated collection techniques to the Director, Collection Strategies Division, U.S. Environmental Protection Agency (2822), 1200 Pennsylvania Ave., NW, Washington, D.C. 20460. Include the OMB control number in any correspondence. Do not send the completed EPA DBE Subcontractor Performance Form to this address.

EPA FORM 6100-3 (DBE Subcontractor Performance Form)



Environmental
Protection Agency

OMB Control No: 2090-0030
Approved: 05/01/2008
Approval Expires: 01/31/2011

**Disadvantaged Business Enterprise Program
DBE Subcontractor Utilization Form**

BID/PROPOSAL NO.	PROJECT NAME
NAME OF PRIME BIDDER/PROPOSER	E-MAIL ADDRESS
ADDRESS	
TELEPHONE NO.	FAX NO.

The following subcontractors ¹ will be used on this project:			
COMPANY NAME, ADDRESS, PHONE NUMBER, AND E-MAIL ADDRESS	TYPE OF WORK TO BE PERFORMED	ESTIMATE D DOLLAR AMOUNT	CURRENTLY CERTIFIED AS AN MBE OR WBE?

I certify under penalty of perjury that the forgoing statements are true and correct. In the event of a replacement of a subcontractor, I will adhere to the replacement requirements set forth in 40 CFR Part 33 Section 33.302(c).

Signature of Prime Contractor

Date

Print Name

Title

¹Subcontractor is defined as a company, firm, joint venture, or individual who enters into an agreement with a contractor to provide services pursuant to an EPA award of financial assistance.



Environmental
Protection Agency

OMB Control No: 2090-0030
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**Disadvantaged Business Enterprise Program
DBE Subcontractor Utilization Form**

The public reporting and recordkeeping burden for this collection of information is estimated to average fifteen (15) minutes. Burden means the total time, effort, or financial resources expended by persons to generate, maintain, retain, or disclose or provide information to or for a Federal agency. This includes the time needed to review instructions; develop, acquire, install, and utilize technology and systems for the purposes of collecting, validating, and verifying information, processing and maintaining information, and disclosing and providing information; adjust the existing ways to comply with any previously applicable instructions and requirements; train personnel to be able to respond to a collection of information; search data sources; complete and review the collection of information; and transmit or otherwise disclose the information. An agency may not conduct or sponsor, and a person is not required to respond to, a collection of information unless it displays a currently valid OMB control number.

Send comments on the Agency's need for this information, the accuracy of the provided burden estimates, and any suggested methods for minimizing respondent burden, including the use of automated collection techniques to the Director, Collection Strategies Division, U.S. Environmental Protection Agency (2822), 1200 Pennsylvania Ave., NW, Washington, D.C. 20460. Include the OMB control number in any correspondence. Do not send the completed EPA DBE Subcontractor Utilization Form to this address.

EPA FORM 6100-4 (DBE Subcontractor Utilization Form)

DISADVANTAGED 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: _____

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

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

7. Certifications* for each subcontractor enclosed: Yes No

8. Subcontracts or letters of intent signed by both parties enclosed: Yes No

9. **List of MBE Subcontractors:**

Name: _____
Contact Person: _____
Address: _____
Phone: _____
Cell Phone: _____
Email: _____
Type of Contract: _____
Work to be Done: _____
Amount: _____

10. **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.

Information concerning the efforts for obtaining subcontractor(s)

11. Information to be submitted by the bidder concerning good faith efforts taken

- a. Advertisements, etc.: List each publication in which an announcement or notification was placed and attach the tear sheet of each announcement from each publication

Name of publication: _____

Address: _____

Dates of advertisement: _____

Specific subcontract areas announced: _____

- b. List each DBE construction firm or supplier to which a letter of solicitation was sent or with whom negotiations were held.

Company name and phone number: _____

Area of Work Expertise: _____

Date of any follow-up call and person spoke to: _____

- c. Copies of returned envelopes.
- d. Copies of faxes sent.
- e. Copies of certified mail return receipts.
- f. Copies of letters or e-mails from solicited firms declining offer.
- g. Copy of bidders list (see sheet below):

BIDDER'S LIST FORM

OWNER _____

LOAN NO: _____

PROJECT TITLE _____

BID DATE: _____

Instructions:

- 1. This list must include all firms that bid or quote on prime or subcontracts under EPA assisted projects (i.e. SRF Projects), included both MBE/WBE's and non MBE/WBE'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 SRF.
- 4. The following information must be obtained from all prime and sub-contractor's. Please complete the form below:

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

REGION 4
DISADVANTAGED BUSINESS ENTERPRISE (DBE) NEGOTIATED RATES
(Subject to change - refer to grant award for specific fair share objectives)

KENTUCKY

SRF Construction: (both programs)	0.70% MBE and 7.60% WBE
Equipment:	1.20% MBE and 1.10% WBE
Services:	1.20% MBE and 16.30% WBE
Supplies:*	3.70% MBE and 4.60% 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 owners requirements on Flood Insurance are contained in the Special Conditions Section of the Contracts Documents.

OUTLAY MANAGEMENT

The contractor must provide a contract progress schedule of percentage of work in place and costs against time; and a schedule of projected payments (cumulative) for construction and for the architectural/engineering contract when the contract is awarded. The payment schedule must be submitted, in a format similar to the attached sample, to the owner for forwarding to the State when the contract is awarded, and whenever actual payments on a project vary beyond -5 percent and +10 percent from the schedule, as determined by the grantee.

Contractor will be required to review each of these contract schedules during the month of June and to submit revised schedules, as necessary, no later than July 1st of each year.

THIS FORMAT IS A SAMPLE ONLY.

CONSTRUCTION AND OUTLAY SCHEDULE

Project No.: _____

Applicant: _____

Contract Identification: _____

Description of Contract: _____

(INSTRUCTIONS FOR USE ON REVERSE SIDE)

SCHEDULE I - CONSTRUCTION SCHEDULE

Date for Advertisement: _____

Date for Opening Bids: _____

Pre-Construction Conference Date: _____

Date of Contract Award: _____

Contract Period: _____ days Projected Contract Completion Date: _____

Total Eligible Contract Amount: _____

Work Order Date: _____

Start Construction Date: _____

Contract Completed: _____

SCHEDULE II - CUMULATIVE OUTLAY SCHEDULE (55% EPA Share) - Projection
only for quarters that remain in the fiscal year (FY) plus cumulative
annual amount for the next FY.

Cum EPA Amount thru 1st Qtr. Oct./Dec.: \$ _____

Cum EPA Amount thru 2nd Qtr. Jan./Mar.: \$ _____

Cum EPA Amount thru 3rd Qtr. Apr./June: \$ _____

Cum EPA Amount thru 4th Qtr. July/Sept.: \$ _____

Cum EPA Amount for Next Fiscal Year: \$ _____

INSTRUCTIONS (Construction and Outlay Schedules)

To insure timely achievement of the grant objectives the owner (grantee) must provide EPA with a grants activities schedule, contract construction schedules and corresponding payment outlay schedules for the grant and each contract under the grant. One copy of information similar to that showing the Construction and Outlay Schedule Form will be submitted for the grant schedule with the grant acceptance. A separate form will accompany each contract at time of contract award.

- A. The grant activities schedule shall depict the period from grant award through grant closeout and cover all major milestone date. The grant activities schedule shall include Schedule I information items as well as other appropriate items necessary to monitor the grant. Schedule II shall be filled out to estimate the cumulative (all construction and architectural/engineering contracts) payment schedule to be requested by the grantee from EPA during the grant period, and whenever actual outlays vary beyond -5% and +10% from the schedule.
- B. Individual contractor's construction schedules for each contract will be submitted to support the grant activities schedule. The Schedule I shall be submitted prior to date of advertisement of each contract and Schedule II along with the contractor's construction schedule shall be submitted seven (7) calendar days prior to the dates of the pre-construction conference. The contractor's construction schedule shall depict the contractor's plan for completing all contract requirements and show work placement in dollars versus contract time. Schedule II shall depict the contract payment outlay by month or quarter. The contract schedule will be coordinated with all parties at the pre-construction conference.

The grants activities schedule, contractor construction schedules, will be the basis for monitoring progress towards completion of the project. The schedules shall be maintained at the available for inspection and updated at least monthly. The schedules shall be revised to incorporate approved change orders as they occur.

All of the schedules will be submitted to the State Division of Water.

NOTICE OF INTENT

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 the following web address: <https://dep.gateway.ky.gov/eForms/default.aspx?FormID=7>.

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

KPDES FORM NOI-SW

Kentucky Pollutant Discharge Elimination System (KPDES)

Instructions

Notice of Intent (NOI) for Storm Water Discharges Associated with Industrial Activity
To Be Covered Under The KPDES General Permit

WHO MUST FILE A NOTICE OF INTENT (NOI) FORM

Federal law at 40 CFR Part 122 prohibits point source discharges of stormwater associated with industrial activity to a water body of the Commonwealth of Kentucky without a Kentucky Pollutant Discharge Elimination System (KPDES) permit. The operator of an industrial activity that has such a storm water discharge must submit a NOI to obtain coverage under the KPDES Storm Water General Permit. If you have questions about whether you need a permit under the KPDES Storm Water program, or if you need information as to whether a particular program is administered by the state agency, call the Storm Water Contact, Industrial Section, Kentucky Division of Water at (502) 564-3410.

If you have any questions regarding the completion of this form call the Storm Water Contact, Industrial Section, at (502) 564-3410.

SECTION I - FACILITY OPERATOR INFORMATION

Give the legal name of the person, firm, public organization, or any other entity that operates the facility or site described in this application. The name of the operator may or may not be the same as the name of the facility. The responsible party is the legal entity that controls the facility's operation, rather than the plant or site manager. Do not use a colloquial name. Enter the complete address and telephone number of the operator.

Enter the appropriate letter to indicate the legal status of the operator of the facility.

F = Federal M = Public (other than federal or state)
S = State P = Private

SECTION II - FACILITY/SITE LOCATION INFORMATION

Enter the facility's or site's official or legal name and complete street address, including city, state, and ZIP code.

SECTION III - SITE ACTIVITY INFORMATION

If the storm water discharges to a municipal separate storm sewer system (MS4), enter the name of the operator of the MS4 (e.g., municipality name, county name) and the receiving water of the discharge from the MS4. (A MS4 is defined as a conveyance or system of conveyances (including roads with drainage systems, municipal streets, catch basins, curbs, gutters, ditches, man-made channels, or storm drains) that is owned or operated by a state, city, town, borough, county, parish, district, association, or other public body which is designed or used for collecting or conveying storm water.)

If the facility discharges storm water directly to receiving water(s), enter the name of the receiving water.

Indicate whether or not the owner or operator of the facility has existing quantitative data that represent the characteristics and concentration of pollutants in storm water discharges.

If data is available submit with this form.

List, in descending order of significance, up to four 4-digit standard industrial classification (SIC) codes that best describe the principal products or services provided at the facility or site identified in Section II of this application.

If the facility listed in Section II has participated in Part 1 of an approved storm water group application and a group number has been assigned, enter the group application number in the space provided.

If there are other KPDES permits presently issued for the facility or site listed in Section II, list the permit numbers.

SECTION IV - ADDITIONAL INFORMATION REQUIRED FOR CONSTRUCTION ACTIVITIES ONLY

Construction activities must complete Section IV in addition of Sections I through III. Only construction activities need to complete Section IV.

Enter the project start date and the estimated completion date for the entire development plan.

Provide an estimate of the total number of acres of the site on which soil will be disturbed (round to the nearest acre).

Indicate whether the storm water pollution prevention plan for the site is in compliance with approved state and/or local sediment and erosion plans, permits, or storm water management plans.

SECTION V - CERTIFICATION

Federal statutes provide for severe penalties for submitting false information on this application form. Federal regulations require this application to be signed as follows:

For a corporation: by a responsible corporate officer, which means: (i) president, secretary, treasurer, or vice-president of the corporation in charge of a principal business function, or any other person who performs similar policy or decision making functions, or (ii) the manager of one or more manufacturing, production, or operating facilities employing more than 250 persons or having gross annual sales or expenditures exceeding \$25 million (in second-quarter 1980 dollars), if authority to sign documents has been assigned or delegated to the manager in accordance with corporate procedures;

For a partnership or sole proprietorship: by a general partner or the proprietor; or

For a municipality, state, Federal, or other public facility: by either a principal executive officer or ranking elected official.

WAGE RATES

Federal Davis-Bacon rates are applicable for these funds. This determination applies only to the grant/loan portion of this project. Please contact the other funding sources, if applicable, for their requirements pertaining to federal wage rates. You must contact the Kentucky Labor Cabinet for determination of applicable state wages.

++END OF TABLE OF WAGE RATES++

SECTION 00830

PREVAILING 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 of the Commonwealth of Kentucky.

The Contractor shall comply with the prevailing wage law of Kentucky, Kentucky Revised Statutes 337.510 to 337.550, including latest amendments thereto.

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.

Pursuant to Kentucky Revised Statute 337.540, no laborer, workman, mechanic, helper, assistant, or apprentice shall be permitted to work more than 8 hours in one calendar day, nor more than 40 hours in one week, except in cases of emergency caused by fire, flood, or damage to life or property. Whenever work in excess of 8 hours per day or 40 hours per week is required, payment for overtime shall be at not less than one and one-half times the prevailing rate of wages.

R-2. PREVAILING WAGES. The following wage rate schedule is the prevailing wage rate determination made by the Department of Labor of the Commonwealth of Kentucky on the designated date, and shall be a part of the Contract.

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 Determination OnLine website. Use this link to Find the Davis Bacon wages: <http://www.wdol.gov/dba.aspx#0>. Use the pull down menus to enter “Kentucky”, “Kenton”, and “Heavy Construction” and click “Search” to find the Davis Bacon Wages.



Steven L. Beshear
Governor

Daniel Mongiardo
Lieutenant Governor

KENTUCKY LABOR CABINET
DEPARTMENT OF WORKPLACE STANDARDS
DIVISION OF EMPLOYMENT STANDARDS,
APPRENTICESHIP & MEDIATION
1047 US Hwy 127 S - Suite 4
Frankfort, Kentucky 40601
Phone: (502) 564-3534
Fax (502) 564-2248
www.labor.ky.gov

Mark S. Brown
Secretary

Michael L. Dixon
Commissioner

February 21, 2011

JASON ABBOTT
MALCOLM PIRNIE INC
8600 GOVERNORS HILL DR - STE 210
CINCINNATI OH 45249

Re: NORTHERN KY WATER DIST, TAYLOR MILL WATER TREATMENT ADV IMPROV
(REVISED)

Advertising Date as Shown on Notification: March 17, 2011

Dear JASON ABBOTT:

This office is in receipt of your written notification on the above project as required by KRS 337.510 (1).

I am enclosing a copy of the current prevailing wage determination number CR 1-015, dated February 15, 2011 for KENTON County. This schedule of wages shall be attached to and made a part of the specifications for the work, printed on the bidding blanks, and made a part of the contract for the construction of the public works between the public authority and the successful bidder or bidders.

The determination number assigned to this project is based upon the advertising date contained in your notification. There may be modifications to this wage determination prior to the advertising date indicated. In addition, if the contract is not awarded within 90 days of this advertising date or if the advertising date is modified, a different set of prevailing rates of wages may be applicable. It will be the responsibility of the public authority to contact this office and verify the correct schedule of the prevailing rates of wages for use on the project. Your project number is as follows: 059-H-00476-11-1, Heavy/Highway

Sincerely,

Michael L. Dixon
Commissioner



KENTUCKY LABOR CABINET
PREVAILING WAGE DETERMINATION
CURRENT REVISION
LOCALITY NO. 15

KENTON COUNTY

Determination No. CR-1-015 2011

Date of Determination: February 15, 2011

Project No. 059-H-00476-11-1 Type: ___ Bldg xx___ HH
--

This schedule of the prevailing rate of wages for Kenton County has been determined in accordance with the provisions of KRS 337.505 to 337.550. This determination shall be referred to as Prevailing Wage Determination No. CR-1-015 2011.

Apprentices shall be permitted to work as such subject to Administrative Regulations adopted by the Commissioner of Workplace Standards. Copies of these regulations will be furnished upon request to any interested person.

Overtime is to be computed at not less than one and one-half (1 1/2) times the indicated BASE RATE for all hours worked in excess of eight (8) per day, and/or in excess of forty (40) per week. However, KRS 337.540 permits an employee and employer to agree, in writing, that the employee will be compensated at a straight time base rate for hours worked in excess of eight (8) hours in any one calendar day, but not more than ten (10) hours worked in any one calendar day, if such written agreement is prior to the over eight (8) hours in a calendar day actually being worked, or where provided for in a collective bargaining agreement. The fringe benefit rate is to be paid for each hour worked at a straight time rate for all hours worked.

Fringe benefit amounts are applicable for all hours worked except when otherwise noted. Welders will receive rate for craft in which welding is incidental.

NOTE: The type of construction shall be determined by applying the following definitions:

BUILDING CONSTRUCTION

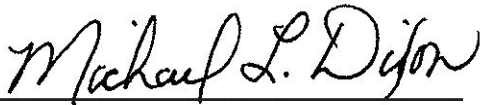
Building construction is the construction of sheltered enclosures with walk-in access for the purpose of housing persons, machinery, equipment, or supplies. It includes all construction of such structures, the installation of utilities and the installation of equipment, both above and below grade level, as well as incidental grading, utilities and paving.

HIGHWAY CONSTRUCTION

Highway construction includes the construction, alteration or repair of roads, streets, highways, runways, taxiways, alleys, trails, paths, parking areas, and other similar projects not incidental to building or heavy construction. It includes all incidental construction in conjunction with the highway construction project.

HEAVY CONSTRUCTION

Heavy projects are those projects that are not properly classified as either "building" or "highway". For example, dredging projects, water and sewer line projects, dams, flood control projects, sewage treatment plants and facilities, and water treatment plants and facilities are considered heavy.

A handwritten signature in black ink that reads "Michael L. Dixon". The signature is written in a cursive style and is positioned above a horizontal line.

Michael L. Dixon, Commissioner
Department of Workplace Standards
Kentucky Labor Cabinet

Determination No. CR-1-015 2011
February 15, 2011

ASBESTOS/INSULATION WORKERS:

(Including duct (hot/cold), Pipe Insulator, pipe wrapping):

BASE RATE \$28.03
FRINGE BENEFITS 12.39

Hazardous Material Handlers: (Includes preparation, wetting, stripping, removal, scrapping, vacuuming, bagging & disposing of all insulation materials, whether they contain asbestos or nor, from mechanical systems):

BASE RATE \$23.60
FRINGE BENEFITS 9.80

BOILERMAKERS:

BASE RATE \$35.79
FRINGE BENEFITS 16.71

BRICKLAYERS:

Bricklayers: BUILDING BASE RATE \$21.86
FRINGE BENEFITS 4.75

Tile Setters: BUILDING BASE RATE \$26.43
FRINGE BENEFITS 9.78

Tile Finishers: BUILDING BASE RATE \$21.99
FRINGE BENEFITS 9.78

Bricklayer: HEAVY HIGHWAY BASE RATE \$26.12
FRINGE BENEFITS 9.73

CARPENTERS:

Carpenters: (Including drywall hanging): BUILDING BASE RATE \$21.47
FRINGE BENEFITS 10.67

Carpenters & Piledrivermen: HEAVY & HIGHWAY BASE RATE \$27.05
FRINGE BENEFITS 9.69

Divers: HEAVY & HIGHWAY BASE RATE \$40.58
FRINGE BENEFITS 9.69

CEMENT MASON/CONCRETE FINISHERS:

BUILDING BASE RATE \$22.50
FRINGE BENEFITS 10.40

HEAVY & HIGHWAY BASE RATE \$25.75
FRINGE BENEFITS 8.60

ELECTRICIANS:

Electricians:		BASE RATE	\$26.11
		FRINGE BENEFITS	14.34

ELECTRICIAN/LINE CONSTRUCTION:

Linemen:	BUILDING	BASE RATE	\$30.50
		FRINGE BENEFITS	11.15

Equipment Operator:	BUILDING	BASE RATE	\$27.45
		FRINGE BENEFITS	10.51

Groundmen:	BUILDING	BASE RATE	\$19.83
		FRINGE BENEFITS	8.92

SOUND & COMMUNICATION TECHNICIAN:		BASE RATE	\$20.45
		FRINGE BENEFITS	6.95

ELEVATOR MECHANICS:		BASE RATE	\$37.47
		FRINGE BENEFITS	20.035

GLAZIERS:		BASE RATE	\$15.45
		FRINGE BENEFITS	0.00

IRONWORKERS:

Structural & Ornamental:		BASE RATE	\$26.17
		FRINGE BENEFITS	16.72

Fence Erector:		BASE RATE	\$23.55
		FRINGE BENEFITS	16.72

REINFORCING:

Beyond 30-mile radius of Hamilton County, OH Courthouse		BASE RATE	\$26.55
		FRINGE BENEFITS	16.70

Up to and including 30-mile radius of Hamilton County, OH Courthouse		BASE RATE	\$26.30
		FRINGE BENEFITS	16.70

LABORERS/BUILDING:

Landscape Laborer and Mason Tender-Cement/Concrete and Mason Tender-Brick (Hod):

	BUILDING	BASE RATE	\$24.85
		FRINGE BENEFITS	6.55

LABORERS/BUILDING (CONTINUED):

Pipelayer and Screw Operator:	BUILDING	BASE RATE	\$24.95
		FRINGE BENEFITS	6.55
Grade Checker:	BUILDING	BASE RATE	\$25.00
		FRINGE BENEFITS	6.55
LABORER	COMMON OR GENERAL	BASE RATE	\$17.17
		FRINGE BENEFITS	4.58
LABORER	MASON TENDER-BRICK	BASE RATE	\$17.42
		FRINGE BENEFITS	7.17

LABORER/HEAVY HIGHWAY:

GROUP 1:

Asphalt Laborer, Carpenter Tender, Concrete Curing applicator, Dump Man (Batch Truck), Guardrail and Fence Installer, Joint Setter, Laborer (Construction), Landscape Laborer, Mesh Handlers & Placer, Right-of-way Laborer, Riprap Laborer & Grouter, Scaffold Erector, Seal Coating, Surface Treatment or Road Mix Laborer, Sign Installer, Slurry Seal, Utility Man, Bridge Man, Handyman, waterproofing Laborer, Flagperson, Hazardous Waste (Level D), Diver Tender, Zone Person & Traffic Control:

HEAVY & HIGHWAY	BASE RATE	\$25.27
	FRINGE BENEFITS	7.50

GROUP 2:

Skid Steer, Asphalt Raker, Concrete Puddler, Kettle Man (Pipeline), Machine Driven Tools (Gas, Electric, Air), Mason Tender, Brick Paver, Mortar Mixer, Power Buggy or Power Wheelbarrow, Sheeting & Shoring Man, Surface Grinder Man, Plastic Fusing Machine Operator, Pug Mill Operator, & Vacuum Devices (wet or dry), Rodding Machine Operator, Diver, Screwman or Paver, Screed Person, Water Blast, Hand Held Wand, Pumps 4" & Under (Gas, Air or Electric) & Hazardous Waste (Level C), Air Track and Wagon Drill, Bottom Person, Cofferdam (below 25 ft. deep), Concrete Saw Person, Cutting with Burning Torch, Form Setter, Hand Spiker (Railroad), Pipelayer, tunnel Laborer (without air) & Caisson, Underground Person (working in Sewer and Waterline, Cleaning, Repairing & Reconditioning), Sandblaster Nozzle Person, & Hazardous Waste (Level B):

HEAVY & HIGHWAY	BASE RATE	\$25.44
	FRINGE BENEFITS	7.50

GROUP 3:

Blaster, Mucker, Powder Person, Top Lander, Wrencher (Mechanical Joints & Utility Pipeline), Yarner, Hazardous Waste (Level A), Concrete Specialist, Concrete Crew in Tunnels (With Air-pressurized - \$1.00 premium), Curb Setter & Cutter, Grade Checker, Utility Pipeline Tapper, Waterline, and Caulker:

HEAVY & HIGHWAY	BASE RATE	\$25.77
	FRINGE BENEFITS	7.50

LABORER/HEAVY & HIGHWAY: (Continued)

GROUP 4:

Miner (With Air-pressurized - \$1.00 premium), & Gunnite Nozzle Person:

HEAVY & HIGHWAY	BASE RATE	\$26.22
	FRINGE BENEFITS	7.50

Signal Person will receive the rate equal to the rate paid the laborer classification for which he or she is signaling

MILLWRIGHTS:

BASE RATE	\$27.55
FRINGE BENEFITS	15.39

OPERATING ENGINEERS/BUILDING:

GROUP 1

Boom & Jib 250' over:

BUILDING	BASE RATE	\$30.74
	FRINGE BENEFITS	12.25

GROUP 2

Boom & Jib Over 180' through 249':

BUILDING	BASE RATE	\$30.49
	FRINGE BENEFITS	12.25

GROUP 3

Boom & Jib 150' through 180':

BUILDING	BASE RATE	\$29.99
	FRINGE BENEFITS	12.25

GROUP 4

Master Mechanic:

BUILDING	BASE RATE	\$29.74
	FRINGE BENEFITS	12.25

GROUP 5

Crane (compact track or rubber over 4,000 lbs capacity, self erecting, stationary, track or truck (all configurations)), elevating grader, forklift (rough terrain with winch/hoist, backhoe, backhoe track, trackhoe, hoist (2 or more drums), horizontal directional drill, rotary drill, slip form paver:

BUILDING	BASE RATE	\$29.49
	FRINGE BENEFITS	12.25

GROUP 6

Asphalt Paver; Bobcat-type and/or Skid Steer Loader with Hoe Attachment Greater than 7,000 lbs.; Bulldozer; Endloader; Power Grader; Power Scraper:

BUILDING	BASE RATE	\$29.37
	FRINGE BENEFITS	12.25

GROUP 7

Forklift (except masonry), highway drills-all types, hoist (1 drum):

BUILDING	BASE RATE	\$28.33
	FRINGE BENEFITS	12.25

OPERATING ENGINEERS/ BUILDING: (Continued)

GROUP 8

Roller (except asphalt), self propelled sub grader, tractor (pulling sheep foot roller or grader):

BUILDING	BASE RATE	\$27.15
	FRINGE BENEFITS	12.25

GROUP 9

Allen Screed Paver(concrete); crane compact, track or rubber under 4,000 lbs, masonry forklift, oiler:

BUILDING	BASE RATE	\$21.69
	FRINGE BENEFITS	12.25

OPERATOR

BOBCAT/SKID LOADER	BASE RATE	\$20.77
	FRINGE BENEFITS	5.38

OPERATOR

COMPACTOR	BASE RATE	\$24.53
	FRINGE BENEFITS	0.00

OPERATOR

EXCAVATOR	BASE RATE	\$19.18
	FRINGE BENEFITS	5.16

OPERATOR

HIGHLIFT	BASE RATE	\$25.00
	FRINGE BENEFITS	0.00

OPERATING ENGINEERS/HEAVY HIGHWAY:

Master Mechanic & Boom from 150-180:

HEAVY & HIGHWAY	BASE RATE	\$29.74
	FRINGE BENEFITS	12.25

Boom from 180 and over:

HEAVY & HIGHWAY	BASE RATE	\$30.00
	FRINGE BENEFITS	12.25

GROUP 1

Air Compressor on Steel Erection; Barrier Moving Machine; Boiler Operator on Compressor or Generator when mounted on a Rig; Cableway; Combination Concrete Mixer & Tower; Concrete Plant (over 4 yd. Capacity); Concrete Pump; Crane (All Types, Including Boom Truck, Cherry Picker); Crane-Compact, Track or Rubber over 4,000 lbs. capacity; Cranes-Self Erecting, Stationary, Track or Truck (All Configurations); Derrick; Dragline; Dredge (Dipper, Clam or Suction); Elevating Grader or Euclid Loader; Floating Equipment (All Types); Gradual; Helicopter Crew (Operator-Hoist or Winch); Hoe (all types); Hoisting Engine on Shaft or Tunnel Work; Horizontal Directional Drill (over 500,000 ft. lbs. thrust); Hydraulic Gantry (Lifting System); Industrial-Type Tractor; Jet Engine Dryer (D8 or D9) Diesel Tractor; Locomotive (Standard Gauge); Maintenance Operator Class A; Mixer, Paving (Single or Double Drum); Mucking Machine; Multiple Scraper; Piledriving Machine (All Types); Power Shovel; Prentice Loader; Quad 9 (Double Pusher); Rail Tamper (with auto lifting & aligning device); Refrigerating Machine (Freezer Operation); Rotary Drill, on Caisson work; Rough Terrain Fork Lift with Winch/Hoist; Side-Boom; Slip-Form Paver; Tower Derrick; Tree Shredder; Trench Machine (Over 24" wide); Truck Mounted Concrete Pump; Tug Boat; Tunnel Machine and/or Mining Machine; & Wheel Excavator:

HEAVY & HIGHWAY	BASE RATE	\$29.49
	FRINGE BENEFITS	11.16

OPERATING ENGINEERS/HEAVY HIGHWAY (CONTINUED):

GROUP 2

Asphalt Paver; Automatic Subgrader Machine, Self-Propelled (CMI Type); Bobcat Type and/or Skid Steer Loader with Hoe Attachment Greater than 7,000 lbs.; Boring Machine More than 48"; Bulldozer; Endloader; Hydro Milling Machine; Kolman-type Loader (production type-Dirt); Lead Greaseman; Lighting & Traffic Signal Installation Equipment (includes all groups or classifications); Material Transfer Equipment (Shuttle Buggy) Asphalt; Pettibone-Rail Equipment; Power Grader; Power Scraper; Push Cat; Rotomill (all), Grinders & Planers of All types; Trench Machine (24" wide & under); & Vermeer type Concrete Saw:

HEAVY & HIGHWAY	BASE RATE	\$29.37
	FRINGE BENEFITS	12.25

GROUP 3

A-Frame; Air Compressor on Tunnel Work (low pressure); Asphalt Plant Engineer; Bobcat-type and/or Skid Steer Loader with or without Attachments; Highway Drills (all types); Locomotive (narrow gauge); Material Hoist/Elevator; Mixer, Concrete (more than one bag capacity); Mixer, one bag capacity (Side Loader); Power Boiler (Over 15 lbs. Pressure) Pump Operator installing & operating Well Points; Pump (4" & over discharge); Roller, Asphalt; Rotovator (lime soil stabilizer); Switch & Tie Tampers (without lifting & aligning device); Utility Operator (Small equipment); & Welding Machines:

HEAVY & HIGHWAY	BASE RATE	\$28.33
	FRINGE BENEFITS	12.25

GROUP 4

Backfiller; Ballast Re-locator; Bars, Joint & Mesh Installing Machine; Batch Plant; Boring Machine Operator (48" or less); Bull Floats; Burlap & Curing Machine; Concrete Plant (capacity 4 yd. & under); Concrete Saw (Multiple); Conveyor (Highway); Crusher; Deckhand; Farm-type Tractor with attachments (highway) except Masonry); Finishing Machine; Fireperson, Floating Equipment (all types); Fork Lift (highway); Form Trencher; Hydro Hammer; Hydro Seeder; Pavement Breaker; Plant Mixer; Post Driver; Post Hole Digger (Power Auger); Power Brush Burner; Power Form Handling Equipment; Road Widening Trencher; Roller (Brick, Grade & Macadam); Self-Propelled Power Spreader; Self-Propelled Power Subgrader; Steam Fireperson; Tractor (Pulling Sheepfoot, Roller or Grader); & Vibratory Compactor with Integral Power:

HEAVY & HIGHWAY	BASE RATE	\$27.15
	FRINGE BENEFITS	12.25

GROUP 5

Compressor (Portable, Sewer, Heavy & Highway); Drum Fireperson (Asphalt); Generator; Inboard-Outboard Motor Boat Launch; Masonry Fork Lift; Oil Heater (asphalt plant); Oiler; Power Driven Heater; Power Sweeper & Scrubber; Pump (under 4" discharge); Signalperson; Tire Repairperson; & VAC/ALLS:

HEAVY & HIGHWAY	BASE RATE	\$21.69
	FRINGE BENEFITS	12.25

PAINTERS:

Brush & Roller Only:	BUILDING	BASE RATE	\$21.30
		FRINGE BENEFITS	3.80

Spray Only:	BUILDING	BASE RATE	\$23.35
		FRINGE BENEFITS	8.10

PAINTERS/BUILDING (CONTINUED):

Sign Painter & Erector:	BUILDING	BASE RATE	\$20.23
		FRINGE BENEFITS	3.25

PAINTERS/ HEAVY & HIGHWAY

Bridge/Equipment Tender and/or Containment Builder:	HEAVY & HIGHWAY	BASE RATE	\$20.27
		FRINGE BENEFITS	8.10

Brush & Roller:	HEAVY & HIGHWAY	BASE RATE	\$22.85
		FRINGE BENEFITS	8.10

Spray:	HEAVY & HIGHWAY	BASE RATE	\$23.35
		FRINGE BENEFITS	8.10

Sandblasting & Water Blasting:	HEAVY & HIGHWAY	BASE RATE	\$23.60
		FRINGE BENEFITS	8.10

Bridge:	HEAVY & HIGHWAY	BASE RATE	\$23.85
		FRINGE BENEFITS	8.10

PIPEFITTERS & PLUMBERS:

(Including HVAC Pipe Installation & HVAC System Installation):

BASE RATE	\$29.00
FRINGE BENEFITS	15.34

PLASTERERS:

BUILDING

BASE RATE	\$22.00
FRINGE BENEFITS	10.10

ROOFERS (excluding metal roofs):

(Including built up roof, modified bitumen roof, rubber roof, shake & shingle roof & single ply roof:

BASE RATE	\$26.31
FRINGE BENEFITS	11.07

SHEETMETAL WORKERS (including metal roofs):

(including HVAC duct installation)

BASE RATE	\$27.26
FRINGE BENEFITS	15.23

SPRINKLER FITTERS:

(Fire Sprinklers)

BASE RATE	\$29.00
FRINGE BENEFITS	16.35

TRUCK DRIVERS/BUILDING:

10 Yard Truck:	BUILDING	BASE RATE	\$16.27
		FRINGE BENEFITS	1.50

Dump Truck:	BUILDING	BASE RATE	\$18.63
		FRINGE BENEFITS	6.00

TRUCK DRIVER/HEAVY HIGHWAY:

Driver:	HEAVY & HIGHWAY	BASE RATE	\$15.85
		FRINGE BENEFITS	4.60

Euclid Wagon, End Dump, Lowboy, Heavy Duty Equipment, Tractor-Trailer Combination, & Drag:	HEAVY & HIGHWAY	BASE RATE	\$16.29
		FRINGE BENEFITS	4.60

End of Document
CR-1-015 2011
February 15, 2011

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General Decision Number: KY100199 12/24/2010 KY199

State: Kentucky

Construction Type: Heavy
Including Water and Sewer Line Construction

County: Kenton County in Kentucky.

HEAVY CONSTRUCTION PROJECTS (including sewer/water construction).

Modification Number	Publication Date
0	10/15/2010
1	11/05/2010
2	12/03/2010
3	12/24/2010

ELEC0212-007 05/31/2010

	Rates	Fringes
ELECTRICIAN.....	\$ 26.11	14.34

* ENGI0018-022 05/01/2010

	Rates	Fringes
OPERATOR:		
Bobcat/Skid Loader & Forklift (All other types)...	\$ 28.33	12.25
Bulldozer & Loader (Front End).....	\$ 29.37	12.25
Masonry Forklift.....	\$ 27.15	12.25
Trackhoe.....	\$ 29.49	12.25

PLAS0132-013 06/01/2010

	Rates	Fringes
CEMENT MASON/CONCRETE FINISHER...	\$ 22.50	10.40

SUKY2010-148 09/14/2010

	Rates	Fringes
LABORER: Common or General.....	\$ 22.10	4.65
LABORER: Landscape.....	\$ 12.00	1.47
LABORER: Pipelayer.....	\$ 16.70	6.10
OPERATOR: Backhoe/Excavator.....	\$ 26.98	6.68
TRUCK DRIVER: Dump Truck.....	\$ 25.67	0.00

WELDERS - Receive rate prescribed for craft performing operation to which welding is incidental.

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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 (29 CFR 5.5(a)(1)(ii)).

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In the listing above, the "SU" designation means that rates listed under the identifier do not reflect collectively bargained wage and fringe benefit rates. Other designations indicate unions whose rates have been determined to be prevailing.

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WAGE DETERMINATION APPEALS PROCESS

1.) Has there been an initial decision in the matter? This can be:

- * an existing published wage determination
- * a survey underlying a wage determination
- * a Wage and Hour Division letter setting forth a position on a wage determination matter
- * a conformance (additional classification and rate) ruling

On survey related matters, initial contact, including requests for summaries of surveys, should be with the Wage and Hour Regional Office for the area in which the survey was conducted because those Regional Offices have responsibility for the Davis-Bacon survey program. If the response from this initial contact is not satisfactory, then the process described in 2.) and 3.) should be followed.

With regard to any other matter not yet ripe for the formal process described here, initial contact should be with the Branch of Construction Wage Determinations. Write 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 the answer to the question in 1.) is yes, then an interested party (those affected by the action) can request review and reconsideration from the Wage and Hour Administrator (See 29 CFR Part 1.8 and 29 CFR Part 7).

Write 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 by 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

4.) All decisions by the Administrative Review Board are final.

END OF GENERAL DECISION

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SECTION 01110

SUMMARY OF WORK

PART 1 – GENERAL

1.1 SECTION INCLUDES

A. Table of Articles for this Section is:

<u>Article</u>	<u>Title</u>
1.1	Section Includes
1.2	Location and Description of Work
1.3	Other Construction Contracts
1.4	Work By Others
1.5	Work By OWNER
1.6	OWNER-furnished Equipment and Materials
1.7	Assigned Procurement Contracts
1.8	Sequence and Progress of Work
1.9	CONTRACTOR's Use of Site
1.10	Easements and Rights-of-Way
1.11	Notices to Owners and Authorities of Properties Adjacent to the Work
1.12	Salvage of Equipment and Materials
1.13	Partial Utilization by OWNER

1.2 LOCATION AND DESCRIPTION OF WORK

A. The Work is located on the site of the Taylor Mill Water Treatment Plant, 608 Grand Avenue, Taylor Mill, Kentucky, 41015.

B. The Work to be performed under this Contract consists of providing all equipment, materials, supplies, tools, and supervision necessary to construct the **TAYLOR MILL WATER TREATMENT PLANT ADVANCED TREATMENT IMPROVEMENTS**, as shown on the Drawings, specified herein, and required for a fully operational and complete facility. See section 01140 Work Restrictions for project work restrictions. The scope of work includes, but is not limited to, the following major items:

1. Construction of Preliminary Treatment/Granular Activated Carbon (GAC) Building with rapid mix flocculation, Plate settling, residuals collection system and GAC pressure vessels.
2. Construction of a GAC Feed Pump Station.
3. Relocation of existing UV system
4. Installation of an electrical substation and two back-up generators;

5. Demolition of existing flocculation basins, sedimentation basins, and tunnel structure.
6. General piping demolition, modifications, and new piping installation.
7. Other miscellaneous work as indicated in the drawings or specifications

C. Contracting Method: Work shall be constructed under one prime contract.

1.3 OTHER CONSTRUCTION CONTRACTS (NOT USED)

1.4 WORK BY OTHERS

- A. The ENGINEER will be programming the SCADA system. The CONTRACTOR shall provide time in their schedule for the ENGINEER to program the SCADA system as specified in section 01140 Work Restriction

1.5 WORK BY OWNER

- A. OWNER will perform the following in connection with the Work:
1. Operate all existing valves, gates, pumps, equipment, and appurtenances that will affect OWNER's operation, unless otherwise specified or indicated.

1.6 OWNER-FURNISHED EQUIPMENT AND MATERIALS (NOT USED)

1.7 ASSIGNED PROCUREMENT CONTRACTS (NOT USED)

1.8 SEQUENCE AND PROGRESS OF WORK

- A. The Work shall be constructed in accordance with the requirements as outlined in Section 01143, Coordination with Owner's Operations and Section 01120, Suggested Sequence of Construction. All specific planning for tie-ins to existing facilities and other matters pertaining to coordination the sequence of construction and maintaining operation of the facilities shall be submitted to the OWNER and ENGINEER for approval.

1.9 CONTRACTOR'S USE OF SITE

- A. CONTRACTOR's use of the Site shall be confined to the areas shown.
- B. CONTRACTOR shall:
1. Assume full responsibility for protection and safekeeping of products stored on or off the Site.
 2. Move stored products that interfere with the operations of OWNER, other contractors or others performing work for OWNER.
 3. Obtain and pay for all additional storage for work areas required for its operations.
 4. Not interfere with operation of OWNER.

5. Provide all tools, ladders, equipment, etc., for CONTRACTOR's work and the work of all its subcontractors.
- C. Limits on CONTRACTOR's use of the Site are:
1. CONTRACTOR and all personnel shall be restricted to the construction areas shown on the Drawings and designated by the OWNER.
 2. CONTRACTOR shall ensure that all utilities are in good working condition for use by the OWNER's personnel at all times unless written permission is received from the OWNER for temporary outages.
 3. CONTRACTOR shall be responsible for any damage resulting from construction activities.
 4. CONTRACTOR shall not block any access to private property.
 5. CONTRACTOR shall submit written requests and be granted approval a minimum of 48 hours in advance of temporary utility outage.

1.10 EASEMENTS AND RIGHTS-OF-WAY

- A. Easements and rights-of-way will be provided by OWNER in accordance with the General Conditions. Confine construction operations within OWNER's property, public rights-of-way, easements obtained by OWNER, and the limits shown. Use care in placing construction tools, equipment, excavated materials, and materials and equipment to be incorporated into the Work to avoid damaging property and interfering with traffic. Do not enter private property outside the construction limits without permission from the owner of the property.

1.11 NOTICES TO OWNERS AND AUTHORITIES OF PROPERTIES ADJACENT TO THE WORK

- A. Notify owners of adjacent property and utilities when prosecution of the Work may affect their property, facilities, or use of property.
- B. When it is necessary to temporarily obstruct access to property, or when utility service connection will be interrupted, provide notices one week in advance to enable affected persons to provide for their needs. Conform notices to Laws and Regulations and, whether delivered orally or in writing, include appropriate information concerning the interruption and instructions on how to limit inconvenience caused thereby.
- C. Notify utility owners and other concerned entities at least 72 hours prior to cutting or closing streets or other traffic areas or excavating near Underground Facilities or exposed utilities.

1.12 SALVAGE OF EQUIPMENT AND MATERIALS

- A. Comply with the requirements of Section 02220 for Demolition and Salvage.

- B. CONTRACTOR shall disassemble and transport all salvaged material, that is to remain the property of the OWNER, to an OWNER-designated location, within 20 miles of the Taylor Mill Water Treatment Plant. This equipment includes the following:
1. North and South Stage 1 flocculator drives
 2. North and South sludge clarifier pumps
 3. 20" Raw Water butterfly valve
 4. 18" Raw Water cone valve
 5. 5 – Raw Water chemical feed injection nozzles
 6. 12" FTW Return magnetic flow meter
 7. 12" FTW Return butterfly valve
 8. Residuals Pumps
 9. Raw Water sample pump
- C. Existing equipment and materials removed and not shown or specified to be reused in the Work will become CONTRACTOR's property
- D. Existing equipment and materials removed by CONTRACTOR shall not be reused in the Work, except where so specified or indicated.
- E. Carefully remove in manner to prevent damage all equipment and materials specified or indicated to be salvaged and reused or to remain property of OWNER. Store and protect salvaged items specified or indicated to be used in the Work. Replace in kind or with new items equipment, materials, and components damaged in removal, storage, or handling through carelessness or improper procedures.
- F. CONTRACTOR may furnish and install new items, with ENGINEER's approval, instead of those specified or indicated to be salvaged and reused, in which case such removed items will become CONTRACTOR's property.

1.13 PARTIAL UTILIZATION BY OWNER

- A. Complete Preliminary Treatment portion of the PT/GAC Building as specified. OWNER shall use the Preliminary Treatment portion of the PT/GAC Building for the purpose of operating the existing filters with the new Preliminary Treatment before the entire PT/GAC Building is operational, before the demolition of the existing flocculation/sedimentation basins can begin. The OWNER will operate this portion of the facility but the CONTRACTOR will continue to provide all insurance and bonds. The correction period as outlined in GC-13.07 will not begin until substantial completion has been given for the entire project.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

+ + END OF SECTION + +

SECTION 01120

SUGGESTED SEQUENCE OF CONSTRUCTION

PART 1 – GENERAL

1.1 DESCRIPTION

- A. The CONTRACTOR will be required to execute the work in such a manner as will least interfere with the operation of the facility. When filters, clearwells, tanks, process units and conduits are to be taken out of service for construction, dewatering of pipelines shall be done to the extent possible with the existing plant facilities by plant personnel only. Where plant facilities are not sufficient for complete dewatering, the CONTRACTOR shall furnish adequate facilities for and shall completely dewater the pipes or conduits at no additional costs to the OWNER. The CONTRACTOR is advised that existing valves may not be water tight and may leak. The CONTRACTOR shall furnish and operate those additional facilities necessary to handle leakage due to faulty gates or valves. The CONTRACTOR is to include costs of this work in a lump sum bid.
- B. It is the CONTRACTOR'S responsibility to hose down and clean all tanks, basins or structures and remove and dispose of any debris, sludge, solids, etc within the tank or structure in accordance with all applicable regulations.
- C. Temporary power generation/supply is the responsibility of the CONTRACTOR as specified in Section 01511 – Temporary Electricity and Lighting.
- D. Provide temporary reducing couplings, supports, and appurtenances as required for phased construction. Install temporary blind flanges as required to keep water from entering new piping during phased construction.
- E. The CONTRACTOR shall field verify the locations and elevations of the existing piping prior to any piping submittals. The CONTRACTOR shall plan on excavating 20 test pits to locate and identify buried piping.
- F. All temporary electrical and piping materials, supports and routings shall be submitted for approval prior to installation.
- G. Interruptions in facility operations shall be coordinated in accordance with Section 01143, Coordination with Owner's Operation and other contract documents.
- H. The CONTRACTOR shall provide necessary temporary structural support.

- I. The CONTRACTOR shall maintain in operation the monitoring and control capabilities that are currently available in the Control Room on the second floor of the Filter Building. Access shall be provided at all times.
- J. The CONTRACTOR shall coordinate the construction WORK such that plant systems which are currently in operation remain in operation at all times throughout the construction period unless otherwise approved by the Construction Contract Administrator.

PART 2 SUGGESTED SEQUENCE OF WORK

2.1 DESCRIPTION

- A. The following suggested sequence of construction can be used as a guide to scheduling the WORK required to meet the project milestones, constraints and work restrictions. Many of these items should be done in parallel to meet the required project milestones, constraints and work restrictions. This is only a suggested sequence of WORK; the CONTRACTOR shall be responsible for the actual sequence of WORK, and all means and methods.

2.2 PHASE I – PRELIMINARY TREATMENT

- A. Mobilize
- B. PT/GAC Building earthwork and foundation piers
 - 1. Additional site earthwork
 - 2. Construct detention pond
 - 3. Install new Storm Sewer piping
- C. Install Basin drains from the flocculators, clarifiers and EQ basin.
- D. Form and pour EQ basin, flocculators, clarifiers and residuals pump area.
- E. Form and pour PT/GAC Building grade beams, floor slab, and columns
- F. Install PT/GAC Building roof beams
- G. Install rapid mix, flocculation, clarifier and sludge handling equipment
- H. Install PT/GAC Building Roof T-beams and hollow core roofing.
- I. Install 24" Raw Water pipe (plant is shut down, see coordination with Owner's Operations and work restrictions). The proposed 24" Raw Water pipe should be tied into the existing 24" Raw Water main and valved off to allow the existing

Raw Water main to remain operational until the Preliminary Treatment and maintenance area portions of the PT/GAC Building are ready to be started up.

1. The existing 24" Raw Water main shall be removed for a distance of approximately 25' north of the existing cross. The existing abandoned air release valve manhole shall be removed and approximately 25' of new 24" Raw Water main should be installed as follows:
 - a. Approximately 15' feet north of the existing cross a 24" tee should be installed to connect the proposed 24" Raw Water main. From this tee enough new 24" Raw Water pipe should be installed to the west so when the new Raw Water pipe is connected traffic is not disrupted on Howard Street. A valve with a 20' length of capped pipe should be installed to provide a connection for the new 24" Raw Water pipe.
 - b. North of the new 24" tee, 4' of new 24" Raw Water pipe should be installed then a 24" valve and an additional amount of 24" Raw Water pipe. The final piece of pipe should be between 3' to 10' long and should allow for the new pipe to be coupled to the old pipe with a joint restraint coupling a minimum of 5' away from an existing joint.
- J. Install 12" FTW Return pipe (plant is shut down). The proposed 12" FTW Return pipe should be installed up to the existing 12" FTW Return pipe. Once the Preliminary Treatment and maintenance area portions of the PT/GAC Building are started up the existing 12" FTW Return pipe can be removed at the existing 45° bend and the proposed 12" FTW Return pipe can be connected with a joint restraint coupling.
- K. Install permanent 42" Filter Influent pipe to the temporary 24" Filter Influent pipe (North Clarifier shutdown). The proposed 24" Filter Influent pipe should be tied into the existing effluent box on the north clarifier. The existing north clarifier effluent pipe shall remain operational until the Preliminary Treatment and maintenance area portions of the PT/GAC Building are ready to be started up.
1. The temporary 24" Filter Influent pipe should be installed along the ground and supported against but not connected to the lower outside portion of the north clarifier wall.
- L. Install 12" Secondary Backwash supply pipe. Tap existing 24" high service pipe located north of Grand Avenue. OWNER to make the tap. Tapping saddle, valve, piping and all other appurtenances to be provided by the CONTRACTOR.
1. The 12" Secondary Backwash supply pipe is to be installed up to the first valve within the PT/GAC Building, as shown on section 2/M-06-306, and a temporary blind flange is to be installed. The plumbing is to be connected to the 12" x 4" tee and potable water will be run to the progressive cavity residuals pumps to provide seal water.

- M. Install 6" Residuals Main.
- N. Install permanent chemical feed from the existing chemical building to the rapid mix in the PT/GAC Building (plant shutdown). These Chemicals include the following:
 - 1. 1" Sodium Hypochlorite (to the rapid mix basin)
 - 2. 1" Copper Sulfate / Powdered Activated Carbon (to the rapid mix basin)
 - 3. 1" Caustic (to the rapid mix basin)
 - 4. 1" Ferric Sulfate (to the rapid mix basin)
 - 5. 1" Hybrid Coagulant (to the rapid mix basin)

These chemical feed lines should be tied into the existing chemical feed lines in the chemical building and valved off to allow the existing chemical feed lines to remain operational until the Preliminary Treatment and maintenance area portions of the PT/GAC Building are ready to be started up.

- O. Install and finish the masonry walls for Preliminary Treatment and maintenance area portions of the PT/GAC Building, prior to proceeding with the walls of the GAC portion.
- P. Install roofing for Preliminary Treatment and maintenance area portions of the PT/GAC Building.
- Q. Install electrical and controls for Preliminary Treatment and maintenance area portions of the PT/GAC Building, including but not limited to the following:
 - 1. Rapid mix equipment
 - 2. Flocculator equipment
 - 3. Clarifier equipment
 - 4. Residuals pumps
 - 5. Lighting
 - 6. Ventilation
- R. Install temporary electrical service from Duke Energy to operate the new Preliminary Treatment equipment. Duke to provide temporary pad mounted transformer, as indicated on Drawing E-02-102.
- S. Startup the Preliminary Treatment portion of the PT/GAC Building (see project constraints and work restrictions). The startup of the Preliminary Treatment Portion of the PT/GAC Building includes but is not limited to the following:
 - 1. The filter aid polymer and the sodium hypochlorite pump headers must be reconfigured to send the flow of these chemicals to the existing North Clarifier effluent box and the existing 24" filter influent pipe (until the new filter overflow box and 42" FI are constructed):
 - a. 1" Sodium Hypochlorite (to existing 30" filter influent pipe)
 - b. 1" Filter Aid Polymer (to existing North Clarifier effluent box)

The existing Sodium Hypochlorite and Filter Aid Polymer to the existing South Preliminary Treatment basins and channel should be disconnected, capped and removed.

2. Start the chemical feed flow to the new Rapid Mix. Disconnect, cap and remove the existing chemical feed pipes since the flow is now going to the new Preliminary Treatment.
 3. Open valve of the new 24" Raw Water pipe. Valve off the existing 24" Raw Water Main and cap the valve since the flow is now going to the new Preliminary Treatment.
 4. Drain the existing North Clarifier so that only water from the temporary 24" Filter Influent pipe flows through the influent box.
 5. Start up all new Preliminary Treatment Equipment and transfer from the existing Preliminary Treatment process to the new Preliminary Treatment process. At this point the Owner will utilize the Preliminary Treatment and maintenance area portions of the PT/GAC Building.
- T. The OWNER shall operate the new Preliminary Treatment portion of the PT/GAC Building for the 30 day demonstration period prior to any demolition as specified in Section 01140 Work Restrictions.
- U. Install permanent wall to block off the southern feed to the existing Filter Influent Channel. Contractor shall provide temporary means of blocking flow in the Filter Influent Channel from the northern feed so that only the two southernmost filters (filter #1 and #2) are temporarily out of service. Installation of the permanent wall in the Filter Influent Channel shall be performed on a Thursday or Friday and the two southernmost filters shall be back in service by the following Monday. Owner shall be given a minimum of 2 weeks notice prior to commencement of work.

2.2 PHASE II – GAC & ADMINISTRATION AREAS (To run concurrently with Phase III)

- A. Set GAC Vessels
- B. Finish GAC area and Administration area masonry walls
- C. Finish GAC area and Administration area roof
- D. Install all interior GAC piping, backwash pump and EQ pumps, provide all required pipe supports
 1. Move the control panel and reactor for UV 1 to the PT/GAC Building. Move the UV UPS to the filter Building pipe gallery and connect it to operate the existing UV 2 reactor and control panel. Should be done while filter building pipe gallery modifications are taking place (Plant is

shutdown, see Phase III 2.3.D). At this point only UV 2 and the UPS are operational in the filter building.

- E. Install GAC and Administration area electrical, controls and HVAC.
- F. Paint within PT/GAC Building
- G. Outfit Administration area
- H. GAC area ready for start up. Wait for GAC Feed Pump Station and piping modifications to be finalized (See Phase III).

2.3 PHASE III – DEMOLITION, FILTER GALLERY PIPING MODIFICATIONS, GAC FEED PS & GENERATORS (To run concurrently with Phase II)

- A. Relocate the chemical feed piping that is currently located within the Tunnel area between the existing Chemical Building and the existing Filter Building (plant shutdown). These chemical feed pipes shall be installed along the floor of the existing tunnel in conduits enclosed in concrete prior to the start of demolition, see drawings M-09-201 and M-09-102. These Chemicals include the following:
 - 1. 1” Corrosion Inhibitor (to finished water pipe)
 - 2. 1” Hydrofluosilicic Acid (to finished water pipe)
 - 3. 1” Sodium Hypochlorite (to finished water pipe)
 - 4. 1” Caustic (to finished water pipe)
 - 5. 1” Sodium Hypochlorite (to proposed 42” filter influent pipe)
 - 6. 1” Filter Aid Polymer (to proposed filter overflow box)
 - 7. 1” Sodium Hypochlorite (to existing booster pump and backwash pump header)

These chemical feed lines should be tied into the existing chemical feed lines in the Chemical Building and valved off to allow the existing chemical feed lines to remain operational until the existing chemical feed is removed and the upper portion of the Tunnel is demolished.

- B. Relocate all of the existing utilities within the existing Tunnel to allow for demolition of the Tunnel. These utilities include but are not limited to the following:
 - 1. Potable water
 - 2. Fire sprinkler water
 - 3. Electricity
 - 4. Phone
 - 5. Instrumentation, control and access control wiring

These utilities should be tied into the existing Chemical Feed building and the existing Filter Building, and are to remain operational while the upper portion of the Tunnel is demolished.

- C. Once all the chemical lines and utilities in the Tunnel structure have been relocated and are operational, begin demolition of the existing Preliminary Treatment Structures and the Tunnel as follows:
1. Start on the South Clarifier and proceed north, removing walls, footings and slabs as indicated on the Drawings.
 2. Portions of the existing tunnel structure are to remain below elevation 519. Portions of the stairwells on the existing Chemical Building and the Existing Filter Building will not be demolished.
 3. As areas are ready to be filled, fill with compacted engineered fill.
 4. The temporary 24" Filter Influent pipe will remain adjacent to the exterior of the north wall of the North Clarifier. The north wall shall be cut and removed to an elevation above the temporary 24" Filter Influent pipe and enough footing shall be left in place to keep the north wall from overturning (see demolition drawings).
- D. Existing Filter Building Pipe Gallery Modifications (Modifications should be done between October 16, 2012 and April 30, 2013 to coordinate with Phase II above).
1. Remove the existing 20" Raw Water pipe and existing 12" FTW Return pipe that are located in the existing Filter Building pipe gallery once the proposed 24" Raw Water and 12" FTW Return pipes have been installed and are operational.
 2. Drain the clearwell to an elevation below that of the filter effluent penetrations into the clearwell.
 3. Relocate the electrical conduit to UV2.
 4. Remove the UV 1 control panel, UV 1 reactor, two 24" butterfly valves, actuators, all sample and chemical feed piping, joints and all appurtenances for a complete operational UV system and relocate all within the PT/GAC Building. Install blind flange on existing tee and remove chemical feed injectors. Chemical feed injectors to be moved approximately 6' to the west and installed in the proposed 24" GAC UV Treated Water Pipe.
 5. Rotate the existing 90° bend, 90° as shown in section 1/M-08-101, 2/M-08-101 and install valve for proposed 24" GPSS as shown in partial plan 1/M-08-101.
 6. Install 24" 90° bend, flange fillers and 24" valve as shown in section 2/M-08-101 and 2/M-08-301
 7. Keep UV 2 control panel and UV reactor in place and operational.
 8. Fill the clearwell. The filter effluent can only flow through and be treated by UV 2.
 9. Move the existing electrical and control panels on the west wall of the west pipe gallery, see photo 001 on sheet D-08-102. Cut pipe access opening in the west wall of the west pipe gallery. Properly shore the excavation on the exterior or the west wall of the west pipe gallery and install the proposed 24" GAC UV Treated Water pipe and the 24" GAC Feed PS Supply pipe through the pipe access opening.

- a. Connect the 24" GAC UV Treated Water pipe to the west side of the existing 24" tee into the clearwell. Reconnect the 4 chemical injectors into this pipe provide additional flexible pipe as required. Stub out pipe outside of the building for connection to the PT/GAC Building.
 - b. Connect the 24" GAC Feed PS Supply pipe to the 24" valve that was installed above. Stub out pipe for connection to the GAC Feed PS
Provide all required pipe supports and seal the pipe access opening as shown in the structural details.
- E. Install the Filter Overflow Box and the remaining 42" Filter Influent pipe up to the Filter Overflow Box, but do not disconnect the temporary 24" Filter Influent pipe unless this construction falls between the October 1st to May 1st time frame when the plant can be taken out of service. Wait for the October 1st to May 1st time frame to install the remaining 42" Filter Influent and connect it to the existing filter influent box. Once the remaining 42" Filter Influent has been installed remove the temporary 24" Filter Influent and provide a restrained mechanical joint plug on the 24" portion of the 42" x 24" mechanical joint tee.
- F. Excavate and pour GAC Feed PS clearwell, footing and slab.
- G. Install 24" GAC Feed PS Supply pipe, from the existing Filter Building to the GAC Feed PS.
- H. Install 24" GAC Supply pipe, from the GAC Feed PS to the PT/GAC Building.
- I. Install 24" GAC Feed PS Overflow pipe, from the GAC Feed PS to the discharge location. Install headwall and additional riprap.
- J. Install 24" GAC/UV Treated Water pipe, from the PT/GAC Building to the clearwell in the existing Filter Building.
- K. Relocate existing 4" Force Main in driveway area.
- L. Relocate existing 12" Storm Sewer in driveway area.
- M. Rough-in service entrance conduits from new substation transformer location to GAC Feed PS, conduits to generators, conduit to filter building third floor, conduit to 1,500 KVA transformer, as well as other below or in-slab conduits in GAC Feed PS.
- N. Install GAC Feed PS masonry walls and roof.
- O. Install GAC Feed pumps, equipment and piping.
- P. Install electrical and ventilation in the GAC Feed PS.

- Q. Install Paralleling Switchgear and 1500 KVA Transformer in GAC Feed PS, and pull feeder from substation transformer.
- R. Pour slabs and set new generator:
 1. Construct stairs and platform to access new generators
 2. Tie generators into Paralleling Switchgear
- S. Install new 2400V MCC on third floor of filter building, and feeder from GAC Feed PS.
- T. Tie-in electrical service, while existing service to filter building remains in place. Energize main filter building MCC bus.
- U. Startup PT/GAC Building
- V. Remove the UV 2 control panel, UV 2 reactor, actuators, all sample and chemical feed piping, joints and all appurtenances for a complete operational UV system, with the exception of the two existing 24” butterfly valves and relocate all within the PT/GAC Building. Install blind flange on the existing 24” butterfly valves.
- W. Remove the UV UPS and relocate it to the PT/GAC Building.
- X. Install plantings and landscape requirements, seed and mulch.

2.4 PHASE IV – FILTER BUILDING HIGH SERVICE PUMP ELECTRICAL UPGRADES (To run concurrently with Phases II & III)

- A. Install new conduits and cable tray from new filter building MCC on third floor, as far as possible to existing high service pumps, and to transformer backfeed locations on mezzanine and in outside substation area.
- B. Install new conduit and control wiring from new filter building MCC to existing PLC cabinet, and new high service pump remote control stations.
- C. Steps D through I below may not be performed concurrently.
- D. Remove existing feeder and controls from existing starter to high service pump no. 1 and install new feeder from new MCC, and make all power and control connections. Perform startup of high service pump no. 1 on new service.
- E. Remove existing feeder and controls from existing starter to high service pump no. 2 and install new feeder from new MCC, and make all power and control connections. Perform startup of high service pump no. 2 on new service.

- F. Remove existing feeder and controls from existing starter to high service pump no. 3 and install new feeder from new MCC, and make all power and control connections. Perform startup of high service pump no. 3 on new service.
- G. Remove existing feeder and controls from existing starter to high service pump no. 4 and install new feeder from new MCC, and make all power and control connections. Perform startup of high service pump no. 4 on new service.
- H. Remove existing feeder and controls from existing starter to high service pump no. 5 and install new feeder from new MCC, and make all power and control connections. Perform startup of high service pump no. 5 on new service.
- I. Remove existing feeder and controls from existing starter to high service pump no. 6 and install new feeder from new MCC, and make all power and control connections. Perform startup of high service pump no. 6 on new service.
- J. Remove existing starter in mezzanine adjacent to 150 KVA transformer, and prepare bussing for new connection. Install feeder from new MCC and make connection to existing transformer. Energize transformer from new service. (Must be installed and connected between October 1st and May 1st, plant out of service)
- K. Remove existing feeder to existing 2400V switch in mezzanine, serving 150 KVA basement transformer. Install new feeder from MCC and make connection. Energize transformer from new service. (Must be installed and connected between October 1st and May 1st, plant out of service)
- L. Disconnect and remove existing switch feeding to existing 300 KVA transformer located outside. Install new feeder from MCC and make connection. Energize transformer from new service. (Must be installed and connected between October 1st and May 1st, plant out of service)
- M. Disconnect and remove existing primary service transformer, existing 2400V switchgear, existing 2400V starters, and associated unused wiring and conduit. Coordinate with Duke to have existing primary structure removed (removal of existing structure to be decided by Alternate).

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

+ + END OF SECTION + +

SECTION 01140

WORK RESTRICTIONS

PART 1 – GENERAL

1.1 USE OF PREMISES

- A. Limit use of premises at the Site to work areas shown or indicated on the Drawings and as specified in this Section. Do not disturb portions of the Site beyond areas of the Work.
 - 1. Limits:
 - a. Confine construction operations to property owned by the OWNER.
 - b. Confine storage of materials and equipment, and locations of temporary facilities to property owned by the OWNER. Coordinate lay down area with OWNER
 - c. No equipments shall be on the slope north of the existing filter building and existing preliminary treatment facility.
 - 2. Driveways and Entrances: At all times, keep driveways and entrances serving premises clear and available to OWNER, OWNER's employees, daily deliveries, and emergency vehicles. Do not use these areas for parking or storage of materials.
 - a. Schedule deliveries to minimize use of driveways and entrances.
 - b. Schedule deliveries to minimize space and time requirements for on-site storage of materials and equipment.

- B. Use of Existing Building: Maintain existing building in weather-tight condition throughout construction. Protect building and its occupants during construction.
 - 1. Use of Existing Utilities, Sanitary Facilities, and First-aid Facilities: Refer Sections 01511, 01514, 01515 and 01522.
 - 2. Use of Existing Elevators: CONTRACTOR may use OWNER's freight elevator for moving materials and equipment during construction. Elevator shall be available to OWNER at all times unless otherwise arranged with OWNER and ENGINEER. Do not load elevator beyond posted capacity. Use of other elevators is not allowed.

- C. Promptly repair damage to premises caused by construction operations. Upon completion of the Work, restore premises to specified condition; if condition is not specified, restore to pre-construction condition.

- D. The Taylor Mill Water Treatment Plant shall not be taken out of service between May 1st and October 15th of any year.

- E. Between October 16th and April 30th of any year the Taylor Mill Water Treatment Plant shall not be taken out of service for more than 30 days. These days shall be coordinated with and confirmed by the OWNER.
- F. The OWNER will allow the plant to be shutdown and the existing clearwell to be taken out of service for 30 consecutive days between November 1, 2012 and March 31, 2013. CONTRACTOR is to coordinate with the OWNER.
- G. The Preliminary Treatment portion of the PT/GAC Building shall be constructed and operational prior to taking the existing Preliminary Treatment process out of service. The OWNER will operate this portion of the facility but the CONTRACTOR will continue to provide all insurance and bonds. The correction period as outlined in GC-13.07 will not begin until substantial completion has been given for the entire project. The proposed Preliminary Treatment facility shall include but is not limited to the following including all appurtenances for a complete and operational Preliminary Treatment facility:
1. Proposed 24" raw water main
 2. Proposed 12" FTW return main and valve vault
 3. Proposed 6" residuals main
 4. Proposed 12" secondary GAC backwash supply
 5. Proposed plumbing to the preliminary treatment facility, chemical feed and residuals pumps
 6. Proposed 42" permanent filter influent and temporary 24" filter influent
 7. Proposed drain lines
 8. Proposed relocated chemical feed
 9. Proposed rapid mix process
 10. Proposed flocculation process
 11. Proposed sedimentation process
 12. Proposed residuals collection process, including scrappers, progressive cavity pump room, progressive cavity pumps and connection to existing residuals basin.
 13. Proposed drain lines
 14. Proposed electrical
 15. Proposed communication networks
 16. Propose instrumentation and controls. Following a complete and satisfactory commissioning and start-up of the Preliminary Treatment facility equipment, as defined above, the CONTRACTOR shall allow a minimum of 14 days with all equipment remaining operational, for the ENGINEER to program the SCADA system before taking the existing Preliminary Treatment process out of service.
 17. This portion of the building shall have all walls and roof.
- H. There shall be a 30 day demonstration period after the Preliminary Treatment portion of the PT/GAC Building is operational. During this period the entire existing plant shall be able to be to be operated at full capacity. No demolition of the existing plant

or abandoning of existing piping or equipment shall take place prior to the completion of the demonstration period without written authorization from the OWNER.

- I. The modifications to the piping in the existing Filter Building pipe gallery shall take place between October 16, 2012 and April 30, 2013.
- J. Permanent installation of the above grade 42" FI and filter overflow box shall take place between October 16, 2012 and April 30, 2013.
- K. Installation of the permanent wall in the Filter Influent Channel shall be performed on a Thursday or Friday and the two southernmost filters shall be back in service by the following Monday. Only the two southernmost filters shall be taken out of service. The OWNER shall be given 2 weeks notice prior to commencement of work.
- L. UV 2, the temporarily relocated UPS, the UV 2 control panels, the UV 2 transmittance monitor and all piping and appurtenances for a complete operational UV 2 system shall not be taken out of service until the entire PT/GAC Building is operational.
- M. Work that closes Howard Street shall take place between December 26, 2011 and January 2, 2012 or other dates that are approved by the OWNER.
- N. CONTRACTOR shall notify the OWNER at least 30 days in advance of any work requiring closure of Howard Street on a Saturday or Sunday so that OWNER can coordinate access and parking with St. Anthony Church.
- O. Existing high service pumps 1, 2, and 6 shall remain in service while the Taylor Mill Water Treatment Plant is out of service.
- P. Only one of the existing 6 high service pumps shall be taken out of service at a time.
- Q. Access to the east overhead door of the existing sludge building shall be maintained throughout the project. If the CONTRACTOR blocks the west overhead door of the existing sludge building the CONTRACTOR shall provide manpower and equipment to assist the OWNER as needed to remove and rearrange the existing east and west sludge dumpsters up to 11 times per week.
- R. From May 1st to October 15th of any year access to the chemical building shall not be blocked for more than 14 consecutive days. CONTRACTOR shall notify the OWNER at least 14 days in advance of the chemical building being blocked for 14 consecutive days during this time period.
- S. From October 16th to April 30th of any year access to the chemical building shall not be blocked for more than 30 consecutive days. CONTRACTOR shall notify the OWNER at least 14 days in advance of the chemical building being blocked for 30 consecutive days during this time period.

- T. Following the complete and satisfactory commissioning and start-up of all the work and all equipment, the CONTRACTOR shall allow a minimum of 30 days with all equipment operational, for the ENGINEER to program the SCADA system before requesting substantial completion.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

++ END OF SECTION ++

SECTION 01143

COORDINATION WITH OWNER'S OPERATIONS

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:

1. This Section includes requirements for coordinating with OWNER's operations during the Work, and includes requirements for tie-ins and shutdowns necessary to complete the Work without impact on OWNER's operations except as allowed in this Section.
2. CONTRACTOR shall provide labor, materials, tools, equipment and incidentals shown, specified and required to coordinate with OWNER's operations during the Work.
3. CONTRACTOR shall complete the Work without interfering in an unapproved manner with the OWNER's operation of its facility.

B. Coordination:

1. Review installation procedures under other Specification sections and coordinate Work that must be performed with or before the Work specified in this Section.

C. Related Sections:

1. Section 01110, Summary of Work.
2. Section 01120, Suggested Sequence of Construction
3. Section 01723, Cutting and Patching.
4. Section 01724, Connections to Existing Facilities.

D. Except for the shutdowns specified herein, the Work shall be performed such that the OWNER's plant or facility remains in continuous satisfactory operation during the Project. Work shall be scheduled and conducted by CONTRACTOR such that it does not impede the OWNER's production or processes, create potential hazards to operating equipment and personnel, reduce the quality of the treated water.

E. Work not specifically covered herein and in the referenced Specification sections may, in general, be completed at any time during normal work hours, subject to operating requirements described herein.

F. CONTRACTOR has the option of providing additional temporary facilities that can eliminate or mitigate a constraint without additional cost to OWNER, provided such additional temporary facilities: do not present hazards to the public, personnel, structures, and equipment; that such additional temporary facilities do not adversely affect OWNER's ability to comply with Laws and Regulations, permits, and operating requirements; that such temporary facilities do not

generate or foster the generation of odors and other nuisances; and that requirements of the Contract Documents are fulfilled.

- G. Coordinate shutdowns with OWNER and CONSTRUCTION CONTRACT ADMINISTRATOR. When possible, combine multiple tie-ins into a single shutdown to minimize impacts on OWNER's operations and processes.
- H. Do not shut off or disconnect existing operating systems, unless accepted by CONSTRUCTION CONTRACT ADMINISTRATOR in writing. Operation of existing equipment will be by OWNER unless otherwise specified or indicated. Where necessary for the Work, CONTRACTOR shall seal or bulkhead OWNER-operated gates and valves to prevent leakage that may affect the Work, OWNER's operations, or both. Provide temporary watertight plugs, bulkheads, and line stops as required. After completing the Work, remove seals, plugs, bulkhead, and line stops to satisfaction of CONSTRUCTION CONTRACT ADMINISTRATOR.
- I. Bypassing:
 - 1. Diversion of flows around treatment processes is not allowed.
- J. SCADA programming for the proposed equipment shall be done by the ENGINEER. CONTRACTOR shall provide enough time in their construction schedule for the programming to be completed prior to the date of Substantial Completion.

1.2 SUBMITTALS

- A. Action Submittals: Submit the following:
 - 1. Substitute Sequence Submittal: When deviation from specified sequence is proposed, provide submittal explaining in detail the proposed sequence change and its effects, including evidence that OWNER's operations will not be adversely affected by proposed change. List benefits of proposed sequence change, including benefits to Progress Schedule. Submit in accordance with Section 01630, Substitution Procedures.
- B. Informational Submittals: Submit the following:
 - 1. Shutdown Planning Submittal:
 - a. For each shutdown, submit an inventory of labor and materials required to perform the shutdown and tie-in tasks, an estimate of time required to accomplish the complete shutdown including time for OWNER to take down and start up existing equipment, systems, or conduits, and written description of steps required to complete the Work associated with the shutdown.
 - b. Furnish submittal to CONSTRUCTION CONTRACT ADMINISTRATOR at least thirty days prior to proposed shutdown start date. Do not start shutdown until obtaining CONSTRUCTION CONTRACT ADMINISTRATOR's acceptance of shutdown planning submittal.

2. Shutdown Notification: After acceptance of shutdown planning submittal and prior to starting the shutdown, provide written notification to OWNER and CONSTRUCTION CONTRACT ADMINISTRATOR of date and time each shutdown is to start. Provide notification at least 2 weeks in advance of each shutdown.

1.3 GENERAL CONSTRAINTS

- A. Specified in the Contract Documents are the sequence and shutdown durations, where applicable, for OWNER'S equipment, systems, and conduits that are to be taken out of service temporarily for the Work. New equipment, materials, and systems may be used by OWNER after the specified field quality controls and testing are successfully completed and the materials or equipment are Substantially Complete.
- B. The following constraints apply to coordination with OWNER's operations:
 1. Operational Access: OWNER'S personnel shall have access to equipment and areas that remain in operation.
 2. Temporary Partitions and Enclosures: CONTRACTOR shall provide temporary partitions and enclosures necessary to maintain dust-free, heated, and ventilated spaces in areas that are adjacent to the Work and that must be kept operational. Comply with Section 01511, Temporary Utilities.
 3. Schedule and perform equipment and system start-ups for Monday through Thursday. Equipment and systems shall not be placed into operation on Friday, Saturday, and Sunday without prior approval of OWNER.
 4. Dead End Valves or Pipe: Provide blind flanges, watertight bulkheads, or valve at temporary and permanent terminuses of pipes and conduits. Blind flanges and bulkheads shall be suitable for the service and braced and blocked, as required, or otherwise restrained as directed by CONSTRUCTION CONTRACT ADMINISTRATOR. Temporary valves shall be suitable for their associated service. Where valve is provided at permanent terminus of pipe or conduit, also provide on downstream side of valve a blind flange with drain/flushing connection.
 5. OWNER will assist CONTRACTOR in dewatering process tanks, basins, conduits, and other work areas to be dewatered for shutdowns. Maintain clean and dry work area by pumping and properly disposing of fluid that accumulates in work areas. Where plant facilities are not sufficient for complete dewatering, the CONTRACTOR shall provide all facilities to adequately dewater tanks, basins, conduits and other work areas.
 6. Draining and Cleaning of Conduits, Tanks, and Basins:
 - a. Unless otherwise specified, CONTRACTOR shall dewater process tanks, basins, conduits, and pipelines at beginning of each shutdown. Flush, wash down, and clean tanks, basins, pipelines, conduits, and other work areas.
 - b. CONTRACTOR shall remove liquids and solids and dispose of them at appropriate location at the Site as directed by CONSTRUCTION CONTRACT ADMINISTRATOR. Unless otherwise specified or indicated, contents of pipes, tanks, basins, and conduits undergoing

modifications shall be transferred to existing process tanks or conduits at the Site with capacity sufficient to accept such discharges, using hoses, piping, pumps, or other means provided by CONTRACTOR. Discharge of fluids across floors is not allowed.

- c. If drainage point is not available on the piping or conduit to be drained, provide a wet tap using tapping saddle and valve or other method approved by CONSTRUCTION CONTRACT ADMINISTRATOR. Uncontrolled spillage of pipe's or conduit's contents is not allowed.
- d. Spillage shall be brought to CONSTRUCTION CONTRACT ADMINISTRATOR'S attention immediately, both verbally and in writing, and reported in accordance with Laws and Regulations. CONTRACTOR shall wash down spillage to floor drains or sumps and flush the system to prevent clogging and odors. If spillage is not suitable for discharge to the drainage system, such as chemical spills, as determined by CONSTRUCTION CONTRACT ADMINISTRATOR, CONTRACTOR shall remove spillage by other method, such as vactor truck, acceptable to CONSTRUCTION CONTRACT ADMINISTRATOR.

1.4 SEQUENCE OF WORK

- A. Perform the Work as required to meet all restrictions, constraints, and project milestones as suggested in Section 01120, Suggested Sequence of Construction. Certain phases or stages of the Work may require working 24-hour days or work during hours outside of regular working hours. Work may be accelerated from a later stage to an earlier stage if OWNER's operations are not adversely affected by proposed sequence change, with CONSTRUCTION CONTRACT ADMINISTRATOR acceptance.

1.5 TIE-INS

- A. Table 01143-A in this Section lists connections by CONTRACTOR to existing facilities. Table 01143-A may not include all tie-ins required for the Work; CONTRACTOR shall perform tie-ins required to complete the Work. For tie-ins not included in Table 01143-A, obtain requirements for tie-ins from CONSTRUCTION CONTRACT ADMINISTRATOR.

1.6 SHUTDOWNS

- A. General:
 - 1. Terminology: A "shutdown" is when a portion of the normal operation of OWNER's facility, whether equipment, systems, piping, or conduit, has to be temporarily suspended or taken out of service to perform the Work.
 - 2. Work that may interrupt normal operations shall be accomplished at times convenient to OWNER.
 - 3. Furnish at the Site, in close proximity to the shutdown and tie-in work areas, tools, equipment, spare parts and materials, both temporary and permanent,

necessary to successfully complete the shutdown. Complete to the extent possible, prefabrication of piping and other assemblies prior to the associated shutdown. Demonstrate to CONSTRUCTION CONTRACT ADMINISTRATOR'S satisfaction that CONTRACTOR has complied with these requirements before commencing the shutdown.

4. If CONTRACTOR's operations cause an unscheduled interruption of OWNER's operations, immediately re-establish satisfactory operation for OWNER.
 5. Unscheduled shutdowns or interruptions of continued safe and satisfactory operation of OWNER's facilities that result in fines or penalties by authorities having jurisdiction shall be paid solely by CONTRACTOR if, in CONSTRUCTION CONTRACT ADMINISTRATOR's opinion, CONTRACTOR did not conform to the requirements of the Contract Documents, or was negligent in the Work, or did not exercise proper precautions in conducting the Work.
 6. Shutdowns shall be in accordance with Table 01143-B of this Section. Work requiring service interruptions for tie-ins shall be performed during scheduled shutdowns.
 7. Temporary, short-term shutdowns of smaller piping, conduits, equipment, and systems may not be included in Table 01143-B. Coordinate requirements for such shutdowns with CONSTRUCTION CONTRACT ADMINISTRATOR and OWNER.
- B. Shutdowns of Electrical Systems: Comply with Laws and Regulations, including the National Electric Code. CONTRACTOR shall lock out and tag circuit breakers and switches operated by OWNER and shall verify that affected cables and wires are de-energized to ground potential before shutdown Work is started. Upon completion of shutdown Work, remove the locks and tags and notify CONSTRUCTION CONTRACT ADMINISTRATOR that facilities are available for use.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION

3.1 GENERAL

- A. In addition to requirements of this Section, conform to requirements of Section 01723, Cutting and Patching, and Section 01724, Connections to Existing Facilities.

3.2 SCHEDULES

- A. The schedules listed below, following the “End of Section” designation, are part of this Specification section:
1. Table 01143-A, Schedule of Tie-ins.
 2. Table 01143-B, Schedule of Shutdowns.

+ + END OF SECTION + +

**TABLE 01143-A
SCHEDULE OF TIE-INS**

Tie-In No.	New Line Size and Service	Existing (Connecting) Line Size & Service	Tie-In Building/Location	Construction Stage	Remarks
1	Multiple Proposed Storm Sewers	Multiple Storm sewers	Throughout the site	Phase I	---
2	24" Temporary Filter Influent	North Clarifier Effluent Box	North of the existing north clarifier	Phase I	---
3	24" Raw Water Main	24" CIP Raw Water Main	Along Howard Street, near the intersection of Grand Ave. and Howard St.	Phase I	Work on Howard Street Shall Take Place Between December 26, 2011 and January 2, 2012
4	12" FTW Return	12" FTW Return	East of FTW Basin Valve Vault	Phase I	No heavy equipment shall be allowed on FTW Basin
5	6" Proposed Residuals Main	6" residuals main	Two locations on the south side of the residuals handling basin	Phase I	---
6	(5) 1" Chemical Feed Pipes	(5) 1" Chemical Feed Pipes	Inside the chemical building, on the west side	Phase I	---
7	12" Secondary GAC Backwash	24" DIP	North side of Grand Ave. and southwest of the PT/GAC Building	Phase II	---
8	(6) 1" Chemical Feed Pipes	(6) 1" Chemical Feed Pipes	Inside the chemical building, on the east side	Phase III	---
9	Multiple Utility Pipes Currently Located in the Tunnel		The east side of the chemical building and the west side of the Filter Building	Phase III	---
10	8" Existing Backwash	8" Backwash	Two locations in drive in front of the filter building	Phase III	---
11	6" Existing Residuals Main	6" Residuals main	Two locations in drive in front of the filter building	Phase III	---
12	4" Existing Force Main	4" Force Main	Two locations in drive in front of the filter building	Phase III	---
13	12" Existing Storm Sewer	12" storm sewer	Two locations in drive in front of the filter building	Phase III	---

14	24" GAC Feed Pumps Station Supply	24" Filter Effluent Main	Filter pipe gallery	Phase III	---
15	24" GAC / UV Treated Water	24" Finished Water Main	Filter pipe gallery	Phase III	---
16	42" Permanent Filter Influent	Filter Influent Box	North of the filter building	Phase III	No heavy equipment shall be allowed on the Clearwell
17	Proposed Electrical Substation	---	---	Phase III	---
18	New Starter for Existing High Service Pump #1	---	New MCC on third floor of filter building	Phase IV	---
19	New Starter for Existing High Service Pump #2	---	New MCC on third floor of filter building	Phase IV	---
20	New Starter for Existing High Service Pump #3	---	New MCC on third floor of filter building	Phase IV	---
21	New Starter for Existing High Service Pump #4	---	New MCC on third floor of filter building	Phase IV	---
22	New Starter for Existing High Service Pump #5	---	New MCC on third floor of filter building	Phase IV	---
23	New Starter for Existing High Service Pump #6	---	New MCC on third floor of filter building	Phase IV	---

**TABLE 01143-B
SCHEDULE OF SHUTDOWNS**

Shut-down No.	Reason For Plant Shutdown - Process Equipment and Service Lines Out-of-Service During Shutdown	Process Equipment To Remain In Operation During Shutdown	Tie-In Nos.	Maximum Duration of Shutdown	Constraints
A	Tie-in Proposed 24" Raw Water Pipe – Entire Plant Shutdown	High Service Pumps 1, 2, and 6	3	3 Days	- Plant Shall Not Be Out of Service Between May 1 st and October 15 th - Work on Howard Street Shall Take Place Between December 26, 2011 and January 2, 2012
B	Tie-in Proposed 12" FTW Return Pipe – FTW Return Pumps Out of Service	Remaining Plant In Service	4	<1 Day	- Plant Shall Not Be Out of Service Between May 1st and October 15th
C	Tie-in Temporary 24" Filter Influent Pipe – Entire Plant Shutdown	High Service Pumps 1, 2, and 6	2	3 Day	- Plant Shall Not Be Out of Service Between May 1st and October 15th
D	Chemical Line Tie-Ins to PT/GAC Building – Entire Plant Shutdown While New pipe with valves are tied into existing pipe	High Service Pumps 1, 2, and 6	6	7 Day	- Plant Shall Not Be Out of Service Between May 1st and October 15th - Plant Shall Not Be Operated Without Chemical Lines Tied-in. - Work shall be done between October 16, 2012 and April 30, 2013
E	Seal off Southern feed to existing filter influent channel – 2 of the 8 Filters Will be Out of Service	Remaining 6 Filters and the Rest of the Plant In Service	---	1 Day	- Plant Shall Not Be Out of Service Between May 1st and October 15th
F	Chemical Line Tie-Ins to existing Filter Building – Entire Plant Shutdown While New pipe with valves are tied into existing pipe.	High Service Pumps 1, 2, and 6	8	7 Day	- Plant Shall Not Be Out of Service Between May 1st and October 15th - Plant Shall Not Be Operated Without Chemical Lines Tied-in. - Work shall be done between October 16, 2012 and April 30, 2013

G	Relocate Tunnel Utilities – Entire Plant Shutdown while new pipes with valves are tied into existing pipes	High Service Pumps 1, 2, and 6	9	4 Day	- Plant Shall Not Be Out of Service Between May 1st and October 15th - Work shall be done between October 16, 2012 and April 30, 2013
H	Relocate 4” Force Main -	Remaining Plant In Service	12	< 1 Day	-This Utility Temporarily Out of Service
I	Remove 6” Residuals Main -	Remaining Plant In Service	11	< 1 Day	-This Utility Temporarily Out of Service
J	Relocate 8” Backwash -	Remaining Plant In Service	10	< 1 Day	-This Utility Temporarily Out of Service
K	Install permanent above grade 42” FI from proposed filter overflow box and tie into existing filter influent box	High Service Pumps 1, 2, and 6	16	8 Days	- Plant Shall Not Be Out of Service Between May 1st and October 15th - These pipe modifications shall be completed between October 16, 2012 and April 30, 2013
L	Relocate UV 1 Reactor & Reconfigure Piping In Filter Pipe Gallery for Tie-in of 24” GAC Supply and 24” GAC/UV Treated Water Piping – Entire Plant Shutdown, clearwell must be drained	High Service Pumps 1, 2, and 6	---	30 Days	- Plant Shall Not Be Out of Service Between May 1st and October 15th - These pipe modifications shall be completed between October 16, 2012 and April 30, 2013
M	Tie-in Proposed Electrical Substation – Entire Plant Shutdown	Entire Plant Shutdown	17	3 Days	- Plant Shall Not Be Out of Service Between May 1st and October 15th
N	Tie-in Proposed High Service Pump #1 Starter – High Service Pump #1 Out of Service	Remaining Plant In Service	18	<1 Day	- High Service Pumps 2, 3, 4, 5 & 6 Shall Remain Operational
O	Tie-in Proposed High Service Pump #2 Starter – High Service Pump #2 Out of Service	Remaining Plant In Service	19	<1 Day	- High Service Pumps 1, 3, 4, 5 & 6 Shall Remain Operational
P	Tie-in Proposed High Service Pump #3 Starter – High Service Pump #3 Out of Service	Remaining Plant In Service	20	<1 Day	- High Service Pumps 1, 2, 4, 5 & 6 Shall Remain Operational
Q	Tie-in Proposed High Service Pump #4 Starter – High Service Pump #4 Out of Service	Remaining Plant In Service	21	<1 Day	- High Service Pumps 1, 2, 3, 5 & 6 Shall Remain Operational

R	Tie-in Proposed High Service Pump #5 Starter – High Service Pump #5 Out of Service	Remaining Plant In Service	22	<1 Day	- High Service Pumps 1, 2, 3, 4 & 6 Shall Remain Operational
S	Tie-in Proposed High Service Pump #6 Starter – High Service Pump #6 Out of Service	Remaining Plant In Service	23	<1 Day	- High Service Pumps 1, 2, 3, 4 & 5 Shall Remain Operational

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SECTION 01210

ALLOWANCES

PART 1 – GENERAL

1.1 SCOPE

- A. This Section includes administrative and procedural requirements governing the following types of allowances:
 - 1. Cash allowances.
- B. Authorization of Allowances:
 - 1. Work that will be paid under an allowance will be authorized in OWNER's written instruction to CONTRACTOR.
 - 2. Do not perform Work under an allowance without written authorization of OWNER.

1.2 CASH ALLOWANCES

- A. Cash allowances are stipulated amounts for anticipated purchase of materials or equipment. In addition to this Section, refer to General Conditions, as may be modified by the Supplementary Conditions; and individual Specification Sections for CONTRACTOR's costs to be covered by allowances, and CONTRACTOR's costs, including overhead and profit, to be included elsewhere in the Contract Price.
- B. At earliest practical date after the Contract Times commence running, notify Construction Contract Administrator of date when final selection and purchase of each material or equipment described by an allowance must be completed to avoid delaying the Work.
- C. Consult with CONSTRUCTION CONTRACT ADMINISTRATOR in selecting Suppliers and obtain proposals for price and time from selected suppliers. Submit proposals to CONSTRUCTION CONTRACT ADMINISTRATOR along with recommendations relevant to furnishing and installing products covered in the allowance.
- D. Purchase materials or equipment from Suppliers selected by CONSTRUCTION CONTRACT ADMINISTRATOR.
- E. Submit invoices or delivery slips to show actual cost and quantity of materials or equipment furnished and used in fulfilling each allowance.
- F. Prepare unused materials or equipment for storage by OWNER, when not economically practical to return for credit. Deliver to storage space at the Site designated by OWNER.

- G. For each allowance, submit to CONSTRUCTION CONTRACT ADMINISTRATOR a Change Order proposal to adjust Contract Price for difference between specified allowance amount and actual cost. Prepare Change Order proposal in accordance with the General Conditions and Supplementary Conditions except that payment within limit of a cash allowance shall exclude cost of bond and insurance premiums.

1.3 CONTINGENCY ALLOWANCE

- A. Contingency allowances are stipulated amounts available as reserve for sole use by OWNER to cover unanticipated costs.
- B. When authorization of Work under contingency allowance is contemplated by OWNER for a defined scope, submit Change Order proposal to CONSTRUCTION CONTRACT ADMINISTRATOR. Prepare Change Order proposal in accordance with the General Conditions as may be modified by the Supplementary Conditions, except that payments within limit of contingency allowance shall exclude cost of bond and insurance premiums.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION

3.1 SCHEDULE OF ALLOWANCES

- A. Cash Allowance
 - 1. Allowance No. 1 – Computer Hardware/Software:
 - a. The amount of \$35,000 is to be included in the Base Bid.
 - b. Allowance will be used to purchase personal computers, SCADA software, associated uninterrupted power supplies and other appurtenances.
- B. Contingency Allowance:
 - 1. Contingency Allowance No. 2 – OWNER’s Contingency Allowance
 - a. The amount of \$100,000 is to be included in the Base Bid.
 - b. Allowance will be used for unidentified changes in the work.

++ END OF SECTION ++

SECTION 01230

ALTERNATIVES

PART 1 - GENERAL

1.1 SCOPE

- A. This Section identifies each alternative and describes the basic changes that shall be incorporated into the Work when that alternative is made part of the Work.
- B. CONTRACTOR shall coordinate related Work as required to complete the Work under each alternative included in the Contract. Include as part of each alternative miscellaneous devices, accessories, and similar items incidental to or required for a complete installation whether or not shown or indicated as part of the alternative.
- C. Notification: Immediately following award of the Contract, the Owner will notify each party involved, in writing, of the status of each alternate. Indicate if alternates have been accepted, rejected, or deferred for later consideration.

1.2 DESCRIPTION

- A. Alternative No. 1 - Sky Light Access on GAC Feed Pump Station.
 - 1. Description: Provide all work indicated on the drawings to provide sky light access on the GAC Feed Pump Station Building for pump/equipment removal in lieu of the bridge crane pump/equipment removal.
 - 2. Refer to the drawings marked "Bid Alternate No. 1"
 - 3. If this alternative is selected the sky light access and all associated modifications including but not limited to structural, electrical, and architectural modifications will be incorporated into the project in lieu of the items required for the bridge crane.
 - 4. If this alternative is not selected the bridge crane and all associated items including but not limited to structural, electrical, and architectural items will be incorporated into the project.
 - 5. All Work in conjunction with this alternative shall be performed to meet the Contract Documents and all applicable codes and regulations.
- B. Alternative No. 2 – Duke Energy One to Construct 69 kV Transmission Substation
 - 1. Description: Materials and installation of substation by Duke Energy One, including the primary structure, switching, terminations, arrestors, transformer, grounding, structural pads, site work, fencing, etc. for the 69 kV substation as shown on the Drawings and as specified, in lieu of the substation being constructed by the Contractor as described for the base bid. The Contractor shall furnish and install the electrical secondary conduits and conductors from

the substation transformer location, and coordinate with Duke Energy One as required. The Contractor will not pay Duke Energy One for the portion of the electrical substation constructed by Duke Energy One. Metering equipment and installation will not be provided by Duke Energy One, and is required to be furnished and installed by the Contractor as detailed. The main point of contact at Duke Energy One is Mr. Jerry King, he can be contacted at jerry.king@duke-energy.com.

2. If this alternative is selected the substation will be constructed by Duke Energy One, and the work not identified as Alternate 2 will be incorporated into the project.
3. If this alternative is not selected the substation and all associated construction including but not limited to structural, electrical and site modifications will be constructed by the Contractor.
4. All Work in conjunction with this alternative shall be performed to meet the Contract Documents and all applicable codes and regulations.

C. Alternative No. 3 – Duke Energy One to Demolish the Existing Electrical Substation.

1. Description: Provide all work required to demolish, remove and properly dispose of all of the equipment from the existing electrical substation as shown on the drawings.
2. Refer to areas on the drawings marked “Bid Alternate No. 3”
3. If this alternative is selected once the new electrical substation is constructed the Contractor shall coordinate with Duke Energy for Duke Energy One to demolish and remove the existing electrical substation. The Contractor shall coordinate with Duke Energy One for the Work associated with Duke Energy One demolishing and removing the existing electrical substation. The Owner will directly pay Duke Energy One for this Work.
4. If this alternative is not selected, after the new electrical substation is constructed and operational the Contractor shall provide all work required for the demolition, removal and proper disposal of all the electrical equipment and entrance structures that make up the existing electrical substation.
5. All Work in conjunction with this alternative shall be performed to meet the Contract Documents and all applicable codes and regulations.

D. Alternative No. 4 – 732 Days for Substantial Completion.

1. Description: The Contractor shall provide all additional cost required to reduce the Substantial Completion date to 732 days after the date when the Contract Times commence to run as provided in Paragraph 2.03 of the Supplementary Conditions, and completed and ready for final payment in accordance with Paragraph 14.07 of the General Conditions within 793 days from the date when the Contract Times commence to run.
2. If this alternative is selected the Contractor shall substantially complete the Work within 732 days after the date when the Contract Times commence to run

as provided in Paragraph 2.03 of the General Conditions, and completed and ready for final payment in accordance with Paragraph 14.07 of the General Conditions within 793 days from the date when the Contract Times commence to run.

3. If this alternative is not selected, the Contractor shall complete the Work as addressed in Article 4 of the Agreement.
4. All Work in conjunction with this alternative shall be performed to meet the Contract Documents and all applicable codes and regulations.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

++ END OF SECTION ++

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SECTION 01271

MEASUREMENT AND PAYMENT

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Items listed in this Section, beginning with Article 1.4, refer to and are the same pay items listed in the Bid Form. They constitute all pay items for completing the Work. No direct or separate payment will be made for providing miscellaneous temporary or accessory works, plant services, CONTRACTOR'S or CONSTRUCTION CONTRACT ADMINISTRATOR'S field offices, layout surveys, Project signs, sanitary requirements, testing, safety devices, submittals and record drawings, water supplies, power and fuel, traffic maintenance, removal of waste, security, coordination with OWNER'S operations, bonds, insurance, or all other requirements of the General Conditions, Supplementary Conditions, General Requirements, and other requirements of the Contract Documents. Compensation for all services, items, and products shall be included in prices stipulated for lump sum and unit price pay items listed in this Section and included in the Contract.
- B. Each lump sum and unit bid price shall be deemed to include an amount considered by CONTRACTOR to be adequate to cover CONTRACTOR'S overhead and profit for each separately identified item.

1.2 ENGINEER'S ESTIMATE OF QUANTITIES

- A. ENGINEER'S estimated quantities for unit price items, as listed in the Bid Form, are approximate only and are included solely for purpose of comparing Bids. OWNER does not expressly or by implication agree that nature of materials encountered below ground surface or actual quantities of material encountered or required shall correspond with quantities on the Bid Form, and reserves the right to increase or decrease quantities or to eliminate quantities as OWNER may deem necessary. CONTRACTOR shall not be entitled to adjustment in a unit bid price as result of change in an estimated quantity and agrees to accept the unit prices bid as complete and total compensation for additions or deductions caused by changes or alterations in the Work directed by OWNER.

1.3 RELATED PROVISIONS

- A. Payments to CONTRACTOR: Refer to General Conditions, Supplementary Conditions, and Agreement.
- B. Changes in Contract Price: Refer to General Conditions and Supplementary Conditions.

- C. Schedule of Values: Refer to General Conditions, Supplementary Conditions, and Section 01291, Schedule of Values.

1.4 CONTRACT NO. 1 – GENERAL CONSTRUCTION

- A. Item 1 – General Construction:
1. Measurement and Payment: Lump sum payment for Item 1 will be full compensation for completing the Work, as shown and specified under Divisions 1 through 16, including allowances specified in section 01210, Allowances, but not Work specifically included under other items or other contracts.
- B. Item 2 – Drilled Concrete Piers (3' – 0" Diameter):
1. Measurement: Drilled Concrete Piers will be measured for payment on the basis of vertical foot installed by CONTRACTOR.
 2. Payment: Unit price per vertical foot for Item 2 will be full compensation for all Drilled Concrete Piers.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

++ END OF SECTION ++

SECTION 01291

SCHEDULE OF VALUES

PART 1 – GENERAL

1.1 DESCRIPTION

- A. Submit to CONSTRUCTION CONTRACT ADMINISTRATOR for acceptance a Schedule of Values in the format required in Section 01321, Project Documentation, that allocates cost to each item of the Work. Schedule of Value list of line items shall correspond to each aspect of the Work, establishing in detail the portion of the Contract Price allocated to each major component of the Work.
- B. Upon request of CONSTRUCTION CONTRACT ADMINISTRATOR, support values with data that substantiate their correctness.
- C. Submit preliminary Schedule of Values to CONSTRUCTION CONTRACT ADMINISTRATOR for initial review. CONTRACTOR shall incorporate CONSTRUCTION CONTRACT ADMINISTRATOR's comments into the Schedule of Values and resubmit to CONSTRUCTION CONTRACT ADMINISTRATOR. CONSTRUCTION CONTRACT ADMINISTRATOR may require corrections and re-submittals until Schedule of Values is acceptable.
- D. Schedule of Values and the Progress Schedule updates specified in Section 01321, Project Documentation, shall be basis for preparing each Application for Payment. Schedule of Values may be used as a basis for negotiating price of changes, if any, in the Work.
- E. Include in Schedule of Values unit price payment items with their associated quantity. Provide in the Schedule of Values detailed breakdown of unit prices when required by CONSTRUCTION CONTRACT ADMINISTRATOR.
- F. Requirements for preliminary Schedule of Values and Schedule of Values are:
 - 1. Schedule of Values shall show division of Work between CONTRACTOR and Subcontractors. Line items for Work to be done by Subcontractor shall include the word, "(SUBCONTRACTED)".
 - 2. Schedule of Values shall include breakdown of costs for materials and equipment, installation, and other costs used in preparing the Bid by CONTRACTOR and each Subcontractor. List purchase and delivery costs for materials and equipment for which CONTRACTOR may apply for payment as stored materials.
 - 3. Include separate amounts for each Specification Section in the Contract Documents by structure, building, and work area.

4. Identify each line item with number corresponding to the associated Specification Section number. List sub-items of major products or systems, as appropriate or when requested by CONSTRUCTION CONTRACT ADMINISTRATOR.
5. Sum of individual values shown on the Schedule of Values shall equal the total of associated payment item. Sum of payment item totals in the Schedule of Values shall equal the Contract Price.
6. Include in each line item a directly proportional amount of CONTRACTOR's overhead and profit. Do not include overhead and profit as separate item(s).
7. Include separate line item for each allowance, and for each unit price item
8. Line items for Site maintenance such as dust control, snow removal, compliance with storm water pollution prevention plans and permits, spill prevention control and countermeasures plans, and for construction photographic documentation; temporary utilities and temporary facilities, field offices, temporary controls, field engineering, and similar Work shall be included in the Schedule of Values and proportioned in Applications for Payment throughout duration of the Work.
9. Include separate line items for mobilization and demobilization. Document for CONSTRUCTION CONTRACT ADMINISTRATOR the activities included in mobilization and demobilization line items.
 - a. Mobilization will be limited to four percent of the Contract Price, and will be paid in four payments, each of twenty five percent of total amount for mobilization over the first four payment applications. Mobilization shall include bonds, insurance and job mobilization.
 - b. Demobilization shall be at least one percent of the Contract Price and shall be included with the Application for Payment following Substantial Completion, or other schedule accepted by CONSTRUCTION CONTRACT ADMINISTRATOR.
10. Costs for submittals, operations and maintenance manuals, field testing, and training of operations and maintenance personnel shall be as follows, unless otherwise accepted by CONSTRUCTION CONTRACT ADMINISTRATOR:
 - a. Up to eight percent of cost (including overhead and profit) of each equipment item, exclusive of transportation and installation costs associated with that item, may be allocated to preparation of submittals and may be included in the Application for Payment following CONSTRUCTION CONTRACT ADMINISTRATOR's approval of Shop Drawings (and acceptance of other submittals, as applicable) required for fabricating or purchasing for that item for the Work.
 - b. Up to three percent of total cost of each item (including overhead and profit), including materials and equipment, and installation, may be apportioned to testing and included in the Application for Payment following CONSTRUCTION CONTRACT ADMINISTRATOR's acceptance of the associated written Site testing report(s).
 - c. Up to a total of four percent of equipment cost (including overhead and profit), exclusive of transportation and installation costs, may be apportioned to operations and maintenance manuals and training of operations and maintenance personnel, which may be included in the Application for Payment following completion of training for that item.

11. Schedule of Values shall include an itemized list of Work by work area, as applicable, for Work included in Section 01143, Coordination with Owner's Operations.
 12. Submit Schedule of Values on 8.5-inch by 11-inch white paper, using the continuation sheets of the Application for Payment form specified in Section 01331, Reference Forms.
- G. If the requirements of this section conflict the requirements of Section 01321, Project Documentation, section 01321 shall take precedence and CONTRACTOR shall coordinate with the CONSTRUCTION CONTRACT ADMINISTRATOR and the OWNER so that the project management software system may be utilized for document tracking and control.

1.2 SUBMITTALS

- A. Informational Submittals: Submit the following:
1. Submit to CONSTRUCTION CONTRACT ADMINISTRATOR five copies of Schedule of Values.
 2. Content of Schedule of Values submittals shall conform to Article 1.1 of this Section.
 3. Time Frames for Submittals:
 - a. Submit preliminary Schedule of Values within time frame specified in the General Conditions.
 - b. Submittal of the Schedule of Values shall be in accordance with the General Conditions. CONSTRUCTION CONTRACT ADMINISTRATOR will not accept Applications for Payment without an acceptable Schedule of Values.
 - c. When required by CONSTRUCTION CONTRACT ADMINISTRATOR, promptly submit updated Schedule of Values to include cost breakdowns for changes in the Contract Price.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

+ + END OF SECTION + +

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SECTION 01297

PROGRESS PAYMENT PROCEDURES

PART 1 - GENERAL

1.1 PROGRESS PAYMENTS

A. General.

1. CONTRACTOR's requests for payment shall be in accordance with the Agreement, General Conditions and Supplementary Conditions, and the Specifications.
2. Applications for Payment shall be in the form of Form No. 01330-D "Application for Payment" as found in Section 01331 Reference Forms.
3. If the requirements of this section conflict the requirements of Section 01321, Project Documentation, section 01321 shall take precedence and CONTRACTOR shall coordinate with the CONSTRUCTION CONTRACT ADMINISTRATOR and the OWNER so the project management software system may be utilized for document tracking and control.

B. Procedure:

1. Review with Resident Project Representative (RPR) quantities and Work proposed for each progress payment. Application for Payment shall include only Work and quantities recommended by the RPR.
2. Submit to CONSTRUCTION CONTRACT ADMINISTRATOR originals of each complete Application for Payment and other documents to accompany the Application.
3. CONSTRUCTION CONTRACT ADMINISTRATOR will act on request for payment in accordance with the General Conditions and Supplementary Conditions.

C. Each request for progress payment shall include:

1. Completed Application for Payment form, including summary/signature page, progress estimate sheets, and stored materials summary. Progress estimate sheets shall have same level of detail as the Schedule of Values.
2. For materials and equipment not incorporated in the Work but suitably stored, submit documentation in accordance with the General Conditions and Supplementary Conditions. Legibly indicate on invoice or bill of sale the specific materials or equipment included in the Application and corresponding payment item number for each.
3. Updated Project Progress Schedule.

4. For Applications that include payment for Work under an allowance, submit documentation acceptable to OWNER of the authorization of allowance Work.
 5. For Applications (other than request for final payment) that include reduction or payment of retainage in an amount greater than that required in the Contract Documents, submit on form acceptable to OWNER consent of surety to partial release or reduction of retainage.
- D. Requirements for request for final payment are in the General Conditions, as may be modified by the Supplementary Conditions.

PART 2 - PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

++ END OF SECTION ++

SECTION 01301

PRE-CONSTRUCTION CONFERENCE

PART 1 – GENERAL

1.1 DESCRIPTION

- A. Scope:
1. A pre-construction conference will be held for the Project.
 2. CONTRACTOR shall attend the conference prepared to discuss all items on the agenda.
 3. CONSTRUCTION CONTRACT ADMINISTRATOR will distribute an agenda, preside at conference, and prepare and distribute minutes to all conference participants and others as requested.
 4. If the requirements of this section conflict the requirements of Section 01321, Project Documentation, section 01321 shall take precedence and CONTRACTOR shall coordinate with the CONSTRUCTION CONTRACT ADMINISTRATOR and the OWNER so the project management software system may be utilized for document tracking and control.
- B. Purpose of conference is to designate responsible personnel, establish working relationships, discuss preliminary schedules submitted by CONTRACTOR, and review administrative and procedural requirements for the Project. Matters requiring coordination will be discussed and procedures for handling such matters will be established.
- C. Date, Time and Location: Conference will be held after execution of the Contract and before Work starts at the Site. CONSTRUCTION CONTRACT ADMINISTRATOR will establish the date, time, and location of conference and notify the interested and involved parties.
- D. One week prior to the conference, submit the following preliminary schedules in accordance with the General Conditions:
1. Progress Schedule.
 2. Schedule of Submittals.
 3. Schedule of Values.
- E. CONTRACTOR shall provide information required and contribute appropriate items for discussion. CONTRACTOR shall bring to the conference the following, with sufficient number of copies for each attendee:
1. Preliminary Progress Schedule, as submitted to CONSTRUCTION CONTRACT ADMINISTRATOR.
 2. Preliminary Schedule of Submittals, as submitted to CONSTRUCTION CONTRACT ADMINISTRATOR.

3. Preliminary Schedule of Values, as submitted to CONSTRUCTION CONTRACT ADMINISTRATOR.
4. List of emergency contact information, in accordance with Article 1.4 of this Section.

1.2 REQUIRED ATTENDANCE

- A. Representative of each entity attending the conference shall be authorized to act on that entity's behalf.
- B. Contractor Attendance: Conference shall be attended by CONTRACTOR's project manager, Site superintendent, project managers for major Subcontractors, and major equipment Suppliers as CONTRACTOR deems appropriate.
- C. Other attendees will be representatives of:
 1. OWNER.
 2. ENGINEER.
 3. Authorities having jurisdiction over the Work, if available.
 4. Utility owners, as applicable.
 5. Others as requested by OWNER, CONTRACTOR, CONSTRUCTION CONTRACT ADMINISTRATOR or ENGINEER.
 6. CONSTRUCTION CONTRACT ADMINISTRATOR

1.3 AGENDA

- A. Preliminary Agenda: Be prepared to discuss in detail the topics listed below. Revisions to this agenda, if any, will be furnished to CONTRACTOR prior to conference.
 1. Procedural and Administrative:
 - a. Personnel and Teams:
 - 1) Designation of roles and personnel.
 - 2) Limitations of authority of personnel, including personnel who will sign Contract modifications and make binding decisions.
 - 3) Lists of proposed Subcontractors and manufacturers (where applicable).
 - 4) Authorities having jurisdiction.
 - b. Procedures for communications and correspondence.
 - c. Copies of the Contract Documents and availability.
 - d. Subcontractors.
 - e. The Work and Scheduling:
 - 1) Scope of the Work.
 - 2) Contract Times, including Milestones (if any).
 - 3) Phasing and sequencing.
 - 4) Preliminary Progress Schedule.
 - 5) Critical path activities.
 - f. Safety:
 - 1) Responsibility for safety.
 - 2) Designation of Contractor's safety representative.

- 3) Emergency procedures and accident reporting.
- 4) Emergency contact information.
- 5) Confined space entry procedures.
- 6) Hazardous materials communication program.
- 7) Impact of Project on public safety.
- g. Permits.
- h. Review of insurance requirements and insurance claims.
- i. Coordination:
 - 1) Project coordination, and coordination among contractors.
 - 2) Coordination with Owner's operations.
 - 3) Progress meetings.
- j. Products and Submittals:
 - 1) Preliminary Schedule of Submittals.
 - 2) Shop Drawings, Samples, and other submittals.
 - 3) Product options, "or equals", and substitutions..
 - 4) Construction photographic documentation.
- k. Contract Modification Procedures
 - 1) Requests for interpretation
 - 2) Clarification notices
 - 3) Field Orders
 - 4) Proposal requests
 - 5) Change Order proposals
 - 6) Work Change Directives.
 - 7) Change Orders.
 - 8) Procedure for filing Claims.
- l. Payment:
 - 1) Owner's Project financing and funding, as applicable.
 - 2) Owner's tax-exempt status.
 - 3) Preliminary Schedule of Values, and procedures for measuring for payment.
 - 4) Retainage.
 - 5) Progress payment procedures.
 - 6) Prevailing wage rates and payrolls.
- m. Testing and inspections, including notification requirements.
- n. Disposal of demolition materials.
- o. Record documents.
- p. Preliminary Discussion of Contract Closeout:
 - 1) Procedures for Substantial Completion.
 - 2) Contract closeout requirements.
 - 3) Correction period.
 - 4) Duration of bonds and insurance.
- 2. Site Mobilization (if not covered in a separate meeting):
 - a. Working hours and overtime.
 - b. Field offices, trailers, and staging areas.
 - c. Temporary facilities.

- d. Temporary utilities and limitations on utility consumption (where applicable).
- e. Utility company coordination (if not done as a separate meeting).
- f. Access to Site, access roads, and parking for construction vehicles.
- g. Maintenance and protection of traffic.
- h. Use of premises.
- i. Protection of existing property.
- j. Security.
- k. Temporary controls, such as sediment and erosion control, noise control, dust control, storm water control, and other such measures.
- l. Site barriers and temporary fencing.
- m. Storage of materials and equipment.
- n. Reference points and benchmarks; surveys and layouts.
- o. Site maintenance during the Project.
- p. Cleaning and removal of trash and debris.
- q. Restoration.
3. General discussion and questions.
4. Next meeting.
5. Site visit, if required.

1.4 EMERGENCY CONTACT INFORMATION

- A. CONTRACTOR shall provide list of emergency contact information for 24-hour use throughout the Project. Emergency contact information shall be updated and kept current throughout the Project. If personnel or contact information change, provide updated emergency contact information list at the next progress meeting.
- B. CONTRACTOR's list of emergency contact information shall include:
 1. CONTRACTOR's project manager's office, field office, cellular, and home telephone numbers.
 2. CONTRACTOR's Site superintendent's office, field office, cellular, and home telephone numbers.
 3. CONTRACTOR's foreman's field office, cellular (if available), and home telephone numbers.
 4. Major Subcontractors' and Suppliers' office, cellular, and home telephone numbers of project manager and foreman (when applicable).
- C. Additional Emergency Contact Information:
 1. OWNER's office and cellular telephone numbers.
 2. OWNER's central 24-hour emergency telephone number.
 3. CONSTRUCTION CONTRACT ADMINISTRATOR's project manager's office, cellular, and home telephone numbers.
 4. CONSTRUCTION CONTRACT ADMINISTRATOR's project engineer's office, cellular, and home telephone numbers.
 5. Resident Project Representative's office, field office, cellular, and home telephone numbers.

6. Utility companies' 24-hour contact telephone number(s), including gas, water, sewer, oil, telephone, cable television/telecommunications, and other companies or concerns having utilities in the vicinity of the Work.
7. Highway and street owners' 24-hour telephone number(s).
8. Emergency telephone numbers, including: "Emergency: Dial 911", and seven-digit telephone numbers for the hospital, ambulance, police, and fire department nearest to the Site. Provide names of each of these institutions.
9. Other involved entities as applicable.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

++ END OF SECTION ++

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SECTION 01310

PROJECT COORDINATION

PART 1 – GENERAL

1.1 DESCRIPTION

- A. CONTRACTOR shall coordinate the Work, including testing agencies, Subcontractors, Suppliers, and others with whom coordination is necessary, in accordance with the General Conditions, Supplementary Conditions, and this Section, to complete the Work within the Contract Times.
- B. In accordance with the General Conditions, CONTRACTOR shall cooperate with and coordinate the Work with other contractors, utility service companies, OWNER's employees working at the Site, and other entities working at the Site, in accordance with Section 01110, Summary of Work.
- C. CONTRACTOR will not be responsible or liable for damage unless it is through negligence of CONTRACTOR, or his Subcontractors, Supplier, or other entity employed by CONTRACTOR.
- D. Attend and participate in all project coordination and progress meetings, and report on the progress of all Work and compliance with the Progress Schedule.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

++ END OF SECTION ++

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SECTION 01312

PROGRESS MEETINGS

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:

1. Progress meetings will be held throughout the Project. CONTRACTOR shall attend each progress meeting prepared to discuss in detail all items on the agenda.
2. CONSTRUCTION CONTRACT ADMINISTRATOR will preside at progress meetings and will prepare and distribute minutes of progress meetings to all meeting participants and others as requested.
3. If the requirements of this section conflict the requirements of Section 01321, Project Documentation, section 01321 shall take precedence and CONTRACTOR shall coordinate with the CONSTRUCTION CONTRACT ADMINISTRATOR and the OWNER so the project management software system may be utilized for document tracking and control.

B. Date and Time:

1. Regular Meetings: Every month on a day and time agreeable to OWNER, ENGINEER, CONSTRUCTION CONTRACT ADMINISTRATOR, and CONTRACTOR.
2. Other Meetings: As required.

C. Place:

1. Location mutually agreed upon by OWNER, CONTRACTOR, CONSTRUCTION CONTRACT ADMINISTRATOR, and ENGINEER.

D. Handouts: CONTRACTOR shall bring to each progress meeting a minimum of ten copies of each of the following:

1. List of Work accomplished since the previous progress meeting.
2. Up-to-date Progress Schedule.
3. Up-to-date Schedule of Submittals.
4. Detailed “look-ahead” schedule of Work planned through the next progress meeting, with specific starting and ending dates for each activity, including shutdowns, deliveries of important materials and equipment, Milestones (if any), and important activities affecting the OWNER, Project, and Site.
5. When applicable, list of upcoming, planned time off (with dates) for personnel with significant roles on the Project, and the designated contact person in their absence.

1.2 REQUIRED ATTENDANCE

- A. Representatives present for each entity shall be authorized to act on that entity's behalf.

- B. Required Attendees:
 - 1. CONTRACTOR:
 - a. Project manager.
 - b. Site superintendent.
 - c. Safety representative.
 - d. When needed for the discussion of a particular agenda item, representatives of Subcontractors and Suppliers shall attend meetings.
 - 2. ENGINEER:
 - a. Project manager or designated representative.
 - b. Resident Project Representative (if any).
 - c. Others as required by ENGINEER.
 - 3. OWNER's representative(s), as required.
 - 4. Testing and inspection agencies, as required.
 - 5. Others, as appropriate.
 - 6. CONSTRUCTION CONTRACT ADMINISTRATOR

1.3 AGENDA

- A. Preliminary Agenda: Be prepared to discuss in detail the topics listed below. Revised agenda, if any, will be furnished to CONTRACTOR prior to first progress meeting. Progress meeting agenda may be modified by CONSTRUCTION CONTRACT ADMINISTRATOR during the Project as required.
 - 1. Review, comment, and amendment (if required) of minutes of previous progress meeting.
 - 2. Review of progress since the previous progress meeting.
 - 3. Planned progress through next progress meeting.
 - 4. Review of Progress Schedule
 - a. Contract Times, including Milestones (if any)
 - b. Critical path.
 - c. Schedules for fabrication and delivery of materials and equipment.
 - d. Corrective measures, if required.
 - 5. Submittals:
 - a. Review of status of critical submittals.
 - b. Review revisions to Schedule of Submittals.
 - 6. Contract Modifications
 - a. Requests for interpretation
 - b. Clarification notices
 - c. Field Orders
 - d. Proposal requests
 - e. Change Order proposals
 - f. Work Change Directives.
 - g. Change Orders.

- h. Claims.
- 7. Applications for progress payments.
- 8. Problems, conflicts, and observations.
- 9. Quality standards, testing, and inspections.
- 10. Coordination between parties.
- 11. Site management issues, including access, security, maintenance and protection of traffic, maintenance, cleaning, and other Site issues.
- 12. Safety.
- 13. Permits.
- 14. Construction photographic documentation.
- 15. Record documents status.
- 16. Punch list status, as applicable.
- 17. Other business.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

++ END OF SECTION ++

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SECTION 01321

PROJECT DOCUMENTATION

PART 1 - GENERAL

1.1 DESCRIPTION

- A. The CONSTRUCTION CONTRACT ADMINISTRATOR will coordinate the project documentation using a project management software system. The primary function of the system is to facilitate timely processing and approval of all contract documentation. This system will utilize Primavera Portfolio Management P6 for scheduling and Primavera Contract Management for document tracking and control. The system will:
1. Facilitate communication among the OWNER, CONSTRUCTION CONTRACT ADMINISTRATOR, ENGINEER, and CONTRACTOR;
 2. Facilitate turnaround time with regard to responses and approvals;
 3. Provide a central location for all project information;
 4. Provide a standard system for project reporting and administration with accountability.
- B. The system will physically reside on a host server. All users of the system shall have a software license to access the system.
- C. The OWNER, CONSTRUCTION CONTRACT ADMINISTRATOR, ENGINEER, and CONTRACTOR will utilize the system to create the required project documents. All project documents generated by the OWNER, CONSTRUCTION CONTRACT ADMINISTRATOR, ENGINEER, and CONTRACTOR will be created and maintained within the database.
- D. The system will be used to create and track the following documents:
1. Contact List: name, address, regular and emergency phone numbers, etc.
 2. Shop drawing submittal log.
 3. Transmittals.
 4. Requests for Information (RFIs).
 5. Change Documents including but not limited to:
 - a. Requests for Proposals (RFPs)
 - b. Change Order Requests (CORs)
 - c. Change Orders (COs)
 6. Daily Reports.
 7. Field Orders and Clarification Memos.
 8. Notices of Non-Compliance.
 9. Construction Issue Memos.
 10. Punchlists.
 11. Meeting Minutes and Agendas.
 12. Correspondence.
 13. Progress Payments.

14. Work plans including shut-downs and tie-ins .
15. Start-up plans.
16. Training and vendor requirements.

E. Related Sections:

1. Section 01321, Project Documentation shall take precedence over any conflicts with, but not limited to, the following sections:
 - a. Section 01291, Schedule of Values
 - b. Section 01297, Progress Payment Procedures
 - c. Section 01301, Pre-Construction Conference
 - d. Section 01312, Progress Meetings
 - e. Section 01324, Photographic Documentation
 - f. Section 01330, Submittals
 - g. Section 01331, Reference Forms
 - h. Section 01332, Shop Drawings Procedures
 - i. Section 01333, Samples

CONTRACTOR shall coordinate conflicts between these sections with the CONSTRUCTION CONTRACT ADMINISTRATOR and the OWNER so that the project management software system may be utilized for document tracking and control.

F. CONTRACTOR Software Requirements:

1. The CONTRACTOR shall include in its bid the cost for procuring software and current licenses of the following software programs:
 - a. Primavera Portfolio Management P6
 - b. Primavera Contract Management
 - c. The software may be obtained by contacting Oracle Corporation.
2. The CONTRACTOR shall also purchase at the initiation of the Project technical support, maintenance, and upgrades, for the duration of the Project, for all software listed above.
3. The CONTRACTOR shall procure at least two licenses of each program for its use, one for the field office and one for the main office where project administration will be conducted. Additional licenses may be purchased by the CONTRACTOR at its sole discretion.
4. The CONTRACTOR shall attend a minimum two-day training session provided by the OWNER's consultant at one of the OWNER's facilities in Northern Kentucky. The CONTRACTOR shall be responsible for providing its own computers loaded with the Primavera software listed above for the training.
5. The procedures for maintaining a secure site with appropriate levels of access for each user will be discussed by the OWNER, CONSTRUCTION CONTRACT ADMINISTRATOR, CONTRACTOR, and ENGINEER.

G. CONTRACTOR Hardware Requirements:

1. The CONTRACTOR shall have for its use on site in the field office for the entire duration of the Project the following hardware:

- a. Computer with Primavera software installed.
- b. Laser printer capable of printing 11" x 17" color documents.

1.2 TRANSMITTALS AND CORRESPONDENCE

- A. All project correspondence shall be generated utilizing the document control system and logged in the system.
- B. The CONTRACTOR shall generate transmittals for sending submittals, Requests for Information, work plans, shut-down plans, start-up plans, reports, training requirements, and other data to the CONSTRUCTION CONTRACT ADMINISTRATOR using the document control system.
- C. The CONTRACTOR shall electronically transmit documents to the CONSTRUCTION CONTRACT ADMINISTRATOR by placing documents in the CONSTRUCTION CONTRACT ADMINISTRATOR's In-Box in the document control system.
- D. All Change Documents will be generated within the document control system and will be monitored and managed by the CONSTRUCTION CONTRACT ADMINISTRATOR.

1.3 SUBMITTALS

- A. The CONSTRUCTION CONTRACT ADMINISTRATOR will manage the submittal review process through review and distribution of reviewed documents. The document control system will be utilized by the CONSTRUCTION CONTRACT ADMINISTRATOR to log and track submittals.
- B. The CONTRACTOR shall create a submittal log and send it electronically to the CONSTRUCTION CONTRACT ADMINISTRATOR for review within 30 days of the Notice to Proceed. The CONSTRUCTION CONTRACT ADMINISTRATOR will post the approved log on the document control system. The CONTRACTOR shall inform the CONSTRUCTION CONTRACT ADMINISTRATOR of any updates or modifications required to the log entries.
- C. To the maximum extent possible, the CONTRACTOR shall transmit Action Submittals and Informational submittals to the CONSTRUCTION CONTRACT ADMINISTRATOR electronically in color pdf format. The OWNER reserves the right to require submittals in electronic format. Exceptions are samples and color charts.
- D. The CONTRACTOR shall be responsible for printing copies of the approved shop drawings for itself, the OWNER, CONSTRUCTION CONTRACT ADMINISTRATOR, and the ENGINEER.

1.4 DAILY INSPECTION REPORTS

- A. The CONTRACTOR shall prepare daily inspection reports in the Contract Management program and enter them in the document control system.
- B. The CONTRACTOR shall complete each daily report by 11:00 a.m. of the subsequent day for each day that CONTRACTOR performs Work.
- C. Required information shall include the CONTRACTOR's name, date the work was performed, description of work performed, equipment utilized, field force, visitors, key materials and equipment delivered, and list the scheduled activities utilizing the P6 schedule activity codes.

1.5 CONSTRUCTION ISSUE MEMOS

- A. The CONSTRUCTION CONTRACT ADMINISTRATOR will manage and monitor the Construction Issue Memo log.
- B. Memos will identify the responsible "ball in court" party, date of issue, and track it through completion.

1.6 PUNCHLISTS

- A. The CONSTRUCTION CONTRACT ADMINISTRATOR shall prepare the punchlist and manage tracking punchlist items within the document control system.

1.7 MEETING AGENDA AND MINUTES

- A. The CONSTRUCTION CONTRACT ADMINISTRATOR will prepare the meeting agenda and be responsible for preparing and placing meeting minutes on the document control system within 7 days of the meeting.
- B. The CONTRACTOR shall notify the CONSTRUCTION CONTRACT ADMINISTRATOR of any changes to meeting minutes within 60 days of the meeting.

1.8 PROGRESS PAYMENTS

- A. The CONTRACTOR shall review the format of the progress payment requests with the CONSTRUCTION CONTRACT ADMINISTRATOR prior to submitting the first request.
- B. The CONTRACTOR shall prepare progress payment requests electronically by inputting the activity code and approved schedule of values into the P6 program.

1.9 PROGRESS SCHEDULE

- A. The CONTRACTOR shall prepare progress schedules using the P6 program.

- B. The format shall be Critical Path Network (CPN) unless otherwise approved by the CONSTRUCTION CONTRACT ADMINISTRATOR. The schedule shall follow the method as generally outlined in Associated General Contractors of America (AGC) 580, "Construction Project Planning and Scheduling Guidelines." If a conflict occurs between the AGC publication and this Specification, this Specification shall govern.
- C. In the title block, show name of Project, OWNER, date submitted, revision or update number, and the name of the scheduler. Updated schedules shall indicate data date.
- D. Identify horizontally across top of schedule the time frame by year, month, and day.
- E. Identify each activity with a unique number and a brief description of the Work associated with that activity.
- F. Indicate the critical path.
- G. Provide a legend to describe standard and special symbols used.
- H. Cost-Loading:
 - 1. Note the estimated cost to perform each Work activity, with the exception of Submittals or Submittal reviews, in the network in a tabular listing.
 - 2. The sum of all activity costs shall equal the Contract Price. An unbalanced or front-end-loaded schedule will not be acceptable.
 - 3. The accepted cost-loaded Progress Schedule shall constitute the Schedule of Values specified in 01297 Progress Payment Procedures.
- I. The CONTRACTOR shall submit a Preliminary Progress Schedule within 14 days of the Notice to Proceed. In addition to the basic requirements outlined in the General Conditions, show a detailed schedule beginning with Notice to Proceed for minimum duration of 120 days, and a summary of balance of the Project through Final Completion. Show activities including but not limited to the following:
 - 1. Notice to Proceed.
 - 2. Permits.
 - 3. Submittals, with review time.
 - 4. Early procurement activities for long lead equipment and materials.
 - 5. Initial Site work.
 - 6. Earthwork.
 - 7. Specified Work sequences and construction constraints including shutdowns and tie-ins.
 - 8. Contract Completion Dates.
 - 9. Major structural, mechanical, equipment, electrical, architectural, and instrumentation and control Work.
 - 10. System startup summary.
 - 11. Project close-out summary.

12. Demobilization summary.

- J. The CONTRACTOR shall submit a Detailed Progress Schedule within 30 days of the Notice to Proceed. Show the duration and sequences of activities required for complete performance of the Work reflecting means and methods chosen by CONTRACTOR.
- K. When accepted by CONSTRUCTION CONTRACT ADMINISTRATOR, the Detailed Progress Schedule will replace the Preliminary Progress Schedule and become the baseline CPN Progress Schedule.
- L. The CPN Progress Schedule will be updated by the CONTRACTOR monthly, at a minimum, to reflect actual progress and occurrences to date, including any weather delays. Identify Work on a calendar basis using days as a unit of measure. Show complete interdependence and sequence of construction and Project-related activities reasonably required to complete the Work. Identify the Work of separate stages and other logically grouped activities, and clearly identify critical path of activities. Include as applicable, at a minimum:
1. Obtaining permits, submittals for early product procurement, and long lead time items.
 2. Mobilization and other preliminary activities.
 3. Initial Site work.
 4. Specified Work sequences, constraints, and Contract Times including shut-downs and tie-ins
 5. Major equipment design, fabrication, factory testing, and delivery dates.
 6. Sitework.
 7. Concrete Work.
 8. Structural Steel Work.
 9. Architectural features Work.
 10. Conveying systems Work.
 11. Equipment Work.
 12. Mechanical Work.
 13. Electrical Work.
 14. Instrumentation and control Work.
 15. Other important Work for each major facility.
 16. Equipment and system startup and test activities.
 17. Project closeout and cleanup.
 18. Demobilization.
- M. No activity duration, exclusive of those for Submittals review and product fabrication/delivery, shall be less than 1 day nor more than 14 days, unless otherwise approved by the CONSTRUCTION CONTRACT ADMINISTRATOR. Activity duration for Submittal review shall not be less than review time specified unless clearly identified and prior written acceptance has been obtained from the CONSTRUCTION CONTRACT ADMINISTRATOR.
- N. Updated Progress Schedules shall reflect:

1. Progress of Work to within 5 working days prior to submission.
 2. Approved changes in Work scope and activities modified since submission.
 3. Delays in Submittals or resubmittals, deliveries, or Work.
 4. Adjusted or modified sequences of Work.
 5. Other identifiable changes.
 6. Revised projections of progress and completion.
 7. Report of changed logic.
- O. The CONTRACTOR shall produce detailed subschedules during the Project upon request of CONSTRUCTION CONTRACT ADMINISTRATOR to further define critical portions of the Work.
- P. If the CONTRACTOR fails to complete activity by its latest scheduled completion date and this failure is anticipated to extend Contract Times, the CONTRACTOR shall, within 7 days of such failure, submit a written statement as to how CONTRACTOR intends to correct nonperformance and return to acceptable current Progress Schedule. Actions by CONTRACTOR to complete the Work within the Contract Times will not be justification for adjustment of Contract Price or Contract Times.
- Q. OWNER may order CONTRACTOR to increase plant, equipment, labor force, or working hours if CONTRACTOR fails to satisfactorily execute Work as necessary to prevent delay to overall completion of Project, at no additional cost to OWNER.

1.10 NARRATIVE PROGRESS REPORT

- A. The CONTRACTOR shall prepare a monthly narrative progress report in the following format:
1. Organize same as Progress Schedule.
 2. Identify, on a cover letter, reporting period, date submitted, and name of author of report.
 3. On 8-1/2-inch by 11-inch white paper, unless otherwise approved.
 4. List information for each activity in tabular format, including at a minimum:
 - a. Activity Identification Number.
 - b. Activity Description.
 - c. Original Duration.
 - d. Remaining Duration.
 - e. Early Start Date (Actual start on Updated Progress Schedules).
 - f. Early Finish Date (Actual finish on Updated Progress Schedules).
 - g. Late Start Date.
 - h. Late Finish Date.
 - i. Total Float.
 5. Sort reports, in ascending order, as listed below:
 - a. Activity number sequence with predecessor and successor activity.
 - b. Activity number sequence.
 - c. Early-start.
 - d. Total float.

B. Contents:

1. Number of days worked over the period, work force on hand, construction equipment on hand (including utility vehicles such as pickup trucks, maintenance vehicles, stake trucks).
2. General progress of Work, including a listing of activities started and completed over the reporting period, mobilization/demobilization of subcontractors, and major milestones achieved.
3. CONTRACTOR's plan for management of Site (e.g., lay down and staging areas, construction traffic), utilization of construction equipment, buildup of trade labor, and identification of potential Contract changes.
4. Identification of new activities and sequences as a result of executed Contract changes.
5. Documentation of weather conditions over the reporting period, and any resulting impacts to the work.
6. Description of actual or potential delays, including related causes, and the steps taken or anticipated to mitigate their impact.
7. Changes to activity logic.
8. Changes to the critical path.
9. Identification of, and accompanying reason for, any activities added or deleted since the last report.
10. Steps taken to recover the schedule from CONTRACTOR-caused delays.

1.11 SCHEDULE ACCEPTANCE

A. CONSTRUCTION CONTRACT ADMINISTRATOR's acceptance will demonstrate agreement that:

1. Proposed schedule is accepted with respect to:
 - a. Contract Times, including Final Completion and all intermediate Milestones are within the specified times.
 - b. Specified Work sequences and constraints are shown as specified.
 - c. Specified OWNER-furnished Equipment or Material arrival dates, or range of dates, are included.
 - d. Access restrictions are accurately reflected.
 - e. Startup and testing times are as specified.
 - f. Submittal review times are as specified.
 - g. Startup testing duration is as specified and timing is acceptable.
2. In all other respects, CONSTRUCTION CONTRACT ADMINISTRATOR's acceptance of CONTRACTOR's schedule indicates that, in CONSTRUCTION CONTRACT ADMINISTRATOR's judgement, schedule represents reasonable plan for constructing Project in accordance with the Contract Documents. CONSTRUCTION CONTRACT ADMINISTRATOR's review will not make any change in Contract requirements. Lack of comment on any aspect of schedule that is not in accordance with the Contract Documents will not thereby indicate acceptance of that change, unless CONTRACTOR has explicitly called the nonconformance to CONSTRUCTION CONTRACT ADMINISTRATOR's attention in submittal. Schedule remains CONTRACTOR's responsibility and

CONTRACTOR retains responsibility for performing all activities, for activity durations, and for activity sequences required to construct Project in accordance with the Contract Documents.

- B. Unacceptable Preliminary Progress Schedule:
 - 1. Make requested corrections; resubmit within 10 days.
 - 2. Until acceptable to CONSTRUCTION CONTRACT ADMINISTRATOR as Baseline Progress Schedule, continue review and revision process, during which time CONTRACTOR shall update schedule on a monthly basis to reflect actual progress and occurrences to date.
- C. Unacceptable Detailed Progress Schedule:
 - 1. Make requested corrections; resubmit within 10 days.
 - 2. Until acceptable to CONSTRUCTION CONTRACT ADMINISTRATOR as Baseline Progress Schedule, continue review and revision process.
- D. Narrative Report: All changes to activity duration and sequences, including addition or deletion of activities subsequent to CONSTRUCTION CONTRACT ADMINISTRATOR's acceptance of Baseline Progress Schedule, shall be delineated in Narrative Report current with proposed Updated Progress Schedule.

1.12 ADJUSTMENT OF CONTRACT TIMES

- A. Reference General Conditions.
- B. Evaluation and reconciliation of Adjustments of Contract Times shall be based on the Updated Progress Schedule at the time of proposed adjustment or claimed delay.
- C. Float:
 - 1. Float time is a Project resource available to both parties to meet contract Milestones and Contract Times.
 - 2. Use of float suppression techniques such as preferential sequencing or logic, special lead/lag logic restraints, and extended activity times are prohibited, and use of float time disclosed or implied by use of alternate float-suppression techniques shall be shared to proportionate benefit of OWNER and CONTRACTOR.
 - 3. Pursuant to above float-sharing requirement, no time extensions will be granted nor delay damages paid until a delay occurs which (i) impacts Project's critical path, (ii) consumes available float or contingency time, and (iii) extends Work beyond contract completion date.
- D. Claims Based on Contract Times:
 - 1. Where CONSTRUCTION CONTRACT ADMINISTRATOR has not yet rendered formal decision on CONTRACTOR's Claim for adjustment of Contract Times, and parties are unable to agree as to amount of adjustment to be reflected in Progress Schedule, CONTRACTOR shall reflect an interim

adjustment in the Progress Schedule as acceptable to CONSTRUCTION CONTRACT ADMINISTRATOR.

2. It is understood and agreed that such interim acceptance will not be binding on either CONTRACTOR or OWNER, and will be made only for the purpose of continuing to schedule Work until such time as formal decision has been rendered as to an adjustment, if any, of the Contract Times.
3. CONTRACTOR shall revise Progress Schedule prepared thereafter in accordance with CONSTRUCTION CONTRACT ADMINISTRATOR's formal decision.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

++ END OF SECTION ++

SECTION 01324

PHOTOGRAPHIC DOCUMENTATION

PART 1 - GENERAL

1.1 DESCRIPTION

- A. CONTRACTOR shall perform services specified, including:
 - 1. Digital photography.
 - 2. Videography.

- B. Provide photographic documentation for the following:
 - 1. Pre-construction.
 - 2. Construction progress.
 - 3. Final.

- C. Image Quality:
 - 1. All photographic documentation shall be in color.
 - 2. Photographic images shall be suitably staged and set up (“framed”), focused, and with adequate lighting.
 - 3. For still photographs, use camera with minimum 6.0-megapixel resolution.

- D. If the requirements of this section conflict the requirements of Section 01321, Project Documentation, section 01321 shall take precedence and CONTRACTOR shall coordinate with the CONSTRUCTION CONTRACT ADMINISTRATOR and the OWNER so the project management software system may be utilized for document tracking and control.

1.2 QUALITY ASSURANCE

- A. CONSTRUCTION CONTRACT ADMINISTRATOR will approve the views to be taken and select time at which images will be taken. Photographic subjects, views, and angles will vary with progress of the Work.

1.3 SUBMITTALS

- A. Informational Submittals:
 - 1. Frequency of Photographic Documentation Submittals:
 - a. Pre-construction: Submit pre-construction photographic documentation (prints and discs) prior to mobilizing and disturbing the Site. Provide pre-construction photographic documentation no later than first Application for Payment, unless other schedule is accepted by CONSTRUCTION CONTRACT ADMINISTRATOR.

- b. Provide construction progress photographic documentation (prints and discs) monthly. Submit with each Application for Payment, unless otherwise agreed to by CONSTRUCTION CONTRACT ADMINISTRATOR.
 - c. Submit acceptable final photographic documentation (prints and discs) prior to submitting final Application for Payment.
2. Photographic Prints:
- a. Quantity: For each photograph taken, provide to CONSTRUCTION CONTRACT ADMINISTRATOR one set of prints bound in a 3 ring binder or if required by OWNER, submit through documentation control software.
 - b. Print Size and Finish:
 - 1) Photographs: Provide 5-inch by 7-inch prints on professional-grade, 9-mil thick, photograph paper with semi-gloss or satin finish, unless specified otherwise.
 - c. Provide the following information on back of each print and front of each disc containing photographic documentation:
 - 1) Date photograph was taken.
 - 2) Name of OWNER.
 - 3) Name of Site.
 - 4) Project name.
 - 5) Description of view shown in photograph.
 - 6) Name and address of photographer.
3. Digital Files of Photographs:
- a. For each photograph taken, provide high-quality digital image on compact disc (CD) in “*.JPG” file format compatible with Microsoft Windows XP and Microsoft Windows Vista.
 - b. Image resolution shall be sufficient for clear, high-resolution prints. Minimum resolution shall be 150 dots per inch (dpi). Minimum size of digital images shall be equal to specified print size.
 - c. Do not imprint date and time in the image.
 - d. Electronic image filename shall describe the image; do not submit filenames automatically created by digital camera. For example, an acceptable electronic filename would be, “Dewatering Building – Looking West at Centrifuge No. 2.jpg”.
 - e. Provide one copy of each disc with photographic images.
 - f. Label each CD as specified in Paragraph 1.3.A.3.c of this Section.
4. Videography:
- a. Video shall be high-resolution, high-quality video of the Site and Project work in standard DVD-R format.
 - b. Video image shall have imprinted date and time that video was taken.
 - c. Include audio narration sufficient to explain the scenes shown. Audio shall be done clearly, precisely, and at a moderate pace. CONTRACTOR shall review audio before submitting to verify the spoken words are audible over background noises. If the CONSTRUCTION CONTRACT

ADMINISTRATOR finds the audio is not of said quality and clarity the CONTRACTOR shall create new video discs.

- d. Provide three copies of each video disc.
- e. Label each video disc as specified in Paragraph 1.3.A.3.c of this Section.

1.4 PRE-CONSTRUCTION PHOTOGRAPHIC DOCUMENTATION

- A. Pre-construction Photographic Documentation:
 - 1. Obtain and submit sufficient pre-construction photographic documentation to record Site conditions prior to construction. Photographs shall document work areas of all prime contracts.
 - 2. Furnish to CONSTRUCTION CONTRACT ADMINISTRATOR specified number of photographs. Pre-construction photographs are not part of required number of construction progress photographs specified in Article 1.5 of this Section.
 - 3. Provide pre-construction video of all work areas included in all prime contracts on the Project, including indoor and outdoor work areas and staging areas.

- B. If dispute arises and pre-construction photographic documentation was not submitted prior to the dispute, restore disputed area to extent directed by CONSTRUCTION CONTRACT ADMINISTRATOR and to complete satisfaction of CONSTRUCTION CONTRACT ADMINISTRATOR.

1.5 CONSTRUCTION PROGRESS PHOTOGRAPHIC DOCUMENTATION

- A. Progress Photographs:
 - 1. Take a minimum of 20 photographs each month during the construction period or as directed by the OWNER.
 - 2. Provide interior and exterior photographic documentation of each structure as directed by CONSTRUCTION CONTRACT ADMINISTRATOR at the time photographic documentation is taken.

1.6 FINAL PHOTOGRAPHIC DOCUMENTATION

- A. Final Photographs:
 - 1. Take photographs at time and day acceptable to CONSTRUCTION CONTRACT ADMINISTRATOR. Do not take final photographs prior to Substantial Completion. Work documented in final photographs shall be generally complete, including painting, furnishings, landscaping, and other visible Work.
 - 2. Take at least 50 final photographs, based on scope of Work at the time Contract Times commence running. Proportionately modify the number of final photographs if scope of Project is modified. Final photographs are not part of construction progress photographs required under Paragraph 1.5.A of this Section.

3. Provide aerial photographs of Site following completion of restoration and landscaping, with final photographic documentation submittal. Provide one oblique photograph taken from each cardinal direction (north, south, east, and west). Obtain permits or permission, as applicable, for required flyovers.

B. Video:

1. Obtain final video at same time that final photographs are taken.
2. Final videography shall cover all areas of the Project.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

++ END OF SECTION ++

SECTION 01330

SUBMITTALS

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Submittal of documents described in the General Conditions, Supplementary Conditions and hereinafter are required prior to, during and at the end of the construction period. The submittals shall conform to the requirements described in this Section and all referenced Sections or Articles.
- B. If the requirements of this section conflict the requirements of Section 01321, Project Documentation, section 01321 shall take precedence and CONTRACTOR shall coordinate with the CONSTRUCTION CONTRACT ADMINISTRATOR and the OWNER so the project management software system may be utilized for document tracking and control.

1.2 PROCEDURE

- A. Submittals within ten days after the Notice to Proceed: Submit the following items within ten days after the Notice to Proceed. Location of information concerning each submittal is referenced and a copy of each required form is included in Section 01331, Reference Forms.
 - 1. Preliminary Schedule of Values: Prepare and submit in accordance with Section 01291, Schedule of Values.
 - 2. Preliminary Schedule of Shop Drawings and Sample Submittal in accordance with the General Conditions and Section 01332, Shop Drawing Procedures.
 - 3. Preliminary Progress Schedule: Prepare and submit in accordance with Section 01323, Progress Schedule.
- B. Submittals within fourteen days after the Notice to Proceed: Submit the following items within fourteen days after the Notice to Proceed. Location of information concerning each submittal is referenced and a copy of each required form is included in Section 01331, Reference Forms.
 - 1. Schedule of Values: Prepare and submit in accordance with Section 01291, Schedule of Values and Section 01321 Project Documentation.
 - 2. Submittal Schedule: Prepare and submit schedule of all Shop Drawings in accordance with Section 01332, Shop Drawing Procedures.
 - 3. Monthly payment schedule.
 - 4. Maintenance of Plant Operations Schedule, in accordance with Section 01143, Coordination with OWNER'S Operations.

5. Ninety-day Bar Chart Schedule: Prepare and submit a 90-day Bar Chart, in accordance with Section 01323, Progress Schedule.
- C. Submit the following items within 30 days after the Notice to Proceed. Location of information concerning each submittal is referenced and a copy of each required form is included in Section 01331, Reference Forms.
1. Progress Schedule: Prepare and submit a Progress Schedule in accordance with Section 01321, Project Documentation.
- D. Submit the following items at the Pre-construction Conference: Refer to Sections 01332, Shop Drawing Procedures, and Section 01520, Engineer's Field Office.
- E. Submittals Prior to Beginning the Work: Refer to the General Conditions and Supplementary Conditions of the Contract Documents.
- F. Submittals During Construction: During progress of the construction, provide the following submittals in a timely manner to prevent any delay in the Work schedule:
1. Updates to Progress Schedule: Provide an assessment of Work progress in relation to the Progress Schedule in accordance with Section 01321, Project Documentation.
 2. Shop Drawings, Product Data and Samples: Submit Shop Drawings, product data and samples in accordance with Section 01332, Shop Drawing Procedures, and as required in applicable Sections of the Contract Documents.
 3. Progress Payments: Submit applications for partial payments as specified in the General Conditions and Section 01297 Progress Procedures.
 4. Request for Information: Submit a Request for Information, included in Section 01331, Reference Forms, when any of the following are required: an interpretation of the Specifications; additional details; information not shown on the Drawings or in the Specifications; or clarification of discrepancies is required. CONTRACTOR shall retain one copy and submit three copies to the ENGINEER for response.
 5. Change Orders: Forms shown in Section 01331, Reference Forms. A proposal for a Change Order may be submitted by CONTRACTOR in accordance with the General Conditions. The Change Order Proposal included in Section 01331, Reference Forms, must be in writing and must include sufficient information to assess the need for a change in the Work, the Contract time or the Contract amount. Whenever the ENGINEER determines the need for a Change Order, CONTRACTOR will receive a Request for Change Order Proposal Form included in Section 01331, Reference Forms. Upon receipt of a Request for Change Order Proposal Form or when CONTRACTOR determines the need for a Change Order, CONTRACTOR shall prepare and submit three copies of a Change Order Proposal. The Change Order Proposal must be approved by CONTRACTOR, ENGINEER, and OWNER. When a Change Order Proposal has been accepted, a Work Change Directive shall be submitted. Each Work Change Directive shall include a Change Order Pricing Sheet, included in Section 01331, Reference Forms. After the Work Change Directive has been accepted

- by the OWNER, a Change Order included in Section 01331, Reference Forms, will be prepared and executed. CONTRACTOR is not authorized to begin work on a Change Order until it is fully executed. Any Work done by CONTRACTOR prior to execution of a Change Order is entirely at his own risk.
6. CONTRACTOR'S Daily Report: Submit four copies of CONTRACTOR'S Daily Report. CONTRACTOR and each subcontractor shall prepare and submit a daily report.
 - a. The report shall contain, as a minimum, information on the location and description of the Work being performed, size, quantity and description of materials and equipment installed or delivered, coordination or scheduling concerns, requests for clarifications, and any discrepancies noted in the Contract Documents or on the as-built conditions.
 - b. The report shall also contain CONTRACTOR'S daily workforce count by craft, general weather conditions, any Work performed other than during established working hours, and any other pertinent items relative to the Work, and as required by ENGINEER.
 - c. The report is due at the ENGINEER'S office by 9:00 a.m. on the following day and shall be signed by a responsible member of CONTRACTOR'S staff.
 7. Submittal Schedule: Shown in Section 01331, Reference Forms. Submit an updated Shop Drawing, Product Data and Sample Submittal Schedule with each Progress Payment Request. Three updated Submittal Schedules shall be submitted with each month's Progress Payment Request.
 8. Construction Photographs: Submit Construction Photographs with each month's Progress Payment Request as specified in Section 01324, Photographic Documentation.
 9. Operation and Maintenance Manuals and Lesson Plans: Submit Equipment Operation and Maintenance Manuals for approval, by the ENGINEER, within 30 days after approval of Equipment Shop Drawing. Submit Equipment Training Lesson Plans for approval, by the ENGINEER, 60 days prior to commencement of training. Submit Operation and Maintenance Data and Lesson Plans in accordance with Section 01781, Operation and Maintenance Data, and Section 01821, Instruction of Operations and Maintenance Personnel.
- G. Submittal at Substantial Completion: Submit all Operations and Maintenance Data for each item of the Work commissioned into operation.
- H. Submittal At Final Completion: With a written Notice of Completion, submit the following items in the proper form as a condition of Final Acceptance of the Work:
1. Project Record Documents: Submit in accordance with Section 01782, Record Documents.
 2. Guarantees, Warranties and Bonds: Submit as required in the General Conditions and listed in various Sections of the Specifications.
 3. Operations and Maintenance Data: Submit all remaining product data and manuals as specified in various Sections of the Specifications.
 4. Survey notes.
 5. Construction photographs of all completed Work.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

++ END OF SECTION ++

SECTION 01331

REFERENCE FORMS

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This Section contains the required forms for CONTRACTOR use. The document testing forms included herein, do not supersede specific testing requirements found elsewhere in the Contract Documents.
- B. If the requirements of this section conflict the requirements of Section 01321, Project Documentation, section 01321 shall take precedence and CONTRACTOR shall coordinate with the CONSTRUCTION CONTRACT ADMINISTRATOR and the OWNER so the project management software system may be utilized for document tracking and control.
- C. The forms listed below are included in this Section are referenced from other Sections in the Contract Documents. Forms include, but are not necessarily be limited to the following:

	<u>Form No.</u>	<u>Title</u>
1.	00800-A	Certificate of Substantial Completion.
2.	00800-B	Contractor's Affidavit Regarding Settlement of Claims.
3.	01330-A	Schedule of Values.
4.	01330-B	Shop Drawings, Product Data and Sample Transmittal Schedule.
5.	01330-C	Authorized Signatures Form.
6.	01330-D	Application for Payment.
7.	01330-E	MBE/WBE Utilization Form.
8.	01330-F	Request for Change Order Proposal.
9.	01330-G	Change Order Proposal.
10.	01330-H	Work Change Directive.
11.	01330-I	Change Order.
12.	01330-J	Request for Information.
13.	01330-K	Request for Alteration.
14.	01330-L	Contractor's Daily Construction Report.
15.	01330-M	TV Inspection Request.
16.	01332-A	Submittal Transmittal Form.
17.	01415-A	Confined Space Data Sheet.
18.	01415-B	Confined Space Entry Permit.
19.	01415-C	Confined Space Hot Work Permit.
20.	01600-A	Equipment Information Form.
21.	01600-B	Unit Responsibility Certification Form.
22.	01620-A	Manufacturer's Installation Certification Form.
23.	01752-A	Equipment Test Report Form.
24.	01781-A	Operation and Maintenance Transmittal Form.
25.	01821-A	Manufacturer's Instruction Certification Form.

26. 11000-A Motor Data Form.
27. 13490-A Loop Wiring and Insulation Resistance Test Data Form.
28. 13490-B Control Circuit Piping Leak Test Form.
29. 13490-C Controller Calibration Test Data Form.
30. 13490-D Panel Indicator Calibration Test Data Form.
31. 13490-E Recorder Calibration Test Data Form.
32. 13490-F Signal Trip Calibration Test Data Form.
33. 13490-G Field Switch Calibration Test Data Form.
34. 13490-H Transmitter Calibration Test Data Form.
35. 13490-I Miscellaneous Instrument Calibration Test Data Form.
36. 13490-J Individual Loop Test Data Form.
37. 13490-K Loop Commissioning Test Data Form.
38. 15142-A Request for Bacteriological Samples.
39. 16000-A Wire and Cable Resistance Test Data Form.
40. 16000-B Installed Motor Test Data Form.
41. 16000-C Dry Transformer Test Data Form.
42. 16000-D Motor Control Center Test Form.
43. 16000-E Medium Voltage Motor Starter Test Form.
44. 16000-F Medium Voltage Switchgear Test Form.
45. 16000-G Protective Relay Test Form.
46. 16000-H Low Voltage Switchgear Test Form.
47. 16000-I Medium Voltage Load Interrupter Switch Test Form.
48. 16000-J Liquid-Filled Transformer Test Form.
49. 16000-K Automatic Transfer Switch Test Form.
50. 16000-L Neutral Grounding Resistor Test.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

+ + END OF SECTION + +

CERTIFICATE OF SUBSTANTIAL COMPLETION

PROJECT NUMBER	PROJECT TITLE
----------------	---------------

DATE OF ISSUANCE: _____ OWNER'S CONTRACT NO.: _____

OWNER: _____

CONSTRUCTION CONTRACT ADMINISTRATOR: _____

CONTRACTOR: _____

This Certificate of Substantial Completion applies to all Work under the Contract Documents or to the following specified parts thereof:

OVERALL PROJECT

To: _____
OWNER

And to: _____
CONTRACTOR

The Work to which this Certificate applies has been inspected by authorized representatives of OWNER, CONTRACTOR and CONSTRUCTION CONTRACT ADMINISTRATOR, and that Work is hereby declared to be substantially complete in accordance with the Contract Documents on

DATE OF SUBSTANTIAL COMPLETION

A tentative list of items to be completed or corrected is attached hereto. This list may not be all-inclusive, and the failure to include an item in it does not alter the responsibility of CONTRACTOR to complete all the Work in accordance with the Contract Documents. The items in the tentative list shall be completed or corrected by CONTRACTOR by Final Completion.

**CONTRACTOR'S AFFIDAVIT
REGARDING SETTLEMENT OF CLAIMS**

Project No.: _____

Contract No.: _____

Gentlemen:

This is to certify that all lawful claims for materials, rental of equipment and labor used in connection with the construction of the above project, whether by subcontractor or claimant in person, have been duly discharged.

The undersigned, for the consideration of \$ _____ as set out in the final pay estimate, as full and complete payment under the terms of the contract, hereby waives and relinquishes any and all further claims or right of lien under, in connection with, or as a result of the above described project. The undersigned further agrees to indemnify and save harmless the **(type in owner here)** against any and all liens, suits, damages, charges and expenses whatsoever, which said **(type in owner here)** may suffer arising out of the failure of the undersigned to pay for all labor performance and materials furnished for the performance of said installation.

Contractor

By

Title

State of _____

County of _____

The forgoing instrument was subscribed and sworn to before me this ____ day of _____, 20____.

Notary Public

Commission Expiration Date

SCHEDULE OF VALUES

Sheet _____ of _____

Section No. _____

Item Description	Material	Labor	Equipment	Total

**SHOP DRAWINGS, PRODUCT
DATA AND SAMPLE
SUBMITTAL SCHEDULE**

CONTRACTOR _____

Project Name _____

Project No. _____ Date _____

Page ___ of ___

Item No.	Description	Specification Section Number	Date To Be Submitted	Approval Needed By	Date Submitted	Date Reviewed	Transmittal Number

**AUTHORIZED SIGNATURES FORM
(Corporation)**

Gentlemen:

WHEREAS, _____, a(n) (Name of State) _____ Corporation, is required to execute certain documents which are necessary for the prompt and efficient execution of the corporate business:

NOW, THEREFORE, BE IT RESOLVED, by the Board of Directors of the (Corporate Name) _____ that name of parties listed below be authorized to execute and sign on behalf of said corporation the following documents:

- | | |
|-----------------|--|
| 1. The Proposal | 6. Change Orders |
| 2. The Contract | 7. Application for Payment |
| 3. The Bond | 8. Work Change Directives |
| 4. Payrolls | 9. All other papers necessary for the conduct of the |
| 5. Claims | corporation's affairs and the execution of the contract. |

The powers and duties herein granted shall be and is hereby granted for the duration of the contract for the construction of the _____, Project No. _____, or until express notice of revocation has been duly given in writing, whichever is the lesser period. Dated and passed by the Board of Directors this _____ day of _____, 20__.

<u>NAME</u>	<u>SIGNATURE</u>	<u>TITLE</u>	<u>DOCUMENTS</u>
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

I, _____ of the _____, a corporation, do hereby certify that the above is a true and correct copy of a resolution adopted by the Board of Directors of said corporation, at a meeting of said board held on _____, 20__, and that the same is in full force and effect at this time.

(Seal of Corporation)

(OFFICER OF CORPORATION)

(NAME & TITLE)

STATE OF _____
COUNTY OF _____

This instrument was acknowledged before me this _____ day of _____, 20____ by _____ appearing before the undersigned Notary Public, and stated that he executed such instrument on behalf of said corporation for the purpose and consideration therein expressed.

My Commission Expires: _____
(NOTARY PUBLIC)

**APPLICATION FOR PAYMENT
TYPE ADDRESS**

To: Project Manager

Progress Payment No.

Payment Period: From mm/dd/yy to mm/dd/yy

Project No.	Project Name NAME OF PROJECT			Contract No. XXXXX	
Name of Contractor NAME OF CONTRACTOR			Telephone (XXX) XXX-XXXX	Fax (XXX) XXX-XXXX	
Address CONTRACTOR'S ADDRESS				Notice To Proceed Date MM/DD/YY	
ITEM NO.	DESCRIPTION List Contract Items, Change Order Items, and Deductions, Each with Subtotals	CONTRACT AMOUNT	ESTIMATED AMOUNT THIS PERIOD	AMOUNT PREVIOUSLY INVOICED	AMOUNT COMPLETED TO DATE
XXXXX	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX	\$xx,xxx,xxx.xx	\$xx,xxx,xxx.xx	\$xx,xxx,xxx.xx	\$xx,xxx,xxx.xx
ATTACHMENTS: SCHEDULE OF VALUES			GROSS AMOUNT DUE: \$xx,xxx,xxx.xx <input type="checkbox"/> RETAINAGE - 10% \$xx,xxx,xxx.xx <input type="checkbox"/> SECURITIES - 10% \$xx,xxx,xxx.xx NET AMOUNT DUE TO DATE: \$xx,xxx,xxx.xx LESS AMOUNT PREVIOUSLY PAID: \$xx,xxx,xxx.xx AMOUNT DUE THIS APPLICATION: \$xx,xxx,xxx.xx		
CERTIFICATION OF CONTRACTOR: I certify that all items and amounts shown on the face of this Application for Payment are correct, that to the best of my knowledge and belief, all work has been performed and/or material supplied in full accordance with the requirements of the referenced contract, and/or duly authorized deviations, substitutions, alterations, and/or additions; that the foregoing is true and correct statement of the contract account up to and including the last day of the period covered by this Application that no part of the "Amount Due This Application" has been received, and that the undersigned and subcontractors have: (check applicable line). <input type="checkbox"/> a. Complied with all labor provisions of said contract. <input type="checkbox"/> b. Complied with all the labor provisions of said contract except in those instances where a dispute exists with respect to said labor provisions. (If "b" is checked, include attachment briefly describing nature of dispute.) _____ Date _____ Contractor Representative			CERTIFICATION OF CONSTRUCTION CONTRACT ADMINISTRATOR: I certify that all work described was inspected, and that to the best of my knowledge and belief the work was performed and/or supplied in full accordance with the requirements of this contract. _____ Date _____ Resident Project Representative <p>I certify that I have checked and verified the above and foregoing Application for Payment; that to the best of my knowledge and belief it is a true and correct statement of work performed and/or material supplied by the contractor; that all work and/or material included in this Application has been inspected and that it has been performed and/or supplied in full accordance with the requirements of the referenced contract; and that payment claimed and requested by the Contractor is correctly computed on the basis of work performed and/or material supplied to date.</p> _____ Date _____ Project Manager/Engineer		
_____ Title _____ Contractor Representative			_____ Firm _____ Project Manager/Engineer		
OWNER USE ONLY BELOW THIS LINE					
RECOMMENDED BY:			APPROVED BY:		
Project Manager _____ Date _____			Superintendent _____ Date _____		

CONTINUATION OF APPLICATION FOR PAYMENT

PROGRESS PAYMENT NO. 1

Project No.		Project Name			Contract No.	
		NAME OF PROJECT			XXXXX	
ITEM NO.	DESCRIPTION List Contract Items, Change Order Items, and Deductions, Each with Subtotals	CONTRACT AMOUNT	ESTIMATED AMOUNT THIS PERIOD	AMOUNT PREVIOUSLY INVOICED	AMOUNT COMPLETED TO DATE	
XXXXX	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXX	\$xx,xxx,xxx.xx	\$xx,xxx,xxx.xx	\$xx,xxx,xxx.xx	\$xx,xxx,xxx.xx	

01330-E MBE/WBE UTILIZATION FORM

CONTRACTOR'S MONTHLY STATEMENT OF MBE/WBE UTILIZATION

CONTRACTOR: _____ PAY REQUEST NO.: _____ REPORT PERIOD FROM: _____ to _____

Project Number: _____ Project Description: _____	Base Bid Amount: \$ _____ Required Goals: MBE _____% WBE _____% Proposed Goals: MBE _____% WBE _____%
---	--

M/WBE Business Name Representative Name and Telephone Number	MBE or WBE	Original Contract Amount	Contract Adjustments	Revised Contract Amount	AMOUNT EARNED THIS PERIOD	AMOUNT EARNED TO DATE	Amount Retained this Period	Amount Retained to Date	Percentage Completed to Date
Minority Owned Business Enterprise Totals									
Woman Owned Business Enterprise Totals									

Authorized Signature: _____ **Date:** _____

Name and Title: _____

OWNER USE
Percent of total project complete _____ % Date: _____
City Project Manager _____ Signature

REQUEST FOR CHANGE ORDER PROPOSAL

Date: _____

CONTRACTOR _____

Project Name _____

Project No. _____

Change Order No. _____

NOTICE TO CONTRACTOR: Please submit a Change Order Proposal for the proposed modifications to the Contract Documents as described below. If acceptable, a Change Order will be issued to authorize the work. **THIS IS NOT A CHANGE ORDER FOR AUTHORIZATION TO PROCEED WITH THE WORK AS DESCRIBED!**

SCOPE OF WORK:

OWNER _____

CHANGE ORDER PROPOSAL

Date _____

Subject: Project Name _____

Project No. _____

Change Order No. _____

Dear Sir:

Certain items of extra work have been found necessary which are not covered by the Contract for the above referenced Project. Therefore, we submit the following amounts as the basis of compensation for such extra work:

JUSTIFICATION:

The Contract completion time will be (increased)(decreased) ____ consecutive calendar days.

Total Cost of Extra Work Covered by Above: \$ _____

Previously Approved Extra Work: \$ _____

Original Contract Amount: \$ _____

TOTAL: \$ _____

By: _____

Title: _____

CONTRACTOR: _____

(OWNER)
WORK CHANGE DIRECTIVE NUMBER X

Project No. XXXXXXXX	Project Title NAME OF PROJECT
--------------------------------	---

CONTRACTOR: _____ CONTRACT NUMBER: _____

IN ACCORDANCE WITH THIS CONTRACT, THE FOLLOWING CHANGE IS ORDERED.

DESCRIPTION:

AUTHORIZATION FOR WORK DESCRIBED HEREIN TO PROCEED ON A NEGOTIATED COST BASIS.

AUTHORIZATION FOR WORK DESCRIBED HEREIN TO PROCEED ON A TIME AND MATERIALS BASIS.

COST:

NET AMOUNT OF THIS WORK CHANGE DIRECTIVE = \$ _____

THE CONSTRUCTION CONTRACT ADMINISTRATOR HAS REVIEWED THE COST FOR THIS WORK CHANGE DIRECTIVE AND CONSIDERS IT REASONABLE FOR THE LABOR AND MATERIAL NECESSARY TO COMPLETE THE WORK.

CONTRACT TIME: INCREASE BY _____ DAYS. NO CHANGE.

RECOMMENDED BY: _____ DATE: _____
CONSTRUCTION CONTRACT ADMINISTRATOR

ACCEPTED BY: _____ DATE: _____
CONTRACTOR

APPROVED BY: _____ DATE: _____
OWNER

01330-I CHANGE ORDER

(OWNER)

CONTRACT CHANGE ORDER NO. X

Page 1 of 1

PROJECT NUMBER XXXXXXXX	PROJECT TITLE NAME OF PROJECT		
CONTRACT NUMBER XXXXX	NAME OF CONTRACTOR XXXXX	% COMPLETE(\$) XX%	% TIME USED XX%

In accordance with this contract, the following change is ordered, resulting in: (Check all that apply).

- | | | |
|--|---|--|
| <input type="checkbox"/> Increase in Contract Amount | <input type="checkbox"/> No Change in Contract Amount | <input type="checkbox"/> Decrease in Contract Amount |
| <input type="checkbox"/> Increase in Contract Time | <input type="checkbox"/> No Change in Contract Time | <input type="checkbox"/> Decrease in Contract Time |

DESCRIPTION:

COST:

Work Change Directive No. X-

Prepared by: Project Manager

THIS CHANGE ORDER: AMOUNT: \$ _____ TIME (Days): _____	PRIOR CHANGE ORDER(S): AMOUNT: \$ _____ TIME (Days): _____	ORIGINAL CONTRACT: AMOUNT: \$ _____ TIME (Days): _____	ADJUSTED CONTRACT: AMOUNT: \$ _____ TIME (Days): _____
Notice to Proceed Date:	Original Contract Completion Date:	Adjusted Contract Completion Date:	
We, the undersigned, have given careful consideration to the change proposed, and hereby agree, if this proposal is approved, that we will provide all equipment, furnish all materials, except as may otherwise be noted above, and perform all services necessary for the work specified, and will therefore, accept as full payment, the fees or prices and adjustments in contract time shown above. This Change Order includes all direct costs such as labor, material, job overhead, profit, costs for modifications or changes in sequence of work to be performed, delays, rescheduling, disruptions, extended direct overhead or general overhead, acceleration, material or other escalation which include wages and other impact costs.		REVIEWED BY: _____ (Construction Contract Administrator) DATE	
		RECOMMENDED BY: _____ (A or B - Project Manager) (C - Superintendent) DATE	
		RECOMMENDED BY: _____ (A or B - Project Manager) (C - Superintendent) DATE	
ACCEPTED (Contractor): COMPANY/FIRM: NAME OF CONTRACTOR SIGNATURE: _____ TITLE: _____ DATE: _____		APPROVED BY: _____ (A or B - Superintendent) (C - Assistant Director) DATE	
		AUTHORIZED FOR THE CITY MANAGER BY: _____ (A or B - Assistant Director) (C - Director) DATE	

(OWNER)

CONTRACT CHANGE ORDER NO. X

SUPPLEMENTARY REPORT

Page 1 of 1

PROJECT NUMBER XXXXXXXX	PROJECT TITLE NAME OF PROJECT		
CONTRACT NUMBER XXXXX	NAME OF CONTRACTOR XXXXX	% COMPLETE(\$) XX%	% TIME USED XX%

REASON:

Work Change Directive No. X

Prepared By: Project Manager

BASIS FOR CHANGE: (Check all that apply).

- | | | |
|---|--|---|
| <input type="checkbox"/> City Request
Item 1 | <input type="checkbox"/> Negotiated Cost
Item 1 | <input type="checkbox"/> Contractor Request |
| <input type="checkbox"/> Use of Allowances | <input type="checkbox"/> Unforeseen Site Condition | <input type="checkbox"/> Final Quantity Adjustment |
| <input type="checkbox"/> Error or Omission | <input type="checkbox"/> Engineer Request | <input type="checkbox"/> Added Value for Added Cost |

Reviewed by: _____ Date: _____

01330-J REQUEST FOR INFORMATION

(OWNER)

REQUEST FOR INFORMATION

CONTRACTOR _____
Requested By _____
Subject _____
Spec. Section _____
Drawing References _____
Date Reply Needed _____

RFI# _____
Directed to _____
Date Received _____
Date Transmitted _____
Date Reply Received _____
Date Reply Transmitted _____

INFORMATION NEEDED:

Date _____ Signature _____

REPLY:

Date _____ Signature _____

01330-K REQUEST FOR ALTERATION

(OWNER)

REQUEST FOR ALTERATION

CONTRACTOR _____
Requested By _____
Subject _____
Spec. Section _____
Drawing References _____
Date Reply Needed _____

RFA# _____
Directed to _____
Date Received _____
Date Transmitted _____
Date Reply Received _____
Date Reply Transmitted _____

REQUESTED ALTERATION:

Date _____ Signature _____

REPLY:

Date _____ Signature _____

01330-L CONTRACTOR'S DAILY CONSTRUCTION REPORT

CONTRACTOR _____

CONTRACTOR'S DAILY CONSTRUCTION REPORT

Project Name _____	Report No. _____	Date _____
Project No. _____		

CONTRACTORS WORK FORCE:	SUBCONTRACTORS WORK FORCE:	EQUIPMENT ON SITE:
		In Use Not in Use
Administrative _____	Mechanical _____	Cranes _____
Supervisors _____	Electrical _____	Loaders _____
Carpenters _____	Instrumentation _____	Dozers _____
Iron Workers _____	Sitework _____	Scrapers _____
Operators _____	Masonry _____	Compactors _____
Finishers _____	Roofing _____	Compressors _____
Welders _____	Rebar _____	Welders _____
Electricians _____	Foundation _____	Graders _____
Laborers _____	Painting _____	Trucks _____
_____	_____	Backhoe _____
_____	_____	_____
_____	_____	_____

Work Performed: _____

Material and Equipment Delivered: _____

Remarks: _____

By: _____

Title: _____

(OWNER)

TV INSPECTION REQUEST

DATE: _____

REQUESTOR: _____

PHONE #: _____

LOCATION: _____

REASON FOR INSPECTION: _____

Q.S.: _____ *(PLEASE PROVIDE COPY OF SECTION TO BE INSPECTED)*

LINEAL FT. TO INSPECT: _____ C/O-MH#: _____ TO C/O-MH#: _____

PIPE DIAM.: _____

PIPE TYPE: _____

DEPTH OF FLOW: _____ IN.

MH DEPTH: _____

DATE WHEN LAST CLEANED: MH=S: _____ MAIN: _____

COMMENTS: _____

FOR TV SECTION ONLY

DATE RECEIVED: _____

ASSIGNED TO: _____ DATE: _____ EQUIP: _____

COMPLETED: _____ DATE: _____

COMMENTS: _____

SUBMITTAL TRANSMITTAL

Submittal Description: _____ Submittal No: _____
 Spec Section: _____

	Routing	Sent	Received
OWNER:	Contractor/RPR		
PROJECT:	RPR/CCA		
	CCA/RPR		
CONTRACTOR:	RPR/Contractor		

We are sending you Attached Under separate cover via _____.
Submittals for review and comment
Product data for information only

Remarks: _____

Item	Copies	Date	Section No.	Description	Review action ^a	Reviewer initials	Review comments attached

^aNote: A = Approved; AC = Approved as Corrected; ACR = Approved as corrected Resubmit; RR - Revise and Resubmit; NR - Not Reviewed; NA - Not Approved; I - For Information Only Attach additional sheets if necessary.

Contractor

Certify either A or B:

- ___ A. We have verified that the material or equipment contained in this submittal meets all the requirements, including coordination with all related work, specified (no exceptions).
 ___ B. We have verified that the material or equipment contained in this submittal meets all the requirements specified except for the attached deviations.

No.

Deviation

Certified by: _____

01415-A CONFINED SPACE DATA SHEET

(OWNER)

Confined Space Data Sheet

Name of Confined Space: _____

Location of Confined Space: _____

Division/Section Responsible for Confined Space: _____

PRE-ENTRY SYSTEM CONTROL

	<u>Check</u>
Mechanical: Isolate, lockout and de-energize to zero potential energy.	<input type="checkbox"/>
Engulfment: Blank/block/cap/bleed off lines. Lock out gates, valves, pumps.	<input type="checkbox"/>
Electrical: Lockout/Tagout	<input type="checkbox"/>
Inerting: Flush/Purge/Vent	<input type="checkbox"/>
Special precautions: _____	

ATMOSPHERE

Date of least measured values: _____

Constituent	O ₂	Explosive	H ₂ S/Toxic	CO	Date/Time	Initials
Permissible Range	19.5%-23.5%	<10% LFL	<10ppm H ₂ S	<35ppm	Completed	
Last Measured Values	_____	_____	_____	_____	_____	_____

SITE AND PERSONAL SAFETY (check if required, list type where applicable)

Personal Protective Equipment:

Safety Harness Life Lines Hard Hats Fall Protection Retrieval Eye Ear Face Hand

Foot Respiratory (type) _____ Clothing (type) _____

Other: _____

Rescue and Emergency Equipment:

Retrieval Equipment Fire Extinguishers Radios/Telephone Ladder Other _____

Equipment on Standby for Rescue Personnel _____

Site Safety:

Explosion-Proof Lighting Barriers/Shield/Barricades (type) _____ Postings/Flagging

Other _____

List specific equipment isolated, de-energized, and locked out.

(OWNER)

Confined Space Entry Permit

ENTRY TEAM

Division: _____ Facility: _____

Specific confined space being entered: _____

Purpose of entry (describe the work to be done): _____

Date: _____ Time: _____ Expected Job Duration (days/hours): _____

Entry Supervisor: _____ Designated Attendant: _____

Authorized/Qualified Entrants: _____

Entry-Team Rotation:

Date: _____ Time: _____

Entry Supervisor: _____ Designated Attendant: _____

Authorized/Qualified Entrants: _____

Entry-Team Rotation:

Date: _____ Time: _____

Entry Supervisor: _____ Designated Attendant: _____

Authorized/Qualified Entrants: _____

Communication Procedures:

Entry Team: _____

Standby/Rescue Personnel: _____

Sign Offs:

Person authorizing this entry: _____

Entry Supervisor: _____

Person terminating permit: _____ Date: _____ Time: _____

Distribution to: _____

Confined Space Entry Permit

PRE-ENTRY SYSTEM CONTROL

	<u>Check</u>	<u>Date/Initials</u>
Mechanical: Isolate, lockout and de-energize to zero potential energy.	Completed <input type="checkbox"/>	_____
Engulfment: Blank/block/cap/bleed off lines. Lock out gates, valves, pumps.	Completed <input type="checkbox"/>	_____
Electrical: Lockout/Tagout	Completed <input type="checkbox"/>	_____
Inerting: Flush/Purge/Vent	Completed <input type="checkbox"/>	_____
Special precautions: _____		

ATMOSPHERE - Tested by portable atmospheric monitor with audible and visual alarms.
No one will enter a space with an unsafe atmosphere without approval from the Division Superintendent/Assistant Superintendent.

Constituent	O ₂	Explosive	H ₂ S/Toxic	CO	Date/Time	
Permissible Range	19.5%-23.5%	<10% LFL	<10ppm H ₂ S	<35ppm	Completed	Initials
Pre-Entry	_____	_____	_____	_____	_____	_____
Post Ventilation	_____	_____	_____	_____	_____	_____
Continuous	_____	_____	_____	_____	_____	_____
Continuous	_____	_____	_____	_____	_____	_____
Continuous	_____	_____	_____	_____	_____	_____

Ventilation Used (circle one): **Mechanical** **Natural**
Special Precautions: (See Confined Space Data Sheet) _____

SITE AND PERSONAL SAFETY (check if required, list type where applicable)

Personal Protective Equipment:
 Safety Harness Life Lines Hard Hats Fall Protection Retrieval Eye Ear Face Hand
 Foot Respiratory (type) _____ Clothing (type) _____
 Other: _____

Rescue and Emergency Equipment:
 Retrieval Equipment Fire Extinguishers Radios/Telephone Other _____
 Equipment on Standby for Rescue Personnel _____

Site Safety:
 Explosion-Proof Lighting Barriers/Shield/Barricades (type) _____ Postings/Flagging
 Other _____

List specific equipment isolated, de-energized, and locked out.

01415-C CONFINED SPACE HOT WORK PERMIT
(OWNER)

Confined Space Hot Work Permit

Division: _____ **Facility:** _____

Specific Confined Space Being Entered: _____

Date: _____ **Time:** _____

Expected Job Duration (days/hours): _____

Purpose of Entry (describe the work to be done): _____

Explain why work cannot be done outside of the confined space: _____

Safety Equipment Required:

Fire Extinguishers: **Yes** _____ **No** _____ **Number** _____
Type _____

Respirators: **Yes** _____ **No** _____ **Number** _____
Type _____

Other Equipment: _____

Authorizing Supervisor:

Print Name _____

Signature _____

Date Signed _____

01600-A EQUIPMENT INFORMATION FORM

(OWNER)
(INSERT PROJECT NAME)
EQUIPMENT INFORMATION FORM

Name: _____ Date: _____

Equipment No.: _____ Description: _____

(Insert Owner) No.: _____ Type: _____

Manufacturer: _____ Location: _____

Model No.: _____ Vendor: _____

Serial No.: _____ Doc. Ref: _____

DWG. Ref: _____ Assoc. Equipment: _____

Size: _____ HP: _____

GPM: _____ PH/DC: _____

Temp: _____ Volts: _____

PSI: _____ Amps: _____

CFM: _____ RPM: _____

Output: _____ Power Ser: _____

Range: _____ Frame: _____

Order No.: _____ Enclosure: _____

Electrical Data: _____

Mechanical Data: _____

Frequency	Week No.	Work to be done
_____	_____	_____
_____	_____	_____
_____	_____	_____

(Project Name)

CERTIFICATE OF UNIT RESPONSIBILITY
for Section _____

(Section title)

In accordance with Paragraph 01600.1.2.B of the Contract Documents, the undersigned manufacturer accepts unit responsibility for all components of equipment furnished under specification Section _____.

We hereby certify that these components are compatible and comprise a functional unit suitable for the specified performance and design requirements.

Notary Public

Name of Corporation

Commission expiration date

Address

Seal:

By: _____
Duly Authorized Official

Legal Title of Official

Date: _____

MANUFACTURER'S INSTALLATION CERTIFICATION FORM

Contract No.: _____ Section: _____

Equipment Name: _____

CONTRACTOR: _____

Manufacturer of Equipment Item: _____

The undersigned manufacturer of the equipment item described above hereby certifies that he has checked the installation of the equipment and that the equipment, as specified in the Contract Documents, has been provided in accordance with the manufacturer's recommendations, and that the trial operation of the equipment item has been satisfactory.

Comments: _____

Date

Manufacturer

Signature of Authorized Representative

Date

CONTRACTOR

Signature of Authorized Representative

EQUIPMENT TEST REPORT FORM

NOTE: This example equipment test report is provided for the benefit of CONTRACTOR and is not specific to any piece of equipment to be installed as a part of this Project. The example is furnished as a means of illustrating the level of detail required for the preparation of equipment test report forms for this project.

 NTS: INSERT AT NO. 1 AND 2 PROJECT TITLE. INSERT AT NO. 3 CONSTRUCTION CONTRACT ADMINISTRATOR'S NAME.

(OWNER)
 (--1--)
 (--2--)
 _____ CONTRACTOR
 (--3--)

EQUIPMENT/SYSTEM TEST REPORT

Equipment Name: _____
 Equipment Number: _____
 Specification Ref: _____
 Location: _____
 System: _____

CONTRACTOR		ENGINEER	
Verified	Date	Verified	Date

PRE-OPERATIONAL CHECKLIST

Mechanical

Lubrication.	_____	_____	_____	_____
Alignment.	_____	_____	_____	_____
Anchor bolts.	_____	_____	_____	_____
Seal water system operational.	_____	_____	_____	_____
Equipment rotates freely.	_____	_____	_____	_____
Safety guards.	_____	_____	_____	_____
Valves operational.	_____	_____	_____	_____
Hopper purge systems operational.	_____	_____	_____	_____
Sedimentation tank/hopper clean.	_____	_____	_____	_____
O&M Manual information complete.	_____	_____	_____	_____
Manufacturer's installation certificate complete.	_____	_____	_____	_____

EQUIPMENT TEST REPORT FORM

	CONTRACTOR		ENGINEER	
	Verified	Date	Verified	Date

Electrical (circuit ring-out and high-pot tests)

Circuits:

Power to MCC __.	_____	_____	_____	_____
Control to HOA.	_____	_____	_____	_____
Indicators at MCC:				
Red (running).	_____	_____	_____	_____
Green (power).	_____	_____	_____	_____
Amber (auto).	_____	_____	_____	_____
Indicators at local control panel.	_____	_____	_____	_____
Wiring labels complete:	_____	_____	_____	_____
Nameplates:				
MCC.	_____	_____	_____	_____
Control station.	_____	_____	_____	_____
Control panel.	_____	_____	_____	_____
Equipment bumped for rotation:	_____	_____	_____	_____

Piping Systems

Cleaned and flushed:				
Suction.	_____	_____	_____	_____
Discharge.	_____	_____	_____	_____
Pressure tests:	_____	_____	_____	_____
Temporary piping screens in place:	_____	_____	_____	_____

Instrumentation and Controls

Flowmeter FE_____ calibration:	_____	_____	_____	_____
Calibration Report No. _____				
Flow recorder FR_____ calibrated against transmitter:	_____	_____	_____	_____
VFD speed indicator calibrated against independent reference:	_____	_____	_____	_____
Discharge overpressure shutdown switch calibration:	_____	_____	_____	_____
Simulate discharge overpressure Shutdown:	_____	_____	_____	_____

EQUIPMENT TEST REPORT FORM

CONTRACTOR		ENGINEER	
Verified	Date	Verified	Date

EQUIPMENT/SYSTEM PERFORMANCE TESTS (Section 01752)

Mechanical

Motor operation temperature				
Satisfactory:	_____	_____	_____	_____
Pump operating temperature				
Satisfactory:	_____	_____	_____	_____
Unusual noise, etc?	_____	_____	_____	_____
Pump operation: 75 gpm/50 psig:	_____	_____	_____	_____
Measurement:				
Flow _____				
Pressure _____		Test gage number _____		
Alignment hot:	_____	_____	_____	_____
Dowelled in.	_____	_____	_____	_____

Remarks: _____

Electrical

Local switch function:				
Runs in <i>HAND</i>	_____	_____	_____	_____
No control power in <i>OFF</i>	_____	_____	_____	_____
Timer control in <i>AUTO</i>	_____	_____	_____	_____
Overpressure protection switch				
PS_____ functional in both				
<i>HAND</i> and <i>AUTO</i> :	_____	_____	_____	_____
Overpressure protection switch				
PS_____ set at 75 psig:	_____	_____	_____	_____
PLC 2500 set at 24-hour cycle,				
25 min <i>ON</i> :	_____	_____	_____	_____

Equipment/System Performance Test Completed

Contractor _____ Date _____

Equipment/System Performance Test Accepted

Engineer _____ Date _____

OPERATION AND MAINTENANCE TRANSMITTAL FORM

Date: _____ Submittal No.¹: _____
 To: _____ Contract No.: _____
 _____ Spec. Section: _____
 _____ Submittal Description: _____
 _____ From: _____
 Attention: _____

Checklist	CONTRACTOR		ENGINEER	
	Satisfactory	N/A	Accept	Deficient
1. Table of Contents				
2. Equipment forms				
3. Manufacturer information				
4. Vendor information				
5. Safety precautions				
6. Operator prestart				
7. Start-up, shutdown, and post-shutdown procedures				
8. Normal operations				
9. Emergency operations				
10. Operator service requirements				
11. Environmental conditions				
12. Lubrication data				
13. Preventive maintenance plan and schedule				
14. Troubleshooting guides and diagnostic techniques				
15. Wiring diagrams and control diagrams				
16. Maintenance and repair procedures				
17. Removal and replacement instructions				
18. Spare parts and supply list				
19. Corrective maintenance man-hours				
20. Parts identification				
21. Warranty information				
22. Personnel training requirements				
23. Testing equipment and special tool information				

Remarks: _____

 CONTRACTOR'S Signature

¹ Refer to Paragraph 01340-1.2 A, Transmittal Procedure.

MANUFACTURER'S INSTRUCTION CERTIFICATION FORM

Contract No: _____ Section: _____ Equipment Name: _____

CONTRACTOR: _____

Manufacturer of equipment item: _____

The undersigned manufacturer certifies that a service engineer has instructed the Plant operating personnel in the proper maintenance and operation of the equipment designated herein.

Operations Check List (check appropriate spaces)

Start-up procedure reviewed.	_____
Shutdown procedure reviewed.	_____
Normal operation procedure reviewed.	_____
Others: _____	_____
_____	_____

Maintenance Check List (check appropriate spaces)

Described normal oil changes (frequency).	_____
Described special tools required.	_____
Described normal items to be reviewed for wear.	_____
Described preventive maintenance instructions.	_____
Described greasing frequency.	_____
Others: _____	_____
_____	_____

Date

Manufacturer

Signature of Authorized Representative

Date

Signature of OWNER'S Representative

Date

Signature of CONTRACTOR'S Representative

11000-A MOTOR DATA FORM

MOTOR DATA FORM

Equipment Name: _____

Equipment No.(s): _____

Site Location: _____

Nameplate Markings

Mfr _____ Mfr Model _____ Frame _____ HP _____
 Volts _____ Phase _____ RPM _____ Service factor _____
 FLA _____ LRA _____ Freq _____ Amb temp rating _____ degrees C
 Time rating _____ Design letter _____
 (NEMA MG1-10.35) (NEMA MG-1.16)

KVA code letter _____ Insulation class _____

The following information is required for explosionproof motors only:

- A. Approved by UL for installation in Class _____, Div _____
- B. UL frame temperature code _____; Group _____ Atmosphere
(NEC Tables 500-2 and 500-2(b))

The following information is required for all motors 1/2 horsepower and larger:

- A. Guaranteed minimum efficiency _____
(Section 11000)
- B. Nameplate or nominal efficiency _____

Data Not Necessarily Marked on Nameplate

Type of enclosure _____ Enclosure material _____
 Temp rise _____ degrees C (NEMA MG1-12.41,42)
 Space heater included? _____ Yes _____ No; if Yes, _____ watts _____ volts
 Type of motor winding overtemperature protection, if specified: _____

Use the space below to provide additional information on other motor modifications, if specified:

13490-A LOOP WIRING AND INSULATION RESISTANCE TEST DATA FORM

LOOP WIRING AND INSULATION RESISTANCE TEST DATA FORM

Loop No.: _____

List all wiring associated with a loop in table below. Make applicable measurements as indicated after disconnecting wiring.

Wire No.	Panel Tie	Field TB	Continuity Resistance ¹		Insulation Resistance ²			
			Cond./Cond.	Cond./Shield	Shield/Gnd.	Shield/Cond.	Cond./Gnd.	Shield/Shield
A	_____	_____	--	(A/SH)	_____	_____	_____	_____
B	_____	_____	(A/B)	--	_____	_____	_____	_____
C	_____	_____	(A/C)	--	_____	_____	_____	_____
D	_____	_____	(A/D)	--	_____	_____	_____	_____
etc	_____	_____			_____	_____	_____	_____

1. Continuity Test. Connect ohmmeter leads between wires A and B and jumper opposite ends together. Record resistance in table. Repeat procedure between A and C, A and D, etc. Any deviation of ± 2 ohms between any reading and the average of a particular run indicates a poor conductor, and corrective action shall be taken before continuing with the loop test.
2. Insulation Test. Connect one end of a 500 volt megger to the panel ground bus and the other sequentially to each completely disconnected wire and shield. Test the insulation resistance and record each reading.

CERTIFIED _____
CONTRACTOR'S Representative

Date _____

WITNESSED _____
OWNER'S Representative

Date _____

13490-B CONTROL CIRCUIT PIPING LEAK TEST FORM

CONTROL CIRCUIT PIPING LEAK TEST FORM

Loop No.: _____

List tubing associated with loop in table below. Make applicable measurements after isolating any air consuming pilots from circuit.

Tube No.	Tubing Equivalent Length of 1/4-Inch Copper ¹	Test Period (seconds)	Permitted Pressure Drop (psi) ²	Measured Pressure Drop (psi)
A	_____	_____	_____	_____
B	_____	_____	_____	_____
C	_____	_____	_____	_____
D	_____	_____	_____	_____
Etc.	_____	_____	_____	_____

1. Convert actual tubing and air motor volume to equivalent 1/4-inch copper tubing.
2. Pressure drop shall not exceed 1 psi per hundred feet 1/4-inch tubing per 5 seconds.

CERTIFIED _____
CONTRACTOR'S Representative

Date _____

WITNESSED _____
OWNER'S Representative

Date _____

13490-C CONTROLLER CALIBRATION TEST DATA FORM

CONTROLLER CALIBRATION TEST DATA FORM

Tag No. and Description: _____

Make and Model No.: _____ Serial No.: _____

Input: _____ Process Variable (PV) Scale: _____

Output: _____ Output Scale: _____

PV Scale Calibration

<u>% of Range</u>	<u>Input</u>	<u>Expected Reading</u>	<u>Actual Reading</u>	<u>% Deviation</u>
0	_____	_____	_____	_____
50	_____	_____	_____	_____
100	_____	_____	_____	_____

% Deviation Allowed: _____

Connect output to PV for following tests:

<u>Set Point (SP) Indicator Accuracy</u>			<u>Output Meter Accuracy</u>			<u>Controller Accuracy</u>		
<u>SP</u>	<u>PV Reading</u>	<u>Expected % Dev.</u>	<u>Actual Reading</u>	<u>Expected Reading</u>	<u>Actual % Dev.</u>	<u>Output</u>	<u>Output</u>	<u>% Dev.</u>
(0%)	_____	_____	_____	_____	_____	_____	_____	_____
(50%)	_____	_____	_____	_____	_____	_____	_____	_____
(100%)	_____	_____	_____	_____	_____	_____	_____	_____
%Dev. Allowed: _____			% Dev. Allowed: _____			% Dev. Allowed: _____		

CERTIFIED _____
CONTRACTOR'S Representative

Date _____

WITNESSED _____
OWNER'S Representative

Date _____

13490-D PANEL INDICATOR CALIBRATION TEST DATA FORM

PANEL INDICATOR CALIBRATION TEST DATA FORM

Tag No. and Description: _____

Make and Model No.: _____

Serial No.: _____

Input: _____

Scale: _____

Range: _____

PV Scale Calibration

<u>% of Range</u>	<u>Input</u>	<u>Expected Reading</u>	<u>Actual Reading</u>	<u>% Deviation</u>
0	_____	_____	_____	_____
50	_____	_____	_____	_____
100	_____	_____	_____	_____

% Deviation Allowed: _____

CERTIFIED _____
CONTRACTOR'S Representative

Date _____

WITNESSED _____
OWNER'S Representative

Date _____

13490-E RECORDER CALIBRATION TEST DATA FORM

RECORDER CALIBRATION TEST DATA FORM

Tag No. and Description: _____

Make and Model No.: _____ Serial No.: _____

Input: _____ Chart: _____

Scale: _____ Range: _____

<u>% of Range</u>	<u>Input</u>	<u>Expected Reading</u>	<u>Actual Reading</u>	<u>% Deviation</u>
0	_____	_____	_____	_____
50	_____	_____	_____	_____
100	_____	_____	_____	_____

% Deviation Allowed: _____

CERTIFIED _____
CONTRACTOR'S Representative

Date _____

WITNESSED _____
OWNER'S Representative

Date _____

13490-F SIGNAL TRIP CALIBRATION TEST DATA FORM

SIGNAL TRIP CALIBRATION TEST DATA FORM

Tag No. and Description: _____

Make and Model No.: _____ Serial No.: _____

Input: _____

Scale: _____ Range: _____

Set Point(s): _____

After setting set point(s), run signal input through entire range and calculate deadband.

<u>Set Point</u>	<u>Incr. Input Trip Point</u>	<u>Decr. Input Trip Point</u>	<u>Calc. Deadband</u>	<u>Required Deadband</u>
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____

CERTIFIED _____
CONTRACTOR'S Representative

Date _____

WITNESSED _____
OWNER'S Representative

Date _____

13490-G FIELD SWITCH CALIBRATION TEST DATA FORM

FIELD SWITCH CALIBRATION TEST DATA FORM

Tag No. and Description: _____

Make and Model No.: _____

Serial No: _____

Input: _____

Range: _____

Set Point(s): _____

Simulate process variable (flow, pressure, temperature, etc.) and set desired set point(s). Run through entire range of switch and calculate deadband.

<u>Set Point</u>	<u>Incr. Input Trip Point</u>	<u>Decr. Input Trip Point</u>	<u>Calc. Deadband</u>	<u>Required Deadband</u>
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____

CERTIFIED _____
CONTRACTOR'S Representative

Date _____

WITNESSED _____
OWNER'S Representative

Date _____

13490-H TRANSMITTER CALIBRATION TEST DATA FORM

TRANSMITTER CALIBRATION TEST DATA FORM

Tag No. and Description: _____

Make and Model No.: _____

Serial No.: _____

Input: _____

Output: _____

Range: _____

Scale: _____

Simulate process variable (flow, pressure, temperature, etc.) and measure output with appropriate meter.

<u>% of Range</u>	<u>Input</u>	<u>Expected Output</u>	<u>Actual Output</u>	<u>% Deviation</u>
0	_____	_____	_____	_____
50	_____	_____	_____	_____
100	_____	_____	_____	_____

% Deviation Allowed: _____

CERTIFIED _____
CONTRACTOR'S Representative

Date _____

WITNESSED _____
OWNER'S Representative

Date _____

13490-I MISCELLANEOUS INSTRUMENT CALIBRATION TEST DATA FORM

MISCELLANEOUS INSTRUMENT CALIBRATION TEST DATA FORM

(For instruments not covered by any of the preceding test forms, CONTRACTOR shall create a form containing all necessary information and calibration procedures.)

CERTIFIED _____
CONTRACTOR'S Representative

Date _____

WITNESSED _____
OWNER'S Representative

Date _____

13490-J INDIVIDUAL LOOP TEST DATA FORM

INDIVIDUAL LOOP TEST DATA FORM

Loop No.: _____

Description: (Give complete description of loop's function using tag numbers where appropriate.)

P&ID No.: (Attach copy of P&ID.)

- a. Wiring tested:
(Attach Test Form 13490-A)
- b. Instrumentation tubing/piping tested:
(Attach Test Form 13490-B)
- c. Instruments calibrated:
(Attach Test Form 13490-C through I)
- d. List step-by-step procedures for testing loop parameters. Test loop with instruments, including transmitters and control valves, connected and functioning. If it is not possible to produce a real process variable, then a simulated signal may be used with the ENGINEER'S approval.

CERTIFIED _____
CONTRACTOR'S Representative

Date _____

WITNESSED _____
OWNER'S Representative

Date _____

LOOP COMMISSIONING TEST DATA FORM

Loop No.: _____

- a. Loop tested:
(Attach Test Form 13490-J.)
- b. Controlled or connected equipment tests confirmed.
- c. Give complete description of loop's interface with process.
- d. With associated equipment and process in operation, provide annotated chart trace of loop response to changes in set points for verification of performance. This chart should demonstrate quarter-amplitude damping as output adjusts to set point change. Show set points, starting and finishing times on chart, as well as any other pertinent data.

Connect 2-pen recorder to process variable (PV) and to controller output. Use 1 inch/second chart speed.

Pen 1 - PV - Connections:

Pen 2 - Output - Connections:

CERTIFIED _____
CONTRACTOR'S Representative

Date _____

WITNESSED _____
OWNER'S Representative

Date _____

15142-A REQUEST FOR BACTERIOLOGICAL SAMPLES

(OWNER)	REQUEST FOR BACTERIOLOGICAL SAMPLES	LAB# _____
	Date: _____	
	From: TYPE NAME HERE	
	NAME OF AGENCY MAKING REQUEST	
	Fax: XXX XXX-XXXX, Telephone No. XXX XXX-XXXX	
	To: (OWNER)	
Area/Zone # _____ Permit/Project # _____		
Date Wanted: _____ Circle One: AM PM Any		
Contractor: _____ Office On Site? Yes No Phone No. _____		
Location Of Risers:		
#1. _____		
#2. _____		
#3. _____		
#4. _____		
#5. _____		
#6. _____		
Lines Represented: _____		
Requested By Inspector: _____ Beeper/Tel No.: _____		
Test Results:		
_____ Pass	Fax Date: _____	Time: _____ No. of Pages: _____
_____ Failed	Faxed To: _____	Faxed By: _____
_____ Bacteria	Inspectors Comments: _____	
_____ High Chlorine	_____	
_____ No Pressure	_____	
_____ No Risers	_____	
_____ Other	_____	

WIRE AND CABLE RESISTANCE TEST DATA FORM

Wire or Cable No.: _____

Temperature, °F : _____

Location of Test

Insulation
resistance,
megohms

1. _____

2. _____

3. _____

4. _____

5. _____

6. _____

7. _____

CERTIFIED _____
CONTRACTOR'S Representative

Date _____

WITNESSED _____
OWNER'S Representative

Date _____

16000-B INSTALLED MOTOR TEST DATA FORM

INSTALLED MOTOR TEST DATA FORM

Motor Equipment Number: _____ Date of test: _____

Equipment Driven: _____

MCC Location: _____ Ambient temp: _____ °F

Resistance:

Insulation resistance phase-to-ground megohms:

Phase A _____, Phase B _____, Phase C _____

Current at Full Load:

Phase _____ Current, amps _____

Phase _____ Current, amps _____

Phase _____ Current, amps _____

Thermal Overload Device: Manufacturer/Catalog No. _____ Amperes _____

Circuit breaker (MCP) setting: _____

Motor Nameplate Markings:

Mfr _____ Mfr type _____ Frame _____ HP _____

Volts _____ Phase _____ RPM _____ **Service factor _____

Amps _____ Freq _____ Ambient temp rating _____ °C

Time rating _____ **Design letter _____
(NEMA 1-10.35) (NEMA MG-1.16)

Code letter _____ Insulation class _____

**Required for 3-phase squirrel cage induction motors only.

CERTIFIED _____ Date _____
CONTRACTOR'S Representative

WITNESSED _____ Date _____
OWNER'S Representative

16000-C DRY TRANSFORMER TEST DATA FORM

DRY TRANSFORMER TEST DATA FORM

Equipment No.: _____ Temperature: _____

Location: _____

Winding: Primary _____ Secondary _____

A. INSULATION-RESISTANCE TEST:

The test shall be made with a megohmmeter at the test voltage for a period of 1 minute.

<u>Voltage rating</u>	<u>Test voltage</u>	<u>Test results (megohms)</u>	
		<u>Phase</u>	<u>Phase</u>
0-600	1000	A-GRD _____	A-B _____
601-5000	2500	B-GRD _____	B-C _____
5000+	5000	C-GRD _____	C-A _____

Resistance readings less than the manufacturer's recommended value or less than 10 megohms shall be brought to the attention of the CONSTRUCTION CONTRACT ADMINISTRATOR.

B. DIELECTRIC-ABSORPTION TEST:

The test shall be made with a megohmmeter at the test voltage for a period of 10 minutes.

1. TEST RESULTS: (megohms)	<u>Phase</u>	<u>Phase</u>
	A-GRD _____	A-B _____
	B-GRD _____	B-C _____
	C-GRD _____	C-A _____

2. POLARIZATION INDEX:

$$\frac{10 \text{ minute reading}}{1 \text{ minute reading}} = \text{polarization index}$$

(from Paragraph "A" above)

<u>Phase</u>	<u>Phase</u>
A-GRD _____	A-B _____
B-GRD _____	B-C _____
C-GRD _____	C-A _____

Polarization index values less than two shall be brought to the attention of the CONSTRUCTION CONTRACT ADMINISTRATOR.

CERTIFIED _____ Date _____
CONTRACTOR'S Representative

WITNESSED _____ Date _____
OWNER'S Representative

MOTOR CONTROL CENTER TEST FORM

Equipment No.: _____ Ambient room temperature: _____

Location: _____

A. MECHANICAL CHECK:

- 1. All bolted connections either bus to bus or cable to bus shall be torqued to the manufacturer's recommendations.

B. ELECTRICAL TESTS:

- 1. Measure insulation resistance of each bus section phase to phase and phase to ground for one minute using a megohmmeter at 1000 volts.

Test results (megohms)

<u>Phase</u>	<u>Phase</u>
A-GRD _____	A-B _____
B-GRD _____	B-C _____
C-GRD _____	C-A _____

- 2. Set the circuit breaker in the starter unit to comply with the requirements of NEC, Article 430-52 and Table 430-152.
- 3. Motor overload heater elements shall be sized and installed based on the actual nameplate full load amperes of the motor connected to the starter.

CERTIFIED _____
CONTRACTOR'S Representative

Date _____

WITNESSED _____
OWNER'S Representative

Date _____

MEDIUM VOLTAGE MOTOR STARTER TEST FORM

Equipment No.: _____

Location: _____

Room Temperature: _____

A. The protective devices shall be set in accordance with the specification before the tests are performed.

1. Measure contact resistance (micro-ohms).
Phase: A_____ B_____ C_____

Contacts shall be replaced if resistance exceeds 50 micro-ohms.

2. Perform an insulation resistance test (1000 volts DC for 1 minute).

<u>Phase</u>	<u>A</u>	<u>B</u>	<u>C</u>	
Pole to ground	___	___	___	megohms
Across open pole	___	___	___	megohms
Pole to pole	AB_____	BC_____	CA_____	megohms

3. Perform minimum pickup voltage tests on trip and close coils.

4. Motor RTDs shall be tested by using a hot oil bath. The temperature at which the sensor trips shall be recorded for each RTD.

5. The Contactor shall be tripped by operation of each protective device.

CERTIFIED _____
CONTRACTOR'S Representative

Date _____

WITNESSED _____
OWNER'S Representative

Date _____

MEDIUM VOLTAGE SWITCHGEAR TEST FORM

Equipment No.: _____

Location: _____

Room Temperature: _____

A. The protective devices shall be set in accordance with the specification before the tests are performed.

1. Measure contact resistance (micro-ohms).
Phase: A____ B____ C____

Contacts shall be replaced if resistance exceeds 50 micro-ohms.

2. Perform an insulation resistance test (1000 volts DC for 1 minute).

<u>Phase</u>	<u>A</u>	<u>B</u>	<u>C</u>	
Pole to ground	___	___	___	megohms
Across open pole	___	___	___	megohms
Pole to pole	AB___	BC___	CA___	megohms

3. Perform minimum pickup voltage tests on trip and close coils.
4. Verify the instrument transformer ratios. Check the transformer's polarity electrically.
5. The Contactor shall be tripped by operation of each protective device.

CERTIFIED _____
CONTRACTOR'S Representative

Date _____

WITNESSED _____
OWNER'S Representative

Date _____

PROTECTIVE RELAY TEST FORM

Location: _____

Switchgear Breaker No.: _____

Protective Relay Description: _____

- A. The protective relays shall be tested in the following manner:
 - 1. Each protective relay circuit shall have its insulation resistance tested to ground.
 - 2. Perform the following tests on the specified relay setting:
 - a. Pickup parameters on each operating element.
 - b. Timing test shall be performed at three points on the time dial curve.
 - c. Pickup target and seal-in units.

- B. The results shall be recorded and signed by CONTRACTOR and CONSTRUCTION CONTRACT ADMINISTRATOR. A copy shall be provided to the CONSTRUCTION CONTRACT ADMINISTRATOR in accordance with Section 01752, Equipment and System Startup and Performance Testing.

CERTIFIED _____
CONTRACTOR'S Representative

Date _____

WITNESSED _____
OWNER'S Representative

Date _____

16000-H LOW VOLTAGE SWITCHGEAR TEST FORM

LOW VOLTAGE SWITCHGEAR TEST FORM

Equipment No.: _____

Location: _____

Room Temperature: _____

A. The protective devices shall be set in accordance with the specification before the tests are performed.

1. Measure contact resistance (micro-ohms).

Phase: A _____ B _____ C _____

Contacts shall be replaced if resistance exceeds 50 micro-ohms.

2. Perform an insulation resistance test (1000 volts DC for 1 minute).

<u>Phase</u>	<u>A</u>	<u>B</u>	<u>C</u>	
Pole to ground	_____	_____	_____	megohms
Across open pole	_____	_____	_____	megohms
Pole to pole	AB _____	BC _____	CA _____	megohms

3. Minimum pickup current shall be determined by primary current injection.

4. Long time delay shall be determined by primary injection at 300 percent pickup current.

5. Short time pickup and time delay shall be determined by primary injection of current.

6. Instantaneous pickup current shall be determined by primary injection.

7. Trip unit reset characteristics shall be verified.

8. Auxiliary protective devices, such as ground fault or under voltage relays, shall be activated to ensure operation of shunt trip devices.

CERTIFIED _____
CONTRACTOR'S Representative

Date _____

WITNESSED _____
OWNER'S Representative

Date _____

MEDIUM VOLTAGE LOAD INTERRUPTER SWITCH TEST FORM

Equipment Number: _____

Location: _____

Date: _____

- 1. Measure switch blade resistance (micro-ohms).

Phase: A_____ B_____ C_____

Contacts shall be replaced if resistance exceeds 50 micro-ohms.

- 2. Perform an insulation resistance test (1000 volts DC for 1 minute).

<u>Phase</u>	<u>A</u>	<u>B</u>	<u>C</u>
Pole to ground	___	___	___ megohms
Across open pole	___	___	___ megohms
Pole to pole	AB__	BC __	CA __ megohms

The results shall be recorded and signed by CONTRACTOR and CONSTRUCTION CONTRACT ADMINISTRATOR. A copy shall be provided to the CONSTRUCTION CONTRACT ADMINISTRATOR in accordance with Section 01752, Equipment and System Startup and Performance Testing.

CERTIFIED _____
CONTRACTOR'S Representative

Date _____

WITNESSED _____
OWNER'S Representative

Date _____

LIQUID-FILLED TRANSFORMER TEST FORM

Equipment Number: _____

Location: _____

Date/Weather Conditions: _____

- A. Perform the "Insulation-Resistance Test" and "Dielectric Absorption Test" using Form 16000-C, Dry Transformer Test Data Form.
- B. Perform an applied voltage (low frequency dielectric) test in accordance with ANSI C57.12.90, Paragraph 10.5, Applied Voltage Test. Applied voltage levels shall be 75 percent of recommended factory test levels or recommended test levels of ANSI C57.12.00, Table 5.
- C. Insulating oil shall be sampled and shall be laboratory tested for the following:
 - 1. Dielectric strength.
 - 2. Acid neutralization.
 - 3. Interfacial tension.
 - 4. Color.
 - 5. Power factor.
- D. Perform a turns ratio test between the windings for all tap positions.
- E. The temperature and pressure switches shall be tested using a hot oil bath and air pump.
- F. The results shall be recorded and signed by CONTRACTOR and CONSTRUCTION CONTRACT ADMINISTRATOR. A copy shall be provided to the CONSTRUCTION CONTRACT ADMINISTRATOR in accordance with Section 01752, Equipment and System Startup and Performance Testing. Any readings which are abnormal to ANSI industry standards shall be reported to the CONSTRUCTION CONTRACT ADMINISTRATOR.

CERTIFIED _____
CONTRACTOR'S Representative

Date _____

WITNESSED _____
OWNER'S Representative

Date _____

AUTOMATIC TRANSFER SWITCH TEST FORM

Equipment Number: _____

Location: _____

Date: _____

- 1. Perform an insulation resistance test (1000 volts DC for 1 minute):

	<u>Phase</u>			
	<u>A</u>	<u>B</u>	<u>C</u>	
Pole to ground	___	___	___	megohms
Pole to pole	AB___	BC___	CA___	megohms

- 2. Perform the following operations and initial:
 - a. Manual transfer _____
 - b. Loss of normal power; ___sec. delay.
 - c. Return to normal power; ___sec. Delay.

The results shall be recorded and signed by CONTRACTOR and CONSTRUCTION CONTRACT ADMINISTRATOR. A copy shall be provided to the CONSTRUCTION CONTRACT ADMINISTRATOR in accordance with Section 01752, Equipment and System Startup and Performance Testing.

CERTIFIED _____
CONTRACTOR'S Representative

Date _____

WITNESSED _____
OWNER'S Representative

Date _____

16000-L NEUTRAL GROUNDING RESISTOR TEST

NEUTRAL GROUNDING RESISTOR TEST

Equipment No.: _____

Location: _____

Date: _____

- A. The pickup and time delay setting on the ground fault relay shall be set in accordance with Section 16061, Grounding Systems.
 - 1. The transformer neutral insulation resistance shall be measured with and without the grounding resistor connected to ensure no parallel ground paths exist.
 - 2. The protective relay pickup current shall be determined by injecting test current into the current sensor. The pickup current should be within ten percent of the dial setting. Record the dial setting and actual pickup tie.
 - 3. The relay timing shall be tested by injecting 150 and 300 percent of pickup current into the current sensor. The relay timing shall be in accordance with the manufacturer's published time-current characteristic curves. Record the relay timing at 150 and 300 percent of pickup current.
 - 4. The circuit interrupting device shall be operated by operating the relay.
- B. The results shall be recorded and signed by CONTRACTOR and CONSTRUCTION CONTRACT ADMINISTRATOR. A copy shall be provided to the CONSTRUCTION CONTRACT ADMINISTRATOR in accordance with Section 01752, Equipment and System Startup and Performance Testing.

CERTIFIED _____
CONTRACTOR'S Representative

Date _____

WITNESSED _____
OWNER'S Representative

Date _____

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SECTION 01332

SHOP DRAWING PROCEDURES

PART 1 - GENERAL

1.1 DESCRIPTION

- A. The submittal of Shop Drawings shall conform to requirements of General Conditions, procedures described in this Section and procedures described in Section 01321, Project Documentation. A separate transmittal form shall be used for each specific item or class of material or equipment for which a submittal is required.
- B. If the requirements of this section conflict the requirements of Section 01321, Project Documentation, Section 01321 shall take precedence and CONTRACTOR shall coordinate with the CONSTRUCTION CONTRACT ADMINISTRATOR and the OWNER so the project management software system may be utilized for document tracking and control.
- C. The term “Shop Drawings” as used herein shall be understood to include detailed design calculations, fabrication and installation drawings, lists, graphs, test data, operating instructions, and other items which shall include, but are not necessarily limited to:
 - 1. Drawings and catalog information and cuts.
 - 2. Specifications, parts list, suggested spare parts lists, and equipment drawings.
 - 3. Wiring diagrams of systems and equipment.
 - 4. Complete lubrication, maintenance and operation instructions, including initial startup instructions as described in Section 01821, Instruction of Operations and Maintenance Personnel.
 - 5. Applicable certifications.
 - 6. Anchor bolt templates, mounting instructions and mounting design calculations as required.
 - 7. Required maintenance operations to allow all installed equipment to remain idle for a period of time not to exceed 24 months.
 - 8. Other technical, installation, and maintenance data as applicable.
 - 9. Unloading and handling methods and storage requirements.
 - 10. Note, highlight, and explain proposed changes to the Contract Documents.
 - 11. Paint submittal showing type of paint and the mils thickness of coating system used. The coating system shall be the approved system as submitted under Division 9, Finishes.
 - 12. Drawings showing CONTRACTOR field verifications illustrating all field dimensions. CONTRACTOR shall field verify all dimensions and existing materials shown on the Drawings. Any modifications required shall be at CONTRACTOR’S expense.

1.2 PROCEDURE

- A. Submit Shop Drawings to the ENGINEER as identified at the Preconstruction Conference. Submit additional copy to Resident Project Representative at address provided by ENGINEER.
- B. A letter of transmittal shall accompany each submittal. If data for more than one Section of the Specifications is submitted, a separate transmittal letter shall accompany the data submitted for each Section.
- C. All letters of transmittal shall be submitted in duplicate.
- D. At the beginning of each letter of transmittal, provide a reference heading indicating the following:
 - 1. OWNER’S Name: Northern Kentucky Water District
 - 2. Project Name: Taylor Mill Water Treatment Plant
Advance Treatment Improvements.
 - 3. Contract No.: _____
 - 4. Transmittal No.: _____
 - 5. Section No.: _____
- E. If a Shop Drawing deviates from the requirements of the Contract Documents, CONTRACTOR shall specifically note each variation in its letter of transmittal.
- F. All Shop Drawings submitted for approval shall have a title block with complete identifying information satisfactory to ENGINEER.
- G. All Shop Drawings submitted shall bear the stamp of approval and signature of CONTRACTOR as evidence that they have been reviewed and verified to the completeness of the submittal by CONTRACTOR. Submittal without this stamp of approval will not be reviewed by ENGINEER and will be returned to CONTRACTOR. CONTRACTOR’S stamp shall contain the following minimum information:

Project Name: _____
CONTRACTOR’S Name: _____
Date: _____

-----Reference-----

Item: _____
Specifications:
Section: _____
Page No.: _____
Para. No.: _____

Drawing No.: _____ of _____

Location: _____

Submittal No.: _____

Approved By: _____

H. CONTRACTOR shall utilize the submittal identification numbering system as follows:

1. The Submittal Number shall be a separate and unique number correlating to each individual submittal that is required to be tracked as a separate and unique item. The Submittal Number shall be a two part, eight character, alpha/numeric number assigned by CONTRACTOR in the following manner:
 - a. The first part of the Submittal Number shall consist of five characters that pertain to the applicable Specification Section number.
 - b. The second part of the Submittal Number shall consist of three digits (numbers 001 to 999) to number each separate and unique submittal submitted under each Specification Section.
 - c. A dash shall separate the two parts of the Submittal Number.
 - d. A typical Submittal Number for the third Working Drawing submitted under Section 15101, Ductile Iron Pipe, would be 15101-003.
2. The Review Cycle shall be a three-digit number indicating the initial submission or resubmission of the same submittal. For example:

- 001 = First (initial) submission.
- 002 = Second submission (first resubmission).
- 003 = Third submission (second resubmission).

3. An example of the typical submittal identification numbers for the first submission of the third submittal submitted under Section 15101, Ductile Iron Pipe is:

<u>Submittal Number</u>	<u>Review Cycle</u>
15101-003	001

An example of the typical submittal identification numbers for the second submission of the third submittal submitted under Section 15101, Ductile Iron Pipe is:

<u>Submittal Number</u>	<u>Review Cycle</u>
15101-003	002

I. CONTRACTOR shall initially submit to ENGINEER a minimum of 8 copies of all submittals. The Resident Project Representative shall receive one copy only of each submittal which will be stamped "Preliminary – Not for Construction".

J. After ENGINEER completes its review, Shop Drawings will be affixed with a stamp

1. Approved.
 2. Approved as Noted.
 3. Revise and Resubmit.
 4. Rejected.
 5. No Action Required.
- K. If a submittal is acceptable, it will be marked “Approved” or “Approved as Corrected”. Three prints or copies of the submittal will be returned to CONTRACTOR.
- L. Upon return of a submittal marked “Approved” or “Approved as Noted”, CONTRACTOR may order, ship or fabricate the materials included on the submittal, provided it is in accordance with the corrections indicated.
- M. If a Shop Drawing marked “Approved as Noted” has extensive corrections or corrections affecting other Shop Drawings or Work, ENGINEER may require that CONTRACTOR make the corrections indicated thereon and resubmit the Shop Drawings for record purposes.
- N. If a submittal is unacceptable, two copies will be returned to CONTRACTOR with one of the following notations:
1. “Revise and Resubmit”.
 2. “Not Approved”.
- O. Upon return of a submittal marked “Revise and Resubmit”, CONTRACTOR shall make the corrections indicated and repeat the initial approval procedure. The “Not Approved” notation is used to indicate material or equipment that is not acceptable. Upon return of a submittal so marked, CONTRACTOR shall repeat the initial approval procedure utilizing acceptable material or equipment.
- P. Shop Drawings shall be submitted well in advance of the need for the material or equipment for construction and with ample allowance for the time required to make delivery of material or equipment after data covering such is approved. CONTRACTOR shall assume the risk for all Work, materials or equipment that are fabricated, delivered or installed prior to the approval of Shop Drawings. Materials or equipment will not be included in periodic progress payments until approval thereof has been obtained in the specified manner.
- Q. ENGINEER will review and process all submittals within 30 days of receipt unless otherwise specified for the Shop Drawings being revised and resubmitted, and for time required to return the approved Shop Drawings to CONTRACTOR.
- R. It is CONTRACTOR’S responsibility to review submittals made by its suppliers and subcontractors before transmitting them to the ENGINEER to assure proper coordination of the Work and to determine that each submittal is in accordance with CONTRACTOR’S desires and that there is sufficient information about materials and

- equipment for ENGINEER to determine compliance with the Contract Documents. Incomplete or inadequate submittals will be returned for revision without review.
- S. CONTRACTOR shall furnish required submittals with complete information and accuracy in order to achieve required approval of an item within two submittals. OWNER reserves the right to backcharge CONTRACTOR, for ENGINEER'S costs for resubmittals that account for a number greater than 20 percent of the total number of first time submittals. OWNER reserves the right to backcharge CONTRACTOR for all third submittals. The number of first time submittals shall be equal to the number of submittals agreed to by ENGINEER and CONTRACTOR in accordance with Section 01330.1.2.A.2. All costs to ENGINEER involved with subsequent submittal of Shop Drawings, Samples or other items requiring approval will be backcharged to CONTRACTOR at the rate of 3.0 times direct technical labor cost by deducting such costs from payments due CONTRACTOR for Work completed. In the event that CONTRACTOR requests a substitution for a previously approved item, all of ENGINEER'S costs in the reviewing and approval of the substitution will be backcharged to CONTRACTOR, unless the need for such substitution is beyond the control of CONTRACTOR.
- T. Mark each page of a submittal and each individual component submitted with the specification number, paragraph, and subparagraph. Arrange submittal information presentation to appear in the sequence in the Specification Section.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

+ + END OF SECTION + +

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SECTION 01333

SAMPLES

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Submittal of Samples shall conform to the requirements of the General Conditions, to procedures described in this Section and procedures described in Section 01321, Project Documentation.
- B. If the requirements of this section conflict the requirements of Section 01321, Project Documentation, section 01321 shall take precedence and CONTRACTOR shall coordinate with the CONSTRUCTION CONTRACT ADMINISTRATOR and the OWNER so the project management software system may be utilized for document tracking and control.
- C. Samples and Shop Drawings, which are related to the same unit of Work or Specification Section, shall be submitted at the same time. If related Shop Drawings and Samples are submitted at different times, they cannot be reviewed until both are furnished to the ENGINEER.

1.2 PROCEDURE

- A. CONTRACTOR shall review, approve, and submit all Samples promptly. Identify samples with correct reference to Specification Section, page, article and paragraph number, and Drawing Number, when applicable. Samples shall clearly illustrate functional characteristics of the product, all related parts and attachments, and full range of color, texture, pattern and material. Furnish samples so as not to delay fabrication, allowing the ENGINEER reasonable time for the consideration of the Samples submitted.
- B. Submit at least three Samples of each item required for the ENGINEER'S approval. Submittal of Samples shall conform to all applicable provisions under Section 01330: Submittals. Deliver two of the Samples to the ENGINEER'S office, unless otherwise authorized by the ENGINEER. One Sample shall be delivered to the ENGINEER'S field office. The ENGINEER shall retain all samples. If CONTRACTOR requires a Sample for its use, he shall notify the ENGINEER, in writing.
- C. CONTRACTOR shall make all corrections required and shall resubmit the required number of new Samples, until approved.
- D. Store and protect large Samples until the Work is complete or until a time approved by ENGINEER.

1.3 SAMPLES FOR TESTS

- A. CONTRACTOR shall furnish such Samples of material as may be required for examination and tests. All Samples of materials for tests shall be taken according to standard methods and as required by the Contract Documents.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

++ END OF SECTION ++

SECTION 01411

SPILL PREVENTION CONTROL AND COUNTERMEASURES PLAN

PART 1 – GENERAL

1.1 DESCRIPTION

- A. CONTRACTOR shall provide all labor, materials, equipment, tools, professional engineering (when required), and incidentals as shown, specified, and required to comply with Laws and Regulations regarding spill prevention control and countermeasures (SPCC) planning and compliance, including 40 CFR Part 112.
- B. CONTRACTOR shall determine whether a SPCC Plan is required. If SPCC Plan is required, CONTRACTOR shall prepare, implement and maintain SPCC Plan as required by Laws and Regulations.
- C. Determination of Need for SPCC Plan:
 - 1. CONTRACTOR shall determine need for SPCC Plan.
 - 2. Professional Engineer:
 - a. If the Site will include storage of more than 10,000 gallons of oil in above-ground storage, or if the Site does not comply with oil discharge history criteria specified in 40 CFR 112, CONTRACTOR shall retain a qualified professional engineer to determine need for SPCC Plan and, if SPCC Plan is required, professional engineer shall prepare or supervise preparation of SPCC Plan.
 - b. If a professional engineer is not required to prepare the full SPCC Plan, but the SPCC Plan includes environmentally-equivalent SPCC measures, or impracticality determinations, CONTRACTOR shall retain a qualified professional engineer to prepare and certify those portions of the SPCC Plan dealing with environmentally equivalent measures and impracticality determinations; the balance of the SPCC Plan may be prepared by and self-certified by CONTRACTOR.
 - 3. Submit to CONSTRUCTION CONTRACT ADMINISTRATOR letter presenting results of evaluation of whether a SPCC Plan is required for the Project in accordance with Laws and Regulations.
- D. SPCC Plan is required if the Project activities at the Site meet the following criteria:
 - 1. the Site and activities thereon are not exempt from Laws and Regulations, and;
 - 2. oil is stored, used, transferred, or otherwise handled at the Site; and
 - 3. maximum oil storage capacity at the Site equals or exceeds either of the following thresholds: 42,000 gallons of completely buried capacity, or 1,320

of above-ground capacity. Capacity includes total storage tank volume and operational storage volume at the Site for contractors and Subcontractors, including bulk storage tanks, containers with 55-gallon storage capacity and larger, mobile tanks located at the Site, and other containers covered by Laws and Regulations. Motive storage containers, such as those on construction equipment and vehicles, is not included. Oil includes petroleum products, fuel oil, hydraulic fluid, oil sludge, oil refuse, oil mixed with wastes other than dredged material, synthetic oil, vegetable oil, animal fats and oils, and other oils defined in Laws and Regulations; and

4. there is reasonable expectation, based on location of the Site, that oil spill would reach navigable waters of the United States or adjoining shorelines.
- E. If SPCC Plan is not required, CONTRACTOR shall ensure that conditions that preclude the need for SPCC Plan, including the activities of all contractors and Subcontractors at the Site, are maintained throughout duration of the Project. Should changes that affect the storage, use, or handling of oil at the Site occur, reassess the need for SPCC Plan at no additional cost to OWNER and provide to ENGINEER evaluation letter regarding need for SPCC Plan.
- F. If SPCC Plan is required, develop SPCC Plan and submit for acceptance by OWNER, with copy to CONSTRUCTION CONTRACT ADMINISTRATOR. SPCC Plan shall be specific to the Site and shall include the following:
1. Stamp, original signature, and license number of CONTRACTOR'S professional engineer, when self-certification by CONTRACTOR is not allowed by Laws and Regulations.
 2. Site plan identifying the name (or tag number) and location of each tank and container that will contain a substance regulated in 40 CFR 112 and other Laws and Regulations, including above-ground and buried tanks. Site plan shall indicate general directions of storm water runoff, including storm sewers and drainage inlets, and storm sewer outfall locations.
 3. For each tank and container on the Site plan, provide a table that lists the tank or container's name and tag number, type of oil stored, and maximum storage capacity. List total storage capacity of all tanks and containers at the Site covered by SPCC Laws and Regulations.
 4. Predictions of direction, rate of flow, and total quantity of oil that could be discharged from the Site as result of storage tank or container failure.
 5. Operating procedures that prevent oil spills, including procedures for oil handling, details of secondary containment structures at fuel and oil transfer areas, and details and descriptions of equipment to be used for oil handling, including piping.
 6. Details of and descriptions of control measures installed at the Site by CONTRACTOR to prevent spill from reaching navigable waters, including secondary containment and diversionary structures. For on-shore Sites, one of the following must be used, at minimum: dikes, berms, or retaining walls; curbing; culverts, gutters, or other drainage systems; weirs, booms, or other barriers; spill diversion ponds; retention ponds; sorbent materials. Where

appropriate, the SPCC Plan shall clearly demonstrate that containment or diversionary structures or equipment are not practical. Include brittle fracture evaluation, where required, for field-constructed above-ground storage containers undergoing repair, alteration, construction, or change in service.

7. Plans for countermeasures to contain, clean up, and mitigate effects of oil spill that reaches navigable waters, including written commitment of manpower, equipment, and materials to quickly control and remove spilled oil. Include estimation of time required to contain spill after spill occurs.
 8. Contact list and telephone numbers for facility response coordinator, National Response Center, cleanup contractors, and all appropriate federal, state, and local authorities having jurisdiction to be contacted in event of spill or discharge.
 9. Program for monthly inspections of the Site by CONTRACTOR for SPCC Plan compliance. Notify OWNER of each inspection at least 72 hours in advance.
 10. Measures for Site security relative to oil storage.
 11. Procedures for safely handling mobile containers such as totes, drums, and fueling vehicles and construction equipment that remain at the Site.
 12. Procedures and schedules for periodic testing of integrity of tanks and containers, and associated piping and valves.
 13. Plans for bulk storage container compliance.
 14. Plans for personnel training and oil spill prevention briefings.
 15. For SPCC Plans that do not follow the format listed in Laws and Regulations, provide cross-reference to requirements of Laws and Regulations, including 40 CFR 112.7.
- G. Obtain acceptance of SPCC Plan by OWNER, for coordination with OWNER's Site-specific SPCC Plan, if any.
- H. SPCC Plan shall be reviewed by CONTRACTOR's professional engineer (when professional engineer is required) and OWNER every five years, as applicable.
- I. Post a copy of accepted, certified SPCC Plan in conspicuous location at the Site and provide copies to OWNER, CONSTRUCTION CONTRACT ADMINISTRATOR, other contractors, and Subcontractors as appropriate. All contractors shall comply with SPCC Plan.
- J. In event of violation of SPCC Plan or release of oils attributable to construction operations, CONTRACTOR shall:
1. Immediately issue notifications in accordance with Laws and Regulations, including 40 CFR 110 and 40 CFR 112. When required by Laws and Regulations, report to National Response Center, US Environmental Protection Agency, and other authorities having jurisdiction, if any.
 2. Have spill clean-up performed in conformance with Laws and Regulations and the SPCC Plan.

3. Pay fines or civil penalties (or responsible portion thereof) imposed on OWNER by authorities having jurisdiction, and pay costs associated with clean-up of spills.

1.2 QUALITY ASSURANCE

A. Qualifications:

1. Professional Engineer:
 - a. When required by Laws and Regulations, engage a registered professional engineer legally qualified to practice in the jurisdiction where the Site is located and experienced in providing engineering services of the kind indicated.
 - b. Submit qualifications data.
 - c. Responsibilities include but are not necessarily limited to:
 - 1) Carefully reviewing Laws and Regulations relative to SPCC.
 - 2) Preparing written requests for clarifications or interpretations of criteria specified in the Contract Documents for submittal to CONSTRUCTION CONTRACT ADMINISTRATOR by CONTRACTOR, and obtaining from authorities having jurisdiction clarifications regarding Laws and Regulations as required.
 - 3) Preparing or supervising the preparation of letter-report evaluation of need for SPCC Plan in accordance with the Contract Documents. Evaluation shall include professional engineer's seal, registration number, and original signature.
 - 4) When SPCC Plan is required, preparing, supervising the preparation of, or reviewing the SPCC Plan (or designated portions thereof when oil storage at the Site will be 10,000 gallons or less) in accordance with the Contract Documents. SPCC Plan (or designated portions thereof) shall include professional engineer's seal, registration number, and original signature.
 - 5) Periodically re-evaluating the need for SPCC Plan and issuing findings as letter-reports with seal, license number, and signature. When SPCC Plan is required, periodically evaluating the SPCC Plan and providing recommendations for compliance with Laws and Regulations, in accordance with the Contract Documents.
 - 6) Certifying that:
 - a) it is familiar with the Laws and Regulations, including 40 CFR 112, and
 - b) it has visited, examined, and is familiar with the Site, planned modifications to the Site under the Project as such modifications pertain to SPCC Laws and Regulations, and
 - c) it has performed the evaluations and prepared SPCC Plan in accordance with the Contract Documents, and
 - d) procedures for required testing and inspections have been established, and
 - e) the said evaluations and SPCC Plan are adequate for the Project,

- and
- f) the said evaluations and SPECC Plan conform to all Laws and Regulations, applicable industry standards, and to prevailing standards of practice.

1.3 SUBMITTALS

- A. Informational Submittals: Submit the following:
 - 1. Certifications: With each evaluation letter and SPCC Plan submittal, include certification signed by preparer of submittal that the submittal conforms to the Contract Documents and Laws and Regulations. Signature on all certifications shall be original.
 - 2. Evaluations:
 - a. Submit letter presenting results of evaluation of whether a SPCC Plan is required for the Project. Submit evaluation no later than fourteen days after the Contract Times commence running, unless longer time is allowed by CONSTRUCTION CONTRACT ADMINISTRATOR.
 - b. Submit updated evaluations as required when conditions at the Site change. Submit updated evaluation no later than seven days after the conditions at the Site change, or within seven days of CONSTRUCTION CONTRACT ADMINISTRATOR's request, unless longer time is allowed by CONSTRUCTION CONTRACT ADMINISTRATOR.
 - 3. SPCC Plan: When SPCC Plan is required:
 - a. Submit jointly to OWNER and CONSTRUCTION CONTRACT ADMINISTRATOR. Submit within fourteen days of receipt of CONSTRUCTION CONTACT ADMINISTRATOR's acceptance of evaluation submittal.
 - b. Update CONSTRUCTION CONTRACT ADMINISTRATOR e and resubmit the SPCC Plan, or acceptable SPCC Plan amendments, as required when conditions at the Site change. Submit updated SPCC Plan or amendments no later than seven days after the change in conditions at the Site change giving rise to the SPCC Plan change or amendment, or within seven days of CONSTRUCTION CONTRACT ADMINISTRATOR's request, unless longer time is allowed by CONSTRUCTION CONTRACT ADMINISTRATOR.
 - 4. SPPC Plan Distribution: When SPCC Plan is required, submit copies of letters transmitting SPCC Plan and amendments (if any) to contractors and Subcontractors working at the Site.
 - 5. Qualifications Statements: CONTRACTOR's professional engineer, when requested by CONSTRUCTION CONTRACT ADMINISTRATOR.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

+ + END OF SECTION + +

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SECTION 01412

STORMWATER POLLUTION PREVENTION PLAN AND PERMIT

PART 1 – GENERAL

1.1 DESCRIPTION

- A. CONTRACTOR shall comply with the condition of the Kentucky Pollutant Discharge Elimination System permit. CONTRACTOR shall be the permittee/applicant that files the Notice of Intent (NOI) with the Kentucky Division of Water (KDOW) and is responsible for providing necessary materials and taking appropriate measures to comply with requirements of the permit and minimize pollutants in storm water runoff from the Site.
- B. Documents: The following are part of the Work included under this Section:
1. Storm Water Pollution Prevention Plan (SWPPP): CONTRACTOR shall prepare and file with authority having jurisdiction over storm water discharges during construction and with the OWNER. The SWPPP is part of the Contract Documents.
 2. Sediment and Erosion Control Permit: Prepared by OWNER and filed with the authority having jurisdiction over sediment and erosion control during construction. Sediment and erosion control permit is part of the Contract Documents.
 3. SWPPP Revisions: Prepared by CONTRACTOR and submitted to CONSTRUCTION CONTRACT ADMINISTRATOR. At minimum, CONTRACTOR shall file a SWPPP prior to starting Work at the Site, and as required by authorities having jurisdiction. SWPPP and subsequent revisions shall include CONTRACTOR's proposed temporary means for storm water control during all phases of the Work and include plans for storm water conveyance and retention, as applicable. Should CONTRACTOR propose deviations to the SWPPP included in the Contract Documents, or if Project-specific modifications of the SWPPP are required to conform to field conditions, CONTRACTOR shall provide additional SWPPP Revisions as necessary, in accordance with requirements of authorities having jurisdiction and applicable permits. CONTRACTOR shall supply SWPPP Revisions to OWNER and all authorities having jurisdiction. SWPPP Revisions that do not comply with the Contract Documents and are not required by authorities having jurisdiction will be regarded as substitutions, in accordance with the General Conditions and substitution procedures in the Specifications.
 4. Storm Water Certification Statement to OWNER: To be provided by CONTRACTOR to CONSTRUCTION CONTRACT ADMINISTRATOR on the form included with this Section, or on a form provided by authority having jurisdiction. Do not perform Work at the Site until the Storm Water Certification has been submitted to CONSTRUCTION CONTRACT ADMINISTRATOR.
 5. Site disturbance by the CONTRACTOR is not to occur until 48 hours after the NOI is submitted in electronic format to KDOW.
 6. Storm Water Inspection Report: Prepared by CONSTRUCTION CONTRACT ADMINISTRATOR's Resident Project Representative (RPR) using a form provided by authority having jurisdiction. Storm water inspection reports will be filed in a log

book kept at the Site by CONSTRUCTION CONTRACT ADMINISTRATOR. Copy of each report will be furnished to ENGINEER upon request. Storm water inspection report will be completed for each of the following:

- a. Pre-construction: After placement of storm water management measures, including sediment and erosion controls, and temporary field offices and other temporary facilities, prior to starting other Work at the Site.
 - b. During the Work: Every seven days and within 24 hours of a 0.5- inch or greater rainfall event until Notice of Termination is completed. When the Site is stabilized relative to storm water, erosion, and discharge of sediment, inspection frequency during temporary shutdowns and seasonal shutdowns is once per month until Notice of Termination is completed.
 - c. Final: Final inspection report will be prepared prior to completion of Notice of Termination.
7. Notice of Termination (NOT): Prepared by CONTRACTOR on the form included with storm water permit and provided to CONSTRUCTION CONTRACT ADMINISTRATOR for review and signature by OWNER. CONSTRUCTION CONTRACT ADMINISTRATOR will submit the NOT to authority having jurisdiction. Submit the NOT following completion of all Work that may result in pollution in storm water discharges, including landscaping Work. Final Payment will not be made until the NOT is filed with authority having jurisdiction.
- C. Prevent discharge of sediment to and erosion from the Site to surface waters, drainage routes, public streets and rights-of-way, and private property, including dewatering operations. Prevent trash and demolition and construction debris from leaving the Site via storm water runoff. Provide berms, dikes, and other acceptable methods of directing storm water around work areas to drainage routes. Prior to starting the Work associated with such discharge, construction-related discharges to publicly owned conveyance or treatment systems shall be approved by owner of system to which the discharge will be directed.
- D. Do not cause or contribute to a violation of water quality standards, Laws, or Regulations. Notify CONSTRUCTION CONTRACT ADMINISTRATOR of revisions to the SWPPP necessary to protect receiving water quality and comply with applicable permits. Provide and implement measures to control pollutants in storm water runoff from the Site to prevent:
1. Turbidity increases that will cause a substantial visible contrast to natural conditions.
 2. Increase in suspended, colloidal, and settleable solids that would cause sediment deposition or impair receiving water quality and use.
 3. Presence of residue from oil and floating substances, visible oil, and globules of grease.
- E. CONTRACTOR shall pay civil penalties and other costs incurred by OWNER, including additional engineering, RPR, and inspection services, associated with non-complying with applicable permits related to storm water discharges associated with construction activity and sediment and erosion controls associated with the Work.
- F. Contract Price includes all material, labor, and other permits and incidental costs related to:
1. Preparing SWPPP and its revisions and other documents that are CONTRACTOR's responsibility, in accordance with this Section.

2. Installing and maintaining structural and non-structural items used in complying with the SWPPP and its revisions.
 3. Clean-up, disposal, and repairs following wet weather events or spills caused by CONTRACTOR.
 4. Implementing and maintaining “best management practices”, as defined in applicable permits and Laws or Regulations, to comply with requirements that govern storm water discharges at the Site.
 5. Inspections of storm water, sediment, and erosion controls as specified.
- G. Coordinate requirements of this Section with requirements for earthwork, erosion control, and landscaping in the Contract Documents, applicable permit requirements, and Laws and Regulations.
- H. Implement SWPPP controls and practices prior to starting other Work at the Site. Each contractor and subcontractor identified in the SWPPP and SWPPP Revisions shall sign a copy of the storm water certification statement.

1.2 QUALITY ASSURANCE

- A. Regulatory Requirements: Comply with Laws and Regulations relative to environmental protection and restoration, including:
1. Storm water permit applicable to the Work and Site.
 2. State and local erosion and sediment control guidelines and requirements,
 3. State and local storm water regulations and guidance.

1.3 SUBMITTALS

- A. Informational Submittals: Submit the following:
1. Submit the following, in accordance with Article 1.1 and Article 1.4 of this Section; for Projects involving Work at multiple Sites, submit each of the following for each Site, as applicable:
 - a. SWPPP Revisions.
 - b. Storm Water Certification Statement.
 - c. Notice of Termination
 2. Approval to Discharge to Publicly-owned Treatment Works: For storm water discharges associated with construction activity that are discharged to a publicly owned conveyance or treatment system, prior to commencing discharges, submit system owner’s written approval for such discharges.
 3. Storm Water Site Plan Updates: Within three days after each storm water inspection, submit updated storm water site plan.

1.4 SWPPP REVISIONS

- A. CONTRACTOR shall prepare a SWPPP Revision in accordance with the Project's storm water permit when:
1. There is a significant change in design, construction, operation, or maintenance of the Project that significantly affects the potential of discharging pollutants to Waters of the United States, and has not otherwise been addressed in the SWPPP.
 2. SWPPP proves to be ineffective relative to:
 - a. eliminating or significantly minimizing pollutants from sources identified in the SWPPP required by this permit, or
 - b. achieving general objectives of controlling pollutants in storm water discharges from permitted construction activity.
 3. Prepare and submit SWPPP Revision identifying contractors and subcontractor responsible for implementing part of the SWPPP.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION

3.1 INSPECTIONS AND REPAIRS

- A. Perform Site inspections and assessments as required in applicable storm water permit and this Section. Inspections and assessments shall be done by CONTRACTOR's site superintendent or project manager, together with CONSTRUCTION CONTRACT ADMINISTRATOR's RPR, identified as a qualified person per the NOI.
- B. Inspections:
1. During the Work, Site inspections shall be performed:
 - a. After SWPPP controls are provided and prior to starting other Work at the Site.
 - b. During the Work: Every seven days and within 24 hours of a 0.5-inch or grater rainfall event until Notice of Termination is completed. When the Site is stabilized relative to storm water, erosion, and discharge of sediment, inspection required frequency during temporary shutdowns and seasonal shutdowns is once per month until Notice of Termination is completed
 - c. Prior to CONTRACTOR submitting the Notice of Termination.
 2. During each inspection, verify sediment control practices and record approximate degree of sediment accumulation as percentage of acceptable sediment storage volume; inspect erosion and sediment control practices and record maintenance performed; observe and record deficiencies relative to implementation of the SWPPP. RPR or CONSTRUCTION CONTRACT ADMINISTRATOR will complete Storm Water Inspection Reports and CONTRACTOR shall record and submit the following.
 - a. Storm Water Site Plan: On a copy of the Site plan included in the Contract Documents or other map of the Site acceptable to CONSTRUCTION CONTRACT ADMINISTRATOR, indicate extent of all disturbed areas and

drainage pathways. Indicate areas expected to undergo initial disturbance or significant site work within the next fourteen days.

- b. Indicate on storm water site plan areas of Site that have undergone temporary or permanent stabilization.
 - c. Indicate on storm water site plan all disturbed areas that have not undergone active site Work during the previous fourteen days.
- C. Maintain at the Site a copy of storm water site plans from storm water inspection submit each storm water map to CONSTRUCTION CONTRACT ADMINISTRATOR and RPR. RPR will maintain at the Site a log book with a copy of each Storm Water Inspection Reports.
- D. Cooperate with representatives of authorities having jurisdiction during periodic visits to Site, and promptly provide information requested by authorities having jurisdiction.
- E. Complete repairs to SWPPP controls in accordance with applicable requirements and to satisfaction of CONSTRUCTION CONTRACT ADMINISTRATOR within two calendar days of each inspection.

3.2 ATTACHMENTS

- A. The documents listed below are part of this Specification Section and will be issued by Sanitation District No. 1 of Northern Kentucky at the preconstruction meeting.
1. Storm Water Certification Statement.
 2. Land Disturbance Permit.

If the Authority having jurisdiction over storm water required form other than the forms provided use that authorities required forms.

++ END OF SECTION ++

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SECTION 01413

CONTRACTOR'S HAZARDOUS MATERIALS MANAGEMENT PROGRAM

PART 1 – GENERAL

1.1 DESCRIPTION

- A. CONTRACTOR shall develop, implement, and maintain a Hazardous Materials management program (HMMP) throughout the Project, in accordance with Laws and Regulations.
1. Hazardous Materials Brought to Site by Contractor: Transport, handle, store, label, use, and dispose of in accordance with this Section, and Laws and Regulations.
 2. Hazardous Material Generated by Contractor:
 - a. Hazardous Material shall be properly handled, stored, labeled, transported and disposed of by CONTRACTOR in accordance with Laws and Regulations, and this Section.
 - b. If CONTRACTOR will generate or has generated Hazardous Material at the Site, obtain a United States Environmental Protection Agency (EPA) identification number listing CONTRACTOR's name and address of the Site as generator of the Hazardous Material. Obtain identification number from state environmental agency or similar authority having jurisdiction at the Site. Submit identification number within time frame specified in Article 1.3 of this Section.
 - c. CONTRACTOR shall be responsible for identifying, analysis of profiling, transporting, and disposing of Hazardous Material generated by CONTRACTOR.
 3. Fines or civil penalties levied against OWNER for violations committed at the Site by CONTRACTOR, and costs to OWNER (if any) associated with cleanup of Hazardous Materials shall be paid by CONTRACTOR.
- B. Enforcement of Laws and Regulations:
1. Interests of OWNER are that accidental spills and emissions, Site contamination, and injury of personnel at the Site are avoided.
 2. When OWNER is aware of suspected violations, OWNER will notify CONTRACTOR, and authorities having jurisdiction if OWNER reasonably concludes that doing so is required by Laws or Regulations.
- C. Related Sections:
1. Section 01411, Spill Prevention Control and Countermeasures Plan.

1.2 DEFINITIONS

- A. The following terms are defined for this Section and supplement the terms defined in the General Conditions:
1. Hazardous Material: Material, whether solid, semi-solid, liquid, or gas, that, if not stored or used properly, may cause harm or injury to persons through inhalation, ingestion, absorption or injection, or that may negatively impact the environment through use or discharge of the material on the ground, in water (including groundwater), or to the air. Hazardous Material includes, but is not limited to, chemicals, Asbestos, Hazardous Waste, PCBs, Petroleum, Radioactive Material, and which is or becomes listed, regulated, or addressed pursuant to [a] the Comprehensive Environmental Response, Compensation and Liability Act, 42 United States Code (USC) §§9601 et seq. (“CERCLA”); [b] the Hazardous Materials Transportation Act, 49 USC §§1801 et seq.; [c] the Resource Conservation and Recovery Act, 42 USC §§6901 et seq. (“RCRA”); [d] the Toxic Substances Control Act, 15 USC §§2601 et seq.; [e] the Clean Water Act, 33 USC §§1251 et seq.; [f] the Clean Air Act, 42 USC §§7401 et seq.; and [g] any other Law or Regulation regulating, relating to, or imposing liability or standards of conduct concerning, any hazardous, toxic, or dangerous waste, substance, or material.

1.3 QUALITY ASSURANCE

- A. Regulatory Requirements: Laws and Regulations applying to the Work under this Section include:
1. Code of Federal Regulations (CFR), Title 29, Part 1910, Occupational Safety and Health Standards.
 2. CFR, Title 29, Part 1926, Safety and Health Regulations for Construction.
 3. CFR Title 40, Protection of Environment.
 4. CFR, Title 49, Transportation.
 5. Occupational health and safety requirements of state labor department or similar entity; environmental Laws and Regulations of state environmental agency, Laws and Regulations of state department of transportation.

1.4 SUBMITTALS

- A. Informational Submittals: Submit the following to the entity(ies) specified for each:
1. Hazardous Materials (including Chemicals) Proposed for Use at the Site: Submit current (dated within the past two years) material safety data sheets (MSDS) in accordance with 29 CFR 1910.1200 (OSHA Hazard Communication Standard), manufacturer, Supplier (if different than manufacturer), container size(s) and number of containers proposed to be at the Site, minimum and maximum volume of material intended to be stored at the Site, and description of process or procedures in which Hazardous Material will be used. Furnish information in sufficient time to obtain OWNER’s acceptance

- no later than least three days before bringing Hazardous Material to the Site. Submit to CONSTRUCTION CONTRACT ADMINISTRATOR and OWNER's environmental representative.
2. Hazardous Material Generated at the Site: Submit for each Hazardous Material generated at the Site identification number, analysis results, and number and size of storage containers at the Site. Furnish information not less three days of CONTRACTOR's receipt of analytical results. Submit to CONSTRUCTION CONTRACT ADMINISTRATOR and OWNER's environmental representative.
 3. Permits: Copies of permits for storing, handling, using, transporting, and disposing of Hazardous Materials, obtained from authorities having jurisdiction. Submit to OWNER's environmental representative and CONSTRUCTION CONTRACT ADMINISTRATOR.
 4. Other Documents required for the HMMP: Submit to OWNER's environmental representative requested documents within three days of CONTRACTOR's receipt of request. HMMP documents may include emergency/spill response plan, communication plan, and other documents.
 5. Qualifications Statements:
 - a. Contractor's Safety Representative: Submit qualifications of proposed safety representative, including summary of experience, training received and valid certifications applicable to the Project.

1.5 HAZARDOUS MATERIALS MANAGEMENT

- A. Obtain OWNER's environmental representative's acceptance before bringing each Hazardous Material to the Site.
- B. Communication Plan: CONTRACTOR shall develop a Hazardous Materials communication plan. At minimum, maintain at the Site two notebooks containing: 1) Inventory of Hazardous Materials (including all chemicals); and, 2) Current (dated within the past two years) material safety data sheets (MSDS) for all materials being used to accomplish the Work, whether or not defined as Hazardous Material in this Section. Keep one notebook in CONTRACTOR's field office at the Site; keep second notebook at location acceptable by OWNER's environmental representative. Keep notebooks up-to-date as materials are brought to and removed from the Site.
- C. Emergency/Spill Response Plan: Develop, implement, and maintain an emergency/spill response plan, for each Hazardous Material or each class/group of Hazardous Materials as applicable. At minimum, response plan shall include the following:
 1. Description of equipment available at the Site to contain or respond to emergency related to or spill of the material.
 2. Procedures for notifying, and contact information for: authorities having jurisdiction, emergency responders, OWNER, CONSTRUCTION CONTRACT ADMINISTRATOR, the public as applicable, and other entities as required.

3. Response coordination procedures between CONTRACTOR, OWNER, and others as appropriate.
 4. Site plan showing proposed location of Hazardous Materials storage area and location of spill containment/response equipment, and location of storm water drainage inlets and drainage routes.
 5. Description of Hazardous Material handling and spill response training provided to CONTRACTOR's and Subcontractors' employees, in accordance with 29 CFR 1926.21(b) and other Laws and Regulations..
 6. Comply with Section 01414, Spill Prevention Control and Countermeasures Plan.
- D. Storage of Hazardous Materials and Non-Hazardous Materials:
1. Hazardous Materials containers shall bear applicable hazard diamond(s).
 2. Container Labeling:
 - a. Properly label each container of consumable materials, whether or not classified as Hazardous Materials under this Section.
 - b. Stencil CONTRACTOR's name and, as applicable, Subcontractor's name, on each vessel containing Hazardous Material and, for non-Hazardous Materials, on each container over five-gallon capacity. Containers shall bear securely-attached label clearly identifying contents. Label containers that are filled from larger containers.
 - c. If OWNER becomes aware of unlabeled containers at the Site, OWNER's environmental representative will notify CONTRACTOR. Properly label container(s) within one hour of receipt of notification or remove container from the Site.
 3. To greatest extent possible, store Hazardous Materials off-Site until required for use in the Work.
- E. Hazardous Materials Storage Area:
1. Maintain designated storage area for Hazardous Materials that includes secondary containment. Storage area shall include barriers to prevent vehicles from colliding with storage containers, and shall include protection from environmental factors such as weather.
 2. Provide signage in accordance with Laws and Regulations, clearly identifying the Hazardous Materials storage area.
- F. CONTRACTOR's safety representative shall meet at least monthly with OWNER's environmental representative to review CONTRACTOR's HMMP documents, procedures, and inspect storage areas and the Site in general, to verify compliance with this Section.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

++ END OF SECTION ++

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SECTION 01416

SPECIAL INSPECTIONS

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope

1. CONTRACTOR shall provide labor, materials, tools, equipment, and incidentals as shown, specified and required to cooperate with the Coordinating Special Inspector, individual special inspectors, and testing agencies employed by OWNER, to facilitate Special Inspections.
2. Supplement A, Statement of Special Inspections, included with this Section, lists testing and inspections required.
3. Requirements for vibration, seismic, and wind controls for non-structural components are in Section 15073 Vibration and Seismic Controls for Plumbing Piping and Equipment and 15074 Vibration and Seismic Controls for HVAC Piping and Equipment.

1.2 DEFINITIONS

- A. Coordinating Special Inspector: Professional engineer or architect, hired by OWNER, registered in the same state as the Site, responsible for coordinating and verifying the inspection and testing required by the Statement of Special Inspections included in this Section and reporting to the Building Official.
- B. Building Official: Officer or other designated authority having jurisdiction charged with the administration and enforcement of the governing code, or a duly authorized representative.
- C. Special Inspections: Testing and inspection required in Supplement A, Statement of Special Inspections, of this Section.

1.3 QUALITY ASSURANCE

- A. OWNER will employ and pay for services of the Coordinating Special Inspector and testing of materials, unless otherwise stated in the specifications.
- B. Special Inspections will be in accordance with applicable building code, Laws and Regulations, and Supplement A, Statement of Special Inspections, of this Section.
- C. Inspectors will be qualified in their assigned Special Inspection in accordance with Supplement A, Statement of Special Inspections, of this Section.

1.4 SUBMITTALS

- A. Action Submittals: Submit the following:
 - 1. Samples: Representative Samples of materials when required by CONSTRUCTION CONTRACT ADMINISTRATOR.
- B. Informational Submittals: Submit the following:
 - 1. Completed Supplement C, Contractor's Statement of Responsibility, as attached to this Section, addressing each system and component listed in the Quality Assurance Plan portion of Supplement A, Statement of Special Inspections, of this Section.
 - 2. Completed Supplement D, Fabricator's Certificate of Compliance, as attached to this Section, for fabrication of structural steel.

1.5 CONTRACTOR'S RESPONSIBILITIES

- A. Prepare Supplement C, Contractor's Statement of Responsibility, of this Section which shall include:
 - 1. Acknowledgment of the requirements of the Quality Assurance Plan portion of Supplement A, Statement of Special Inspections, of this Section.
 - 2. Acknowledgment that necessary quality control shall be exercised in fabricating, handling, and installing, to conform to the Contract Documents.
 - 3. List CONTRACTOR's procedures for assuring the quality of Work necessary for conforming to the Contract Documents relative to each system or component listed in the Quality Assurance Plan portion of Supplement A of this Section.
 - 4. List personnel who control the quality of the Work relative to the Contract Documents and indicate their position in the CONTRACTOR's organization.
- B. Provide safe access to Work to be tested and inspected.
- C. Provide assistance in obtaining and handling test samples at the Site.
- D. Facilitate inspections and tests.
- E. Provide access to Suppliers' and Subcontractors' operations as required.
- F. Notify Coordinating Special Inspector and CONSTRUCTION CONTRACT ADMINISTRATOR sufficiently in advance of the Work for the Coordinating Special Inspector and CONSTRUCTION CONTRACT ADMINISTRATOR to coordinate their personnel at the Site. Do not cover Work to be inspected until Special Inspection has been completed and accepted.
- G. Special Inspections required in this Section do not supersede or make unnecessary inspections and tests required under other Specification Sections or standard inspections required by Laws and Regulations.

1.6 COODINATING SPECIAL INSPECTOR'S RESPONSIBILITIES

- A. Coordinating Special Inspector will:
1. Complete Supplement A, Statement of Special Inspections, of this Section to provide names of each inspector and testing agency for each Special Inspection required
 2. Engage services of inspectors and testing agencies for Special Inspections in accordance with Supplement A, Statement of Special Inspections, of this Section and as required by Laws and Regulations.
 3. Coordinate activities of individual inspectors and testing agencies with CONTRACTOR.
 4. Provide interim reports of inspections and material testing to OWNER, CONSTRUCTION CONTRACT ADMINISTRATOR, and ENGINEER's consultants, including structural engineer and architect.
 5. To obtain certificate of use and occupancy from the Building Official, complete and provide to the OWNER, CONSTRUCTION CONTRACT ADMINISTRATOR, and ENGINEER Supplement B, Final Report of Special Inspections, of this Section, documenting completion of Special Inspections and correction of discrepancies noted in the Special Inspections.

1.7 INSPECTOR RESPONSIBILITIES

- A. Perform specified inspections, sampling, and testing of materials and methods of construction; review and ascertain compliance with Laws and Regulations.
- B. Promptly notify Coordinating Special Inspector, OWNER, CONSTRUCTION CONTRACT ADMINISTRATOR and CONTRACTOR of irregularities or deficiencies in the Work observed during Special Inspections. Corrective action, if required, will be determined by CONSTRUCTION CONTRACT ADMINISTRATOR.
- C. Promptly submit two copies each of reports of inspections and tests to Coordinating Special Inspector, CONSTRUCTION CONTRACT ADMINISTRATOR, and CONTRACTOR including:
1. Date issued.
 2. Project title and number.
 3. Name and signature of inspector.
 4. Date of inspection or sampling and test.
 5. Record of temperature and weather.
 6. Identification of product and Specification Section.
 7. Location in Project.
 8. Type of inspection or test.
 9. Results of inspections and tests, and observations regarding compliance with Laws and Regulations, and standards.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION

3.1 SUPPLEMENTS

- A. The supplements listed below, following the “End of Section” designation, are part of this Section:
1. Supplement A – Statement of Special Inspections
 2. Supplement B – Final Report of Special Inspections
 3. Supplement C – Contractor’s Statement of Responsibility
 4. Supplement D – Fabricator’s Certificate of Compliance

+ + END OF SECTION + +

Supplement A - Statement of Special Inspections

Project: Taylor Mill Water Treatment Plant Advanced Treatment Improvements

Location: 608 Grand Avenue
Taylor Mill, KY 41015

Owner: Northern Kentucky Water District

Design Professional in Responsible Charge: Registered Professional Engineer to be named later.

This *Statement of Special Inspections* is submitted as a condition for permit issuance in accordance with the Special Inspection and Structural Testing requirements of the Building Code. It includes a schedule of Special Inspection services applicable to the Project as well as the name of the Coordinating Special Inspector and the identity of other approved agencies to be retained for conducting these inspections and tests. This *Statement of Special Inspections* encompass the following disciplines:

Structural

The Coordinating Special Inspector shall keep records of all inspections and shall furnish inspection reports to the Construction Contract Administrator and Registered Design Professional in Responsible Charge. Discovered discrepancies shall be brought to the immediate attention of the Contractor for correction. If such discrepancies are not corrected, the discrepancies shall be brought to the attention of the Construction Contract Administrator and Registered Design Professional in Responsible Charge. The Special Inspection program does not relieve the Contractor of his or her responsibilities.

Inspections listed are periodic unless indicated to be continuous or required by code to be continuous.

Interim reports shall be submitted to the Construction Contract Administrator and the Registered Design Professional in Responsible Charge.

A *Final Report of Special Inspections* documenting completion of all required Special Inspections, testing and correction of any discrepancies noted in the inspections shall be submitted prior to issuance of a Certificate of Use and Occupancy.

Job site safety and means and methods of construction are solely the responsibility of the Contractor.

Interim Report Frequency: As required by the Building Official

Prepared by:

(type or print name)

Signature

Date

Design Professional Seal

Building Official's Acceptance:

Signature

Date

Schedule of Inspection and Testing Agencies

This Statement of Special Inspections / Quality Assurance Plan includes the following building systems:

- | | |
|--|---|
| <input type="checkbox"/> Soils and Foundations
<input type="checkbox"/> Cast-in-Place Concrete
<input type="checkbox"/> Masonry
<input type="checkbox"/> Steel Construction | <input type="checkbox"/> Pier Foundations |
|--|---|

Special Inspection Agencies	Firm	Address, Telephone, e-mail
1. Coordinating Special Inspector		
2. Inspector		
3. Inspector		
4. Testing Agency		
5. Testing Agency		
6. Other		

Note: The inspectors and testing agencies shall be engaged by Owner or Owner's Agent, and not by Contractor or Subcontractor whose Work is to be inspected or tested. Conflicts of interest must be disclosed to the Building Official prior to commencing Work.

Quality Assurance Plan

Quality Assurance for Seismic Resistance

Seismic Design Category = B

Quality Assurance Plan: Not Required per section 1705.3

Quality Assurance for Wind Requirements

Basic Wind Speed (three-second gust): 90 mph

Wind Exposure Category: C

Quality Assurance Plan: Not Required per section 1705.4

Qualifications of Inspectors and Testing Technicians

The qualifications of all personnel performing Special Inspections are subject to the approval of the Building Official. The credentials of all inspectors and testing technicians shall be provided if requested.

Special Inspections

The following list will be, but not limited to, inspections to be provided by the testing agency:

1. Section 1704.7 Soils (Building Code)
Related Specification: Section 02300 – Earthwork
Geotechnical Investigation Report
Section 01802.2 (Building Code)

Location of Work:

- a. PT/GAC Building & GAC Feed Pump Station Building

Requirements:

- a. Site Preparation:
Prior to placement of the prepared fill, the Special Inspector shall determine that the site has been prepared in accordance with the Geotechnical Investigation Report.
- b. During Fill Placement:
During placement and compaction of the fill material, the Special Inspector shall determine that the material being used and the maximum lift thickness comply with the Geotechnical Investigation Report, Section 02300 – Earthwork, and Section 01802.2 (Building Code).
- c. Evaluation of In-Place Density:
The Special Inspector shall determine, at the approved frequency, that the in-place dry density of the compacted fill complies with the Geotechnical Investigation Report and Section 02300 – Earthwork.

Requirements:

Table 1704.1 Required Verification And Inspection of Soils		
Verification and Inspection	Continuous	Periodic
Verify materials below footings are adequate to achieve the design bearing capacity.	X	--
Verify excavations are extended to proper depth and have reached proper material.	--	X
Perform classification and testing of controlled filled materials.	--	X
Verify use of proper materials, densities and lift thicknesses during placement and compaction of controlled fill.	X	--
Prior to placement of controlled fill, observe subgrade and verify that site has been prepared properly.	X	--

2. Section 1704.4 Concrete Construction (Building Code)
 Related Specification: Section 03300 – Cast-In-Place Concrete

Location of Work:

- a. PT/GAC Building & GAC Feed Pump Station Building

Requirements:

Table 1704.4 Required Verification and Inspections of Concrete Construction		
Verification and Inspection	Continuous	Periodic
Inspection of reinforcing steel, including prestressing tendons, and placement.	--	X
Inspection of reinforcing steel welding in accordance with Table 1704.3, Item 5B.	--	--
Inspect bolts to be installed in concrete prior to and during placement of concrete where allowable loads have been increased.	X	--
Verifying use of required design mix.	--	X
Sampling fresh concrete and performing slump, air content and determining the temperature of fresh concrete at the time of making specimens for strength tests.	X	--
Inspection of concrete and shotcrete placement for proper application techniques.	X	--
Inspection for maintenance of specified curing temperature and techniques.	--	X
Inspection of prestressed concrete: a. Application of prestressing forces. b. Grouting of bonded prestressing tendons in the seismic-force-resisting system.	X X	--

Erection of precast concrete members.	--	X
Verification of in-situ concrete strength, prior to stressing of tendons in post tensioned concrete and prior to removal of shores and forms from beams and structural slabs.	--	X
Inspect formwork for shape, location and dimensions of the concrete member being formed.	--	X

3. Section 1704.5 Masonry Construction (Building Code)
 Related Specification: Section 04810 – Unit Masonry

Location of Work:

- a. PT/GAC Building & GAC Feed Pump Station Building

Requirements:

Table 1704.5.1 Level 1 Special Inspection – Masonry		
Verification and Inspection	Continuous	Periodic
As masonry construction begins the following shall be verified to ensure compliance: a. Proportions of site-prepared mortar. b. Construction of mortar joints. c. Location of reinforcement and connectors.	--	X X X
The inspection program shall verify: a. Size and location of structural elements. b. Type, size and location of anchors, including other details of anchorage of masonry to structural members, frames or other construction. c. Specified size, grade and type of reinforcement. d. Welding of reinforcing bars. e. Protection of masonry during cold weather (temperature below 40°F) or hot weather (temperature above 90°F).	X	X X X X
Prior to grouting, the following shall be verified to ensure compliance: a. Cleanliness of grout space. b. Placement of reinforcement and connectors. c. Proportions of site-prepared grout. d. Construction of mortar joints.	--	X X X X
Grout placement shall be verified to ensure compliance with code and construction document provisions.	X	--
Preparation of any required grout specimens, mortar specimens and/or prisms shall be observed.	X	--
Compliance with required inspection provisions of the construction documents and the approved submittals shall be verified.	--	X

4. Section 1704.6 Wood Construction (Building Code)
 Related Specification: Section 06176 – Metal Plate-Connected Wood Trusses
 Section 1704.2 (Building Code)

Location of Work:

- a. PT/GAC Building & GAC Feed Pump Station Building

Requirements:

- a. Wood truss fabricator shall submit a certificate of compliance that the work was performed in accordance with the approved construction documents. The certificate shall include structural analysis data signed and sealed by a qualified Professional Engineer responsible for their preparation, registered in Kentucky.

5. Section 1704.3 Steel Construction (Building Code)
 Related Specification: Section 05120 - Structural Steel
 Section 05500 - Metal Fabrications
 Section 05051 – Anchor Bolts, Toggle Bolts and Concrete Inserts

Location of Work:

- a. PT/GAC Building & GAC Feed Pump Station Building

Requirements:

Table 1704.3 Required Verification and Inspection of Steel Construction		
Verification and Inspection	Continuous	Periodic
Material verification of high-strength bolts, nuts and washers: a. Identification markings to conform to ASTM standards specified in the approved construction documents. b. Manufacturer's certificate of compliance required.	--	X
Inspection of high-strength bolting: a. Bearing-type connections. b. Slip-critical connections.	X	X X
Material verification of structural steel: a. Identification markings to conform to ASTM standards specified in the approved construction documents. b. Manufacturers' certified mill test reports.	--	
Material verification of weld filler materials: a. Identification markings to conform to AWS specifications in the approved construction documents. b. Manufacturer's certificate of compliance required.	--	--
Inspection of welding: a. Structural Steel: 1) Complete and partial penetration groove welds. 2) Multi-pass fillet welds. 3) Single-pass fillet welds > 5/16" 4) Single-pass fillet welds < 5/16" 5) Floor and deck welds.	X X X	X X

b. Reinforcing Steel: <ol style="list-style-type: none"> 1) Verification of weldability of reinforcing steel other than ASTM A 706. 2) Reinforcing steel-resisting flexural and axial forces in intermediate and special moment frames, and boundary elements of special reinforced concrete shear walls and shear reinforcement. 3) Shear reinforcement. 4) Other reinforcing steel. 	 X X	 X X
Inspection of steel frame joint details for compliance with approved construction documents: <ol style="list-style-type: none"> a. Details such as bracing and stiffening. b. Member locations. c. Application of joint details at each connection. 	 --	 X

For SI: 1 inch = 25.4 mm.

a. Where applicable, see also Section 1707.1, Special Inspection for seismic resistance.

6. Section 1704.9 Pier Foundations (Building Code)

Related Specification: Section 02475 – Drilled Piers
Section 03300 – Cast-In-Place Concrete

Location of Work:

a. PT/GAC Building

Requirements:

Table 1704.9 Required Verification and Inspection of Pier Foundations		
Verification and Inspection Task	Continuous	Periodic
Observe drilling operations and maintain complete and accurate records for each pier.	X	--
Verify placement locations and plumbness, confirm pier diameters, bell diameters (if applicable), lengths, embedment into bedrock (if applicable) and adequate end bearing strata capacity.	X	--
For concrete piers, perform additional inspections in accordance with Section 1704.4.	--	--
For masonry piers, perform additional inspections in accordance with Section 1704.5.	--	--

Supplement B - Final Report of Special Inspections

Project: TAYLOR MILL WATER TREATMENT PLANT ADVANCED TREATMENT IMPROVEMENTS

Owner: Northern Kentucky Water District

Location: 608 Grand Avenue
Taylor Mill, KY 41015

Architect of Record:

Structural Engineer of Record:

Architect of Record and Structural Engineer of Record did not provide any construction Administration services for the project at the Owner's request.

To the best of my information, knowledge and belief, the Special Inspections required for this project, and itemized in the *Statement of Special Inspections* submitted for permit, have been performed and all discovered discrepancies have been reported and resolved other than the following:

Comments:

(Attach continuation sheets if required to complete the description of corrections.)

Interim reports submitted prior to this final report form a basis for and are to be considered an integral part of this final report.

Respectfully submitted,
Special Inspector

(Type or print name)

Signature

Date



Licensed Professional Seal

Agent's Final Report

Project: TAYLOR MILL WATER TREATMENT PLANT ADVANCED TREATMENT IMPROVEMENTS

Agent:

Special Inspector:

Special Inspections were conducted by a third party, no representative of the Engineer or Architect of record were on site to witness the special inspections. The Special Inspections are based on information provided by the Owner and the special inspections consultant. To the best of my information, knowledge and belief, the Special Inspections or testing required for this project, and designated for this Agent in the *Statement of Special Inspections* submitted for permit, have been performed and all discovered discrepancies have been reported and resolved other than the following:

Comments:

(Attach continuation sheets if required to complete the description of corrections.)

Interim reports submitted prior to this final report form a basis for and are to be considered an integral part of this final report.

Respectfully submitted,
Agent of the Special Inspector

(Type or print name)

Signature

Date

*Licensed Professional Seal or
Certification*

Supplement C - Contractor's Statement of Responsibility

Each contractor responsible for the construction or fabrication of a system or component designated in the Quality Assurance Plan of Supplement A shall submit a Contractor's Statement of Responsibility.

Project: TAYLOR MILL WATER TREATMENT PLANT ADVANCED TREATMENT IMPROVEMENTS

Contractor's Name:

Address:

License No.:

Description of designated building systems and components included in the Contractor's Statement of Responsibility:

Contractor's Acknowledgment of Special Requirements

I hereby acknowledge that I have received, read, and understand the Project's seismic requirements, Quality Assurance Plan in Supplement A, and Special Inspection program.

I hereby acknowledge that control will be exercised to obtain conformance with the Contract Documents approved by the Building Official having jurisdiction.

Signature

Date

Contractor's Provisions for Quality Control

Procedures for exercising control within the Contractor's organization, the method and frequency of reporting and the distribution of reports are attached to this Statement.

Identification and qualifications of the person(s) exercising such control and their position(s) in the organization are attached to this Statement.

Supplement D - Fabricator's Certificate of Compliance

Each approved fabricator that is exempt from Special Inspection of shop fabrication and implementation procedures per section 1704.2 of the International Building Code must submit a *Fabricator's Certificate of Compliance* at the completion of fabrication.

Project: TAYLOR MILL WATER TREATMENT PLANT ADVANCED TREATMENT IMPROVEMENTS

Fabricator's Name:

Address:

Certification or Approval Agency:

Certification Number:

Date of Last Audit or Approval:

Description of structural members and assemblies that have been fabricated:

I hereby certify that items described above were fabricated in strict accordance with the Contract Documents.

Signature

Date

Title

Attach copies of fabricator's certification or building code evaluation service report and fabricator's quality control manual.

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SECTION 01420

REFERENCES

PART 1 – GENERAL

1.1 DEFINITIONS

- A. Definitions and terminology applicable to all the Contract Documents are included in the General Conditions and Supplementary Conditions.
- B. Terminology used in the Specifications includes:
1. “Indicated” refers to graphic representations, notes, or schedules on the Drawings, or to other paragraphs or schedules in the Specifications and similar locations in the Contract Documents. Terminology such as “shown”, “noted”, “scheduled”, and “specified” are used to help the user locate the reference without limitation on the location.
 2. “Installer”, “applicator”, or “erector” is CONTRACTOR or another entity engaged by CONTRACTOR, either as an employee or Subcontractor, to perform a particular construction activity, including installation, erection, application or similar Work. Installers shall be experienced in the Work that installer is engaged to perform.
 - a. The term “experienced”, when used with the term “installer” means having successfully completed a minimum of five previous projects similar in size and scope to this Project; being familiar with the special requirements indicated; being familiar with Laws and Regulations; and having complied with requirements of authorities having jurisdiction, and complying with requirements of the Supplier of the material or equipment being installed.
 3. Trades: Use of a term such as “carpentry” does not imply that certain construction activities must be performed by accredited or unionized individuals of a corresponding generic name, such as “carpenter”, unless otherwise indicated in the Contract Documents or required by Laws or Regulations. Such terminology also does not imply that specified requirements apply exclusively to trade personnel of the corresponding generic name.
 4. “Assigned specialists” and similar terms: Certain Sections of the Specifications require that specific construction activities be performed by specialists recognized as experts in those operations. Engage said specialists for those activities, and their engagement is a requirement over which CONTRACTOR has no option. These requirements do not conflict with enforcement of building codes and other Laws and Regulations. Also, such requirements are not intended to interfere with local trade union jurisdictional settlements and similar conventions. Such assignments shall not relieve CONTRACTOR of responsibility for complying with the requirements of the Contract Documents.

1.2 ABBREVIATIONS

A. Common abbreviations that may be found in the Contract Documents are listed below, alphabetically by their written-out meaning:

alternating current		a-c
ampere		A
ante meridian		a.m.
average		avg
biochemical oxygen demand		BOD
brake horsepower		bhp
British thermal unit		Btu
Centigrade (or Celsius)		C
chlorinated polyvinyl chloride		CPVC
Construction Contract Administration		CCA
cubic inch		cu in
cubic foot		cu ft
cubic yard		cu yd, or CY
cubic feet per minute		cfm
cubic feet per second		cfs
decibel		db
degree Centigrade (or Celsius)	(Write)	degrees C or °C
degrees Fahrenheit		degrees F or °F
diameter		dia
direct current		d-c
dollars		\$
each		ea
efficiency		eff
Fahrenheit		F
feet		ft
feet per hour		fph
feet per minute		fpm
feet per second		fps
figure		Fig
flange		flg
foot-pound		ft-lb
gallon		gal

gallons per hour	gph
gallons per minute	gpm
gallons per second	gps
gram	g
grams per liter	g/L
Hertz	Hz
horsepower	hp or HP
hour	hr
inch	in.
inches water gage	in. w.g.
inch-pound	in.-lb
inside diameter	ID
thousand pounds	kips
thousand pounds per square inch	ksi
kilovolt-ampere	kva
kilowatt	kw
kilowatt-hour	kwhr or kwh
linear foot	lin ft or LF
liter	L
maximum	max
mercury	Hg
milligram	mg
milligrams per liter	mg/l or mg/L
milliliter	ml
millimeter	mm
million gallons per day	mgd or MGD
million gallon	MG
minimum	min
National Pipe Threads	NPT
net positive suction head	NPSH
net positive suction head available	NPSHA
net positive suction head required	NPSHR
number	no.
ounce	oz
ounce-force	ozf
outside diameter	OD

parts per hundred	pph
parts per million	ppm
parts per billion	ppb
polyvinyl chloride	PVC
post meridian	p.m.
pound	lb
pounds per square inch	psi
pounds per square inch absolute	psia
pounds per square inch gauge	psig
pounds per square foot	psf
revolutions per minute	rpm
second	sec
specific gravity	sp gr, or SG
square	sq
square foot	sq ft, or sf
square inch	sq in.
square yard	sq yd, or SY
standard	std
standard cubic feet per minute	scfm
total dynamic head	TDH
totally-enclosed fan-cooled	TEFC
vertical foot	VF
volt	V
volts alternating current	vac
volts direct current	vdc
vertical foot	vf

1.3 REFERENCE STANDARDS

- A. Refer to Article 3 of the General Conditions, as may be modified by the Supplementary Conditions, relative to reference standards and resolving discrepancies between reference standards and the Contract Documents. Provisions of reference standards are in effect in accordance with the Specifications.
- B. Copies of Standards: Each entity engaged in the Work shall be familiar with reference standards applicable to its construction activity. Copies of applicable reference standards are not bound with the Contract Documents. Where reference standards

are needed for a construction activity, obtain copies of standards from the publication source.

- C. Abbreviations and Names: Where reference standards, specifications, codes, manuals, Laws or Regulations, or other published data of international, national, regional or local organizations are referred to in the Contract Documents, the organization issuing the standard may be referred to by their acronym or abbreviation only. Following acronyms or abbreviations that may appear in the Contract Documents shall have the meanings indicated below. Listing is alphabetical by acronym.

AA	Aluminum Association
AABC	Associated Air Balance Council
AAMA	American Architectural Manufacturers Association
AASHTO	American Association of State Highway and Transportation Officials
ACI	American Concrete Institute
ACS	American Chemical Society
AEIC	Association of Edison Illuminating Companies
AF&PA	American Forest and Paper Association
ABMA	American Bearing Manufacturers Association (formerly Anti-Friction Bearing Manufacturers Association (AFBMA))
AGMA	American Gear Manufacturers Association
AI	Asphalt Institute
AIChE	American Institute of Chemical Engineers
AISC	American Institute of Steel Construction
AISI	American Iron and Steel Institute
AITC	American Institute of Timber Construction
ALSC	American Lumber Standards Committee
AMA	Acoustical Materials Association
AMCA	Air Movement and Control Association
ANSI	American National Standards Institute
APA	The Engineered Wood Association
API	American Petroleum Institute
APHA	American Public Health Association
AREA	American Railway Engineering Association
ARI	Air Conditioning and Refrigeration Institute
ASAE	American Society of Agricultural Engineers
ASCE	American Society of Civil Engineers
ASHRAE	American Society of Heating, Refrigerating and Air Conditioning Engineers

ASME	American Society of Mechanical Engineers
ASNT	American Society for Non-Destructive Testing
ASTM	American Society for Testing and Materials
AWCI	Association of the Wall and Ceiling Industry
AWI	Architectural Woodwork Institute
AWPA	American Wood Protection Association
AWPI	American Wood Preservers Institute
AWS	American Welding Society
AWWA	American Water Works Association
BAAQMD	Bay Area Air Quality Management District
BHMA	Builders Hardware Manufacturers Association
BIA	Brick Industry Association
CBMA	Certified Ballast Manufacturers Association
CDA	Copper Development Association
CEMA	Conveyor Equipment Manufacturers Association
CGA	Compressed Gas Association
CISCA	Ceilings and Interior Systems Construction Association
CISPI	Cast Iron Soil Pipe Institute
CLFMI	Chain Link Fence Manufacturers Institute
CMAA	Crane Manufacturers Association of America
CRSI	Concrete Reinforcing Steel Institute
DIN	Deutsches Institut für Normung eV (German Institute for Standardization)
DIPRA	Ductile Iron Pipe Research Association
EJMA	Expansion Joint Manufacturers Association, Inc.
ETL	Intertek Testing Services, Inc. (formerly ETL Testing Laboratories, Inc.)
FCC	Federal Communications Commission
FEMA	Federal Emergency Management Agency
FM	Factory Mutual (FM Global)
FRPI	Fiberglass Reinforced Plastics Institute
FS	Federal Specification
GA	Gypsum Association
GANA	Glass Association of North America
HEW	United States Department of Health, Education and Welfare
HI	Hydraulic Institute
HMI	Hoist Manufacturers Institute
HUD	United States Department of Housing and Urban Development

IBC	International Building Code
ICC	International Code Council
ICEA	Insulated Cable Engineers Association
IEEE	Institute of Electrical and Electronics Engineers
IESNA	Illuminating Engineering Society of North America
IFI	Industrial Fasteners Institute
IRI	Industrial Risk Insurers
ISA	Instrumentation, Systems, and Automation Society (formerly Instrument Society of America)
ISO	Insurance Services Office
ISO	International Organization for Standardization
LEED	Leadership in Energy and Environmental Design (USGBC)
LPI	Lightning Protection Institute
MIA	Marble Institute of America
ML/SFA	Metal Lath/Steel Framing Association
MS	Military Specifications
MSS	Manufacturers' Standardization Society
MMA	Monorail Manufacturers Association
NAAMM	National Association of Architectural Metal Manufacturers
NACE	National Association of Corrosion Engineers
NAPF	National Association of Pipe Fabricators, Inc.
NARUC	National Association of Regulatory Utilities Commissioners
NBHA	National Builders Hardware Association
NCMA	National Concrete Masonry Association
NEC	National Electric Code
NELMA	Northeastern Lumber Manufacturers' Association
NEMA	National Electrical Manufacturers Association
NESC	National Electrical Safety Code
NETA	International Electrical Testing Association
NFPA	National Fire Protection Association
NFRC	National Fenestration Rating Council
NGA	National Glass Association
NHLA	National Hardwood Lumber Association
NHPMA	Northern Hardwood and Pine Manufacturers Association
NIST	United States Department of Commerce, National Institute of Standards and Technology
NLGA	National Lumber Grades Authority
NRCA	National Roofing Contractors Association

NRMCA	National Ready Mixed Concrete Association
NSF	National Sanitation Foundation
NSSGA	National Stone, Sand, and Gravel Association
NTMA	National Terrazzo and Mosaic Association
OSHA	Occupational Safety and Health Administration
PCA	Portland Cement Association
PCI	Precast/Prestressed Concrete Institute
PEI	Porcelain Enamel Institute
PFI	Pipe Fabrication Institute
PPI	Plastics Pipe Institute
PGMC	Primary Glass Manufacturers Council
PS	Product Standards Section, United States Department of Commerce
RCSC	Research Council on Structural Connections (part of AISC)
RMA	Rubber Manufacturers Association
SAE	Society of Automotive Engineers
SCAQMD	Southern California Air Quality Management District
SCPRF	Structural Clay Products Research Foundation
SDI	Steel Deck Institute
SDI	Steel Door Institute
SIGMA	Sealed Insulating Glass Manufacturing Association
SJI	Steel Joist Institute
SMACNA	Sheet Metal and Air Conditioning Contractor's National Association
SPI	Society of the Plastics Industry
SPIB	Southern Pine Inspection Bureau
SSPC	Society for Protective Coatings
SWI	Steel Window Institute
TEMA	Tubular Exchanger Manufacturers Association
TCNA	Tile Council of North America
UL	Underwriters Laboratories, Inc.
USEPA	United States Environmental Protection Agency
USGBC	United States Green Building Council
USGS	United States Geological Survey
USPHS	United States Public Health Service
WCLIB	West Coast Lumber Inspection Bureau
WDMA	Window and Door Manufacturers Association
WWEMA	Water and Wastewater Equipment Manufacturers Association

WWPA Western Wood Products Association

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

++ END OF SECTION ++

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SECTION 01436

VIBRATION MONITORING

PART 1 - GENERAL

1.1 DESCRIPTION

A. Scope:

1. The work to be done under this Section includes conducting all activities on the project in such a manner that damage is prevented to adjacent pipes, structures, property and work, and such that ground vibrations and ground and structure displacements are consistently maintained below the maximum levels specified in this Section.
2. Notify the ENGINEER and CONSTRUCTION CONTRACT ADMINISTRATOR fourteen (14) working days prior to conducting any vibration producing activity and prior to conducting appropriate monitoring at nearby structures in accordance with the plan prepared by the CONTRACTOR'S Independent Specialist and reviewed by the CONSTRUCTION CONTRACT ADMINISTRATOR.
3. The CONTRACTOR'S Independent Specialist shall provide and install monitoring adjacent or near the following locations:
 - a. Near the existing drive access to the plant from Grand Avenue.
4. Protect vibration monitoring equipment, benchmarks, settlement monitoring points, and other monitoring equipment that is installed.
5. The CONTRACTOR shall be responsible for fixing any damage caused by their operations.

B. Related Sections:

1. Section 01324, Photographic Documentation
2. Section 01722, Field Engineering
3. Section 02475, Drilled Piers
4. Section 02505, Pipe Embedment and Backfill Materials

1.2 JOB CONDITIONS

- A. Monitoring locations shall be approved by the CONSTRUCTION CONTRACT ADMINISTRATOR.

1.3 SUBMITTALS

- A. Shop Drawings: Submit the following in accordance with Section 01330:
 1. Qualifications for the Independent Specialist whose services have been selected by the CONTRACTOR for performing the vibration monitoring work.

2. A monitoring plan prepared by the Independent Specialist, which shows the location and type of all monitoring points, prior to starting this work.
3. Shop drawings and manufacturer's data for the following:
 - a. Engineering seismographs.

1.4 MOVEMENT AND VIBRATION LIMITS

- A. Maximum vibrations at existing structures and utilities shall not exceed the following as a result of excavation, pile driving or other activities of the CONTRACTOR:
 1. All structures on site: Threshold limit, maximum peak particle velocity (PPV) of 1.5 in/sec; limiting value, maximum PPV of 2.0 in/sec.
 2. Buried pipelines or other buried utilities: Threshold limit, maximum peak particle velocity (PPV) of 2.0 in/sec; limiting value, maximum PPV of 3.0 in/sec.
 3. Maximum movements at existing structures, pavement and utilities shall not exceed the following as a result of excavation, pile driving or other activities of the CONTRACTOR:
 - a. All structures and pavement at the site: Threshold limit, maximum settlement or heave of 0.15 inch; limiting value, maximum settlement or heave of 0.25 inch.
 - b. Buried pipelines or other buried utilities: Threshold limit, maximum settlement or heave of 0.2 inch, limiting value, maximum settlement or heave of 0.3 inch.
 4. The CONTRACTOR may establish lower limits if deemed appropriate to protect existing and newly installed structures.
- B. Actions if threshold or limiting values are exceeded:
 1. If threshold limits of vibration or movement are exceeded, the CONTRACTOR shall submit to the CONSTRUCTION CONTRACT ADMINISTRATOR, within 24 hours of notification of the exceedance, a submittal indicating the activity causing the exceedance and the steps the CONTRACTOR has taken and will take to prevent further exceedances of the threshold limit.
 2. If limiting values of vibration or movement are exceeded, all work by the CONTRACTOR in the vicinity of the exceedance shall stop until a meeting takes place between the CONTRACTOR, the CONSTRUCTION CONTRACT ADMINISTRATOR, and the CONTRACTOR'S Independent Specialist to assess the cause of the exceedance. A submittal shall be prepared and submitted to the CONSTRUCTION CONTRACT ADMINISTRATOR indicating what activity caused the exceedance and what steps the CONTRACTOR will take to prevent further exceedances of the limits. No work in the vicinity of the exceedance shall be restarted until the submittal is reviewed and approved by the ENGINEER.

1.5 STRUCTURE EXAMINATION

- A. Prior to starting work, the CONTRACTOR and the CONSTRUCTION CONTRACT ADMINISTRATOR shall make a joint inspection of the existing structures within 150 feet of the work area, and all homes along Grand Avenue adjacent to the plant property, to examine and document their present conditions. CONTRACTOR shall gain permission from the property owner prior to entering any private property.
- B. Photographs shall be taken to record any cracks or other evidence of structural distress in the structure in accordance with Section 01324.
- C. The CONTRACTOR shall prepare a report for each structure documenting all pre-existing conditions, verified by the photographs, and signed by the personnel of the CONTRACTOR and the CONSTRUCTION CONTRACT ADMINISTRATOR participating in the investigation, and submit a copy to the CONSTRUCTION CONTRACT ADMINISTRATOR within ten (10) working days.
 - 1. Included in the report shall be a baseline vibration analysis at location specified in paragraph 1.1.A.3 herein for a period of 7 days prior to mobilization and construction.

PART 2 - PRODUCTS

2.1 ENGINEERING SEISMOGRAPHS

- A. Engineering seismographs shall be capable of measuring vibration levels from 0.02 to 10 inches per second, at frequencies from 2 to 200 Hz, and of continually recording readings for a period of 24 hours.

PART 3 - EXECUTION

3.1 VIBRATION MONITORING

- A. Vibration monitoring shall be performed by the CONTRACTOR'S Independent Specialist using personnel experienced in the correct placement and monitoring of engineering seismographs.
- B. Engineering seismographs will be installed at the locations specified in paragraph 1.1.A.3 herein. Where there is pile driving or sheet installing activity, the seismograph sensors shall be coupled to the ground surface at varying distances of about 10 to 50 feet from the pile driving, in order to be able to predict the potential ground vibrations as a function of distance from the pile driving.

- C. Vibration monitors shall run continuously during all pile driving and sheeting installation activities at the site, and readings on each seismograph shall initially be checked every four (4) hours. If equipment allows, this data may be downloaded and checked remotely. Based on historical results the interval for taking readings may be extended based on recommendations from the CONTRACTOR'S Independent Specialist, and as approved by the ENGINEER.
- D. Vibration monitor at the location specified in paragraph 1.1.A.3 herein shall continuously record as to provide a record of vibrations at this location throughout the project. When no pile driving and sheeting installation activity is taking place the CONTRACTOR shall download and check the results weekly.
- E. Reports of vibration monitoring exceeding the vibration limits shall be provided to the CONSTRUCTION CONTRACT ADMINISTRATOR by the end of the next day after monitoring has been performed. Reports of monitoring below the vibration limits shall be provided to the CONSTRUCTION CONTRACT ADMINISTRATOR weekly.
- F. The ENGINEER and CONSTRUCTION CONTRACT ADMINISTRATOR shall be notified immediately if any vibration readings exceed the threshold or limiting values specified herein, and take other appropriate actions in accordance with paragraph 1.4.B herein.

3.2 AIR OVERHEAD PRESSURE MONITORING

- A. Air overhead pressure monitoring shall be performed by the CONTRACTOR'S Independent Specialist using personnel experienced in the correct placement and monitoring of engineering seismographs. The same engineering seismograph that is used to monitor vibrations shall be utilized to monitor air overhead pressure.

++ END OF SECTION ++

SECTION 01452

TESTING LABORATORY SERVICES

PART 1 – GENERAL

1.1 DESCRIPTION

- A. CONTRACTOR shall employ and pay for an independent testing laboratory to perform specified services. Laboratory selected shall be subject to approval by CONSTRUCTION CONTRACT ADMINISTRATOR. CONTRACTOR shall coordinate with OWNER's special inspection and testing agency.
- B. Inspection, sampling and testing shall be as specified in the Specifications including but not limited to the following that may be by OWNER or CONTRACTOR:
1. Section 01416, Special Inspections.
 2. Section 02505, Pipe Embedment and Backfill Materials, for compaction tests.
 3. Section 02300, Earthwork, for field density tests.
 4. Section 02318, Crushed Stone and Gravel, for granular material tests.
 5. Section 02475, Drilled piers, for pier load tests.
 6. Section 02700, Asphaltic Concrete Paving, for asphaltic pavement tests.
 7. Section 02720, Aggregate Base Course, for bituminous pavement.
 8. Section 03300, Cast-in-Place Concrete, for concrete tests.
 9. Section 03600, Precision Grouting, for grout tests.
 10. Section 04810, Unit Masonry Assemblies, for mortar and masonry grout tests.
 11. Section 05120, Structural Steel, for steel and weld tests.
 12. Section 09910, Painting, for tests on paint and painting.
 13. Section 15051, Buried Piping Installation, and Section 15052, Exposed Piping Installation, for bacteriological testing.
 14. Other tests in the Contract Documents that are not specifically assigned to others.

1.2 QUALITY ASSURANCE

- A. Qualifications:
1. Testing Laboratory:
 - a. Comply with applicable requirements of ASTM E329, Specification for Agencies Engaged in Construction Inspection and/or Testing, for the inspection and testing that is being conducted.
 - b. Laboratory shall be authorized to operate in the same state as the Site. Where applicable, laboratory shall be certified by the authority having jurisdiction for the types of testing required.
 - c. Testing equipment used by laboratory will be calibrated at maximum twelve month intervals by devices of accuracy traceable to either NIST's

Standard Reference Materials (SRM), ISO 17025, General Requirements for the Competence of Testing and Calibration Laboratories, or certified by state or local bureau of weights and measures, or values of natural physical constants generally accepted in the engineering and scientific community.

1.3 SUBMITTALS

- A. Informational Submittals: Submit the following:
 - 1. Qualifications Statements:
 - a. Laboratory:
 - 1) Qualifications statement indicating experience and facilities for tests required under the Contract Documents.
 - 2) Copy of report of inspection of facilities during most recent NIST inspection tour. Include memorandum of remedies of deficiencies reported during inspection.
 - 3) Copy of certificate of calibration for each instrument or measuring device proposed for use, by accredited calibration agency.

1.4 LABORATORY DUTIES

- A. Cooperate with CONTRACTOR and CONSTRUCTION CONTRACT ADMINISTRATOR and provide qualified personnel promptly when notified.
- B. Perform specified inspections, sampling, and testing of materials and methods of construction; comply with applicable standards; ascertain compliance with requirements of the Contract Documents.
- C. Promptly notify CONSTRUCTION CONTRACT ADMINISTRATOR and CONTRACTOR of irregularities or deficiencies in the Work observed during performance of services.
- D. Promptly submit five copies of reports of inspections and tests to CONSTRUCTION CONTRACT ADMINISTRATOR and CONTRACTOR, including:
 - 1. Date issued.
 - 2. Project title, number, and name of the Site.
 - 3. Testing laboratory name and address.
 - 4. Name and signature of inspector or person obtaining samples.
 - 5. Date of inspection or sampling.
 - 6. Record of temperature and weather.
 - 7. Date of test.
 - 8. Identification of material or product tested, and associated Specification Section.
 - 9. Location in the Project.
 - 10. Type of inspection or test.

- 11. Results of tests and observations regarding compliance with the Contract Documents.
- E. Perform additional tests and services as required to ensure compliance with the Contract Documents.

1.5 CONTRACTOR'S COORDINATION WITH LABORATORY

- A. Provide to laboratory representative samples of materials to be tested, in required quantities.
- B. Provide labor and facilities:
 - 1. To provide access to the Work to be tested, and where required, to Suppliers' operations.
 - 2. To obtain and handle samples at the Site.
 - 3. To facilitate inspections and tests.
 - 4. For laboratory's exclusive use for storage and curing of test samples.
 - 5. Forms for preparing concrete test beams and cylinders.
- C. Notify laboratory and CONSTRUCTION CONTRACT ADMINISTRATOR sufficiently in advance of operations to allow for assignment of personnel and scheduling of tests.
- D. Arrange with laboratory and pay for additional services, sampling, and testing required for CONTRACTOR's convenience.

1.6 MATERIAL AND PRODUCT TEST REPORTS

- A. Submit copies of material and product test reports where required by the Contract Documents and as requested by CONSTRUCTION CONTRACT ADMINISTRATOR.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

++ END OF SECTION ++

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SECTION 01453

CLEANING, TESTING AND DISINFECTING HYDRAULIC STRUCTURES

PART 1 - GENERAL

1.1 DESCRIPTION

A. Scope:

1. CONTRACTOR shall provide labor, material, tools, equipment, and incidentals as shown, specified, and required to clean, flush, disinfect, and test structures.
2. The Work also includes all labor and materials required to prepare structure for testing and disinfecting, conveying water to testing location, performing testing, and all labor and materials required to drain and dispose of water used for testing and disinfecting.

B. Water for Testing:

1. Water for initial testing will be furnished by OWNER.
2. CONTRACTOR shall provide temporary piping, hoses, valves, backflow preventers, appurtenances, and services required for testing.
3. CONTRACTOR shall convey the water to testing location.
4. Cost of water for re-testing shall be paid by CONTRACTOR to OWNER at OWNER's standard rates.

C. Provide chemicals for disinfection and dechlorination.

D. Testing and disinfection of piping is under Section 15051, Buried Piping Installation, and Section 15052, Exposed Piping Installation.

E. Related Sections:

1. Section 03300, Cast-In-Place Concrete
2. Section 15051, Buried Piping Installation.
3. Section 15052, Exposed Piping Installation.

1.2 REFERENCES

A. Standards referenced in this Section are:

1. ACI 350.1/ACI 350.1R, Tightness Testing of Environmental Engineering Concrete Structures.
2. APHA/AWWA/Water Environment Federation (WEF), Standard Methods for the Examination of Water and Wastewater..
3. AWWA C652, Disinfection of Water-Storage Facilities.
4. AWWA C653, Disinfection of Water Treatment Plants.
5. NSF/ANSI 60, Drinking Water Treatment Chemicals – Health Effects.

1.3 TERMINOLOGY

- A. The following words or terms are not defined but, when used in this Section, have the following meaning:
1. “Hydraulic structures” are tanks, channels, and other structures through which fluid is conveyed or that hold fluid. Hydraulic structures include structures open to the atmosphere and structures with closed tops. Hydraulic structures, include wet wells, junction chambers, equalization tanks, storage tanks, treatment process tanks such as grit chambers, clarifiers, aeration tanks, filter beds, contact tanks, and other channels and tanks designated in this Section. Excluded are structures that are to be cleaned or tested under other Specification Sections.

1.4 QUALITY ASSURANCE

- A. Testing Laboratory:
1. Testing for bacteria and odor shall be by laboratory certified by authority having jurisdiction. Submit test results to CONSTRUCTION CONTRACT ADMINISTRATOR.
 2. Refer to Section 01452, Testing Laboratory Services Furnished by CONTRACTOR, for testing laboratory qualifications requirements.
- B. Regulatory Requirements:
1. Backflow preventers shall be tested by certified backflow prevention technician and certified by the authority having jurisdiction within one year or less of date of backflow preventer’s use on the Project.

1.5 SUBMITTALS

- A. Action Submittals: Provide the following:
1. Product Data:
 - a. Data sheets on chemicals used for disinfection and dechlorination.
 - b. Proof of NSF/ANSI 60 compliance for chemicals used in disinfection and dechlorination.
 2. Procedure Submittals (including proposed plans for water conveyance, control, and disposal):
 - a. Cleaning procedures.
 - b. Hydrostatic testing procedures and equipment required, by structure to be tested.
 - c. Air testing procedures and equipment required, by structure to be tested.
 - d. Disinfection procedures and equipment required, by structure to be tested.
- B. Informational Submittals: Provide the following:

1. Certifications:
 - a. Certification of each backflow preventer proposed for use.
 - b. Calibration certification for each flow meter proposed for use.
 - c. Certification that tests were performed in compliance with referenced standards.
2. Special Procedure Submittals:
 - a. Schedule for each test required.
 - b. Procedure for disposal of chlorinated water, including proposed dechlorination chemical and methods.
 - c. Provide written notice of intent to test each structure at least 14 days prior to planned testing. Testing shall not commence without acceptance of CONSTRUCTION CONTRACT ADMINISTRATOR.
3. Site Quality Control Submittals:
 - a. Results of each test.
 - b. Chain of custody documentation for bacteriological and odor tests
4. Qualifications Statements:
 - a. Testing laboratory qualifications in accordance with Section 01452, Testing Laboratory Services Furnished by CONTRACTOR.

PART 2 – PRODUCTS

2.1 MATERIALS

- A. Provide and maintain temporary valves, plugs, and bulkheads, and other water control equipment suitable for the intended use. Do not use materials that would be injurious to the Work. Backflow preventers shall be reduced pressure zone-type.
- B. Chemicals:
 1. Chemicals used for disinfection and dechlorination shall conform to NSF/ANSI 60.

PART 3 – EXECUTION

3.1 CLEANING

- A. Cleaning Requirements:
 1. Prior to testing, remove all scaffolding, planks, tools, rags, dirt, debris, and material not part of the structure.
 2. Thoroughly clean walls, floors, and operating equipment by sweeping, high-pressure wash, scrubbing, or other methods that will not injure the Work and existing facilities.
 3. Remove from the hydraulic structure all water, dirt, and foreign material accumulated during cleaning. Provide temporary pumps, piping, and

facilities as required to discharge water from the cleaning operation in manner acceptable to CONSTRUCTION CONTRACT ADMINISTRATOR and in conformance with Laws and Regulations.

4. Do not proceed with testing until CONSTRUCTION CONTRACT ADMINISTRATOR has accepted in the field results of cleaning.
5. Conform to Section 01740, Cleaning.

3.2 TESTING AND DISINFECTION, GENERAL

- A. Conform to the following:
 1. Test each hydraulic structure separately.
- B. Hydraulic structures shall be free of visible leakage. Repair leaks in manner in accordance with the Contract Documents.
- C. Successfully test structure before applying exterior coating systems and before installing masonry block veneer (if any). Apply and cure protective coatings for concrete before starting disinfection.
- D. Provide disinfection be as late as possible to provide maximum degree of sterility at the time the Work is placed into continuous service.
- E. Bacteriological and odor testing shall be performed by certified testing laboratory retained by CONTRACTOR. Testing laboratory shall be acceptable to CONSTRUCTION CONTRACT ADMINISTRATOR. Samples shall be obtained and transported by testing laboratory employee. Results of bacteriological testing shall indicate conformance with the Contract Documents and shall be acceptable to the authority having jurisdiction.
- F. Release of water from structure after testing shall be as approved or accepted (as applicable) by CONSTRUCTION CONTRACT ADMINISTRATOR.

3.3 HYDROSTATIC TESTING OF HYDRAULIC STRUCTURES

- A. Analysis of data from hydrostatic tests of hydraulic structures shall be by CONTRACTOR in accordance with ACI 350.1 and this Section. Provide materials, equipment, and labor to obtain test data.
- B. Prior to starting hydrostatic testing, perform the following:
 1. All elements of the structure that will resist pressure exerted by retained fluid shall be in place and at specified strength. Concrete shall be fully cured.
 2. To the greatest extent possible not backfill structure walls before testing. Apply external coatings such as dampproofing, if any, following CONSTRUCTION CONTRACT ADMINISTRATOR's acceptance of hydrostatic test results, unless approved otherwise by CONSTRUCTION CONTRACT ADMINISTRATOR.

3. Valves, gates, blind flanges, and items other than concrete that control the flow of or otherwise retain fluid in the hydraulic structure shall be watertight for the hydrostatic test.
 4. Repair defective concrete.
 5. Notify CONSTRUCTION CONTRACT ADMINISTRATOR and OWNER prior to starting to fill the structure for hydrostatic testing. Minimum time between notice and starting to fill for testing shall be in accordance with Paragraph 1.5.B.2 of this Section.
 6. Concrete hydraulic structures shall remain filled with water for an initial adsorption period of 48 hours. Following this initial period, provide add make-up water to fill the hydraulic structure to specified water surface test elevation.
- C. Using the water source specified in this Section, fill the hydraulic structure to a minimum of 6 inches above the maximum water surface elevation shown on the Hydraulic Profile. Where test elevation is not specified or indicated and fluid level in the structure will normally be controlled by a weir, fill structure to elevation six inches below the weir crest. Where test elevation is not specified or indicated and structure does not have a flow control weir, test elevation shall be two feet below top of structure.
- D. Filling Hydraulic Structures with Water:
1. Fill the portion of the hydraulic structure to be tested at rate that does not exceed two vertical feet per hour.
 2. If potable water is used for testing, during filling, provide backflow preventer at the point where water is withdrawn from potable water system.
- E. After water has reached specified test elevation and specified wetting period has elapsed, inspect structure's exposed surfaces for leakage. Before starting hydrostatic test, repair locations where leakage or weeping is evident.
- F. Hydrostatic test duration shall be determined by CONSTRUCTION CONTRACT ADMINISTRATOR based on ACI 350.1, and shall not be less than 24 hours.
- G. Allowable Leakage:
1. Leakage during the test period for structures with vertical walls is defined as the volume calculated using the difference in water surface elevations at the start and end of the period adjusted by adding the volume of precipitation and subtracting the volume of evaporation measured during the time period as applicable.
 2. Leakage during the test period for structures with sloping walls is the quantity of water that must be supplied to the hydraulic structure or section thereof to maintain the water level within three inches of specified water surface test elevation during the hydrostatic test, plus the volume of water required to fill the hydraulic structure to specified water surface test

elevation at conclusion of hydrostatic test, plus precipitation, minus evaporation, if applicable.

3. For concrete structures where interior wetted surfaces are not lined, allowable leakage is 0.075 percent of volume tested for each 24-hour period.
4. For concrete structures with interior wetted surfaces lined with waterproof material, allowable leakage is 0.050 percent of volume tested for each 24-hour period.
5. No leakage is allowed for hydraulic structures of material other than concrete.

H. Measurement Locations:

1. For hydraulic structures or portions of structures (when entire structure is not tested as a whole) that are equal to or less than 1,000 square feet in water surface area, measure water level at minimum of two locations approximately 180 degrees apart.
2. For hydraulic structures or portions of structures (when entire structure is not tested as a whole) that are greater than 1,000 square feet in water surface area, measure water level at minimum of four locations approximately 90 degrees apart.
3. Each measurement location shall be marked and given distinct reference number. Mark reference point on face of wall above test water surface in manner that will prevent movement or deterioration of reference point mark during the test.
4. Position the measurement locations to minimize effects of wave action and wind.

I. Evaporation and Precipitation Measurement:

1. In hydraulic structures open to atmosphere, a clear plastic, calibrated, open-topped container not less than 18-inch diameter and at least 18 inches deep shall be partially filled, floated in the hydraulic structure, and held in position near each measurement location. Calibration increments in container shall be 0.1-inch or less.
2. Position containers so that containers are not shaded by hydraulic structure's walls, away from overhead items such as beams, pipes, and walkways.

J. Test Measurements:

1. Do not start hydrostatic tests when severe weather conditions, such as heavy precipitation, high winds, major changes in average daily temperature, and other severe conditions are predicted for duration of test period.
2. Record the following measurements at each test location at start of test period and at 12-hour intervals thereafter:
 - a. Distance from reference point to test water surface.
 - b. Depth of water in evaporation-precipitation containers.

- c. Temperature of test water at point 18 inches below water surface.
 - d. Temperature of water in evaporation-precipitation containers at mid-depth.
3. If water surface is subject to wave action at measurement location, average water surface elevation of wave oscillations shall be recorded as data.
 4. Change in the water surface elevation at each measurement location shall be averaged and adjusted as follows:
 - a. Total change in hydraulic structure's water surface elevation shall be adjusted by average change in water surface elevation in evaporation-precipitation containers.
 - b. Where averaged water temperature measurements vary by more than three degrees from start to completion of test period, adjustment in test volume shall be determined by change of density of water resulting from change in the average water temperature.
 5. Determination of Leakage:
 - a. Hydraulic Structures with Vertical Walls: Leakage shall be the drop in water surface elevation measured during the test, multiplied by water surface area of hydraulic structure tested.
 - b. Hydraulic Structures with Surface Area that Varies with Depth of Water:
 - 1) Provide test container filled with a known quantity of water at start of test. Attach test pump suction to test container.
 - 2) Pump water from test container into hydraulic structure being tested with the test pump to maintain water level in hydraulic structure within three inches of specified test elevation for duration of test period.
 - 3) At conclusion of test, pump water from test container into hydraulic structure to attain specified water surface test elevation.
 - 4) Measure water remaining in test container and record volume used during test. Volume used is leakage during the test.
 - c. Initial full volume shall include the volume of sloping tank bottoms, sump pits, and other features that contain water that is connected to the hydraulic structure being tested.
 - d. Allowable leakage shall be determined by multiplying the initial full volume by the daily leakage allowance and by the leakage test time period in days.

K. Criteria for Acceptance:

1. Hydrostatic test will pass if measured leakage is less than allowable leakage and no leaks or weeping is observed.
2. If test becomes unreliable due to excessive precipitation or other external factors, re-start the test.
3. If hydrostatic test fails, the hydraulic structure may be re-tested immediately without repairs. If subsequent hydrostatic test fails, repair probable areas of leakage and repeat the hydrostatic test.

4. Re-test hydraulic structure until it meets criteria specified for acceptance. Repair probable leakage areas before testing.
- L. Reuse and Disposal of Water Used in Hydrostatic Tests:
1. Obtain acceptance of CONSTRUCTION CONTRACT ADMINISTRATOR before water used in one hydrostatic test is pumped to a different hydraulic structure for reuse in subsequent test.
 2. If chlorine residual in test water exceeds 0.5 mg/L, dechlorinate water used for hydrostatic testing to remove chlorine residual before discharging water to storm water drainage routes. Dechlorinate water using sodium bisulfite or other dechlorination chemical acceptable to CONSTRUCTION CONTRACT ADMINISTRATOR.
- M. Hydraulic structure shall not be backfilled or dampproofed until acceptance of hydrostatic test by CONSTRUCTION CONTRACT ADMINISTRATOR.

3.5 TESTING OF APPURTENANT PIPING

- A. Test piping appurtenant to hydraulic structures in accordance with the Contract Documents.

3.6 DISINFECTING HYDRAULIC STRUCTURES

- A. Hydraulic structures to be disinfected shall be chlorinated by CONTRACTOR in accordance with one of the methods in AWWA C652, unless otherwise specified or indicated in the Contract Documents.
- B. Disinfection:
1. Provide temporary taps, plugs, valves, drains, pumps, tanks, piping, facilities, and connections required to disinfect, dechlorinate, and remove chlorinated water as specified.
 2. Disinfect hydraulic structures immediately before each structure is placed in operation to prevent facility from becoming contaminated after disinfection.
 3. Use solution of water and liquid chlorine, calcium hypochlorite, or sodium hypochlorite. Placement of chlorine powder or tablets inside hydraulic structure as means of disinfection is not allowed.
 4. Introduce chlorine solution into hydraulic structure in manner accepted by CONSTRUCTION CONTRACT ADMINISTRATOR.
 5. Add potable water to hydraulic structure with the chlorine solution. Introduce water to hydraulic structure through backflow prevention device.
 6. Upon completion of disinfection of each hydraulic structure, dechlorinate contents of hydraulic structure until chlorine residual equals the residual in local potable water system. If residual of local potable water system is not available, dechlorinate to maximum chlorine residual of 0.5 mg/L. Dechlorination shall be in accordance with AWWA C653.

7. Discharge of chlorinated water into a sewer will not be allowed without written approval of owner of wastewater conveyance system and wastewater treatment facility. Do not discharge chlorinated water onto roadways or into ditches, storm sewers, drainage culverts, streams, or wetlands.
- C. After disinfection is completed and before hydraulic structure is placed in service, test the hydraulic structure for odor and bacteria in accordance with AWWA C652 and "Standard Methods for Examination of Water and Wastewater".
- D. Samples for bacteriological and odor testing shall be obtained from each disinfected hydraulic structure as follows:
 1. Immediately After Completion of Disinfection: Minimum of two samples.
 2. Twenty-four Hours after Obtaining First Set of Samples: Minimum of two samples.
- E. Sampling and testing for bacteriological and odor tests shall conform to Paragraph 3.2.E of this Section. Test results shall indicate satisfactory results for bacteria and odor, in accordance with requirements of authority having jurisdiction, before hydraulic structure will be Substantially Complete.
- F. Repeat the disinfection procedure at no additional cost to OWNER until test results indicate satisfactory results for bacteria and odor.

+ + END OF SECTION + +

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SECTION 01511

TEMPORARY ELECTRICITY AND LIGHTING

PART 1 - GENERAL

1.1 DESCRIPTION OF REQUIREMENTS

This section specifies administrative and procedural requirements for temporary electricity and lighting.

- A. Use Charges: No cost or usage charges for temporary electricity or lighting are chargeable to the Owner or Engineer. Cost or use charges for temporary electricity or lighting will not be accepted as a basis of claims for a change-order extra.

1.2 RELATED DOCUMENTS

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

1.3 JOB CONDITIONS

- A. General: Provide each temporary service and facility ready for use at each location when the service or facility is first needed to avoid delay in performance of the Work. Maintain, expand as required, and modify temporary services and facilities as needed throughout the progress of the Work. Do not remove until services or facilities are no longer needed, or are replaced by the authorized use of completed permanent facilities.
 - 1. With the establishment of the job progress schedule, establish a schedule for the implementation and termination of service for each temporary utility. At the earliest feasible time, and when acceptable to the Owner and Engineer, change over from the use of temporary utility service to the use of the permanent service, to enable removal of the temporary utility and to eliminate possible interference with completion of the Work.
- B. Conditions of Use: Operate temporary services and facilities in a safe and efficient manner. Do not overload temporary services or facilities, and do not permit them to interfere with the progress of the Work. Do not allow public nuisances or hazardous conditions to develop or persist on the site.

PART 2 - PRODUCTS

2.1 MATERIALS, EQUIPMENT AND SERVICES

- A. General: Provide new materials and equipment for temporary services and facilities; used materials and equipment that are undamaged and in serviceable condition may be used, if acceptable to the Engineer. Provide only materials and equipment that are recognized as being suitable for the intended use, by compliance with appropriate standards. Temporary services shall be separated into two service types:
1. Temporary Service for operation of the Preliminary Treatment equipment and lighting/HVAC associated with the Preliminary Treatment portion of the PT/GAC Building (see Specification Section 01120 for additional information).
 2. Temporary Service for construction needs (number of services as required to meet this specification).
- B. Temporary Electricity:
1. Provide temporary electrical service for construction needs, power to all construction trailers, and for lighting and heating facilities, throughout construction period.
 2. Service shall be adequate for construction use by all trades during construction period.
 3. Contractor shall make all necessary arrangements with the power company to obtain this service. He shall furnish, erect, and maintain the service pole, wires, main switch, panelboards, outlets, lights and metering facilities as required by the power company and as necessary to provide electrical service throughout the construction site.
 4. Contractor shall be responsible for payment of all monthly billing charges for temporary electric power. Contractor shall pay costs of equipment, materials, furnishing, installing, maintenance and removal of temporary electric service facilities.
 5. Contractor shall pay costs of equipment, furnishing, installing, maintenance and removal of temporary service facilities.
 6. Maintenance of temporary electric service shall be the sole responsibility of the General Contractor.
- C. Temporary Lighting:
1. Furnish and install temporary lighting required for :
 - a. Construction needs.
 - b. Safe and adequate working conditions.
 - c. Public Safety.
 - d. Security lighting.
 - e. Temporary office and storage area lighting.
 2. As each building is enclosed, temporary lighting shall be furnished to provide not less than 10 foot-candles in all areas.

3. Service Periods:
 - a. Security lighting: All hours of darkness.
 - b. Safety lighting:
 - c. Within construction area: All times that authorized personnel are present.
 - d. Public areas: At all times.
4. Costs of installation and operation: Contractor shall pay all installation, maintenance and removal costs of temporary lighting.
5. Maintenance of temporary lighting service (replacement of bulbs, etc.) shall be the sole responsibility of the General Contractor.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Use qualified tradesmen for installation of temporary services and facilities. Locate temporary services and facilities where they will serve the entire project adequately and result in minimum interference with the performance of the Work.
- B. Relocate, modify and extend services and facilities as required during the course of work so as to accommodate the entire work of the Project.

3.2 REMOVAL

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

++ END OF SECTION +

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SECTION 01514

TEMPORARY WATER

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Potable water for construction operators:
1. CONTRACTOR shall provide temporary water for entire Project, as specified in this Section.
 - a. Pay all costs for temporary water service facilities, including installation, maintenance, and removal.
 - 1) Obtain permits and pay fees and deposits required by owner of existing water system and authorities having jurisdiction
 - 2) Provide required facilities including piping, valves, meters if not provided by owner of existing waterline, backflow preventers, pressure regulators, and other appurtenances. Provide freeze-protection as required.
 - 3) Provide water for temporary sanitary facilities, field offices, Site cleaning and, when applicable, disinfecting and testing of systems.
 - 4) Continuously maintain adequate water flow and pressure for all purposes during Project, until removal of temporary water system. Provide temporary booster pumps, tanks, compressors, and appurtenances as required for maintaining flow and pressure.
 - 5) Should OWNER occupy part of Project prior to Substantial Completion, cost of water consumed via temporary water service will be shared proportionately between OWNER and CONTRACTOR per a mutually agreeable basis.
 - b. Maintain, service, and clean temporary water facilities and continuously provide consumables.
 - c. Facilities shall be adequate for personnel using the Site and requirements of Project.
 - d. Provide facilities in compliance with Laws and Regulations and, when applicable, requirements of water utility.
- B. Water:
1. Temporary potable water for testing or other approved uses during project:
 - a. OWNER will provide the CONTRACTOR a connection to the plant water system using a 2 -inch diameter yard hydrant with a meter and backflow preventer for temporary needs that do not exceed 30 days per each use. The CONTRACTOR is responsible for safety and security of the meter and backflow assembly and for obtaining a hydrant permit from the OWNER.

- b. The OWNER will track the usage of water through the meter. The OWNER will not charge for water used for project purposes unless the CONTRACTOR is found careless with control of the usage. Secure written permission for connection and use from OWNER and meet requirements for use. Notify fire department before obtaining water from fire hydrants.
 - c. Use only special hydrant operating wrenches to open hydrants. Make certain hydrant valve is open full, since cracking valve causes damage to hydrant. Repair damaged hydrants and notify OWNER as quickly as possible. Hydrants shall be completely accessible to fire department at all times.
- C. CONTRACTOR shall provide water hoses from hose bibs or hydrants, as applicable, to point of operations required for Work.
- D. Potable Water Source:
- 1. Provide temporary potable water by connecting to existing potable waterline as designated by OWNER. Do not connect to existing fire hydrants.
 - 2. Water Meter: Temporary water service shall have a calibrated meter suitable for the application. Temporary meter will be provided by CONTRACTOR.

1.2 USE OF OWNER'S SYSTEM

- A. Restrictions:
- 1. Existing Systems: Modify and extend existing system for temporary water service.
 - 2. Permanent System Provided Under the Project: Obtain OWNER's written permission for using permanent water system provided under the Project, indicating conditions of use.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Materials may be new or used, and shall be adequate for purpose required.
- B. When connecting to existing waterline at location other than existing fitting, provide suitable stainless steel tapping sleeve with appropriate valve. Do not remove existing waterline from service for tapping.
- C. Temporary Backflow Preventers:
- 1. Shall be reduced pressure zone-type with an air gap between discharge point and drain.
 - 2. Size and Capacity: Sufficient for the water flow and pressure requirements of the temporary water system.

3. Backflow preventers shall conform to Laws and Regulations and continually have a valid test certificate signed by a backflow preventer technician licensed by the authority having jurisdiction.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. General:
 1. Install temporary water service in neat, orderly manner. Temporary water system shall be structurally and mechanically sound throughout.
 2. Locate temporary piping, hose bibs, and hydrants as applicable to provide temporary water service convenient to work areas. Avoid interfering with the Work, traffic and work areas, materials handling equipment, OWNER's operating areas, storage areas, and work under other contracts.
 3. Do not locate backflow preventers in basements or in underground chambers. When backflow preventer is outdoors, provide freeze protection.
 4. Do not run piping on floor or on ground.
 5. Provide drip pan or bucket under each hose bib located within building, and connect drain to sewer, or empty pan or bucket when half full.
- B. Modify and extend temporary water service as required by progress of Project.
- C. Disinfect temporary water service prior to use in accordance with requirements of authorities having jurisdiction.

3.2 USE

- A. Properly supervise temporary water service:
 1. Enforce conformance with Laws and Regulations.
 2. Enforce sanitary practices.
 3. Prevent abuse of services.
 4. Prevent wasteful use of water.
 5. Protect system from freezing.

3.3 REMOVAL

- A. Completely remove temporary facilities and materials when no longer required. Repair damage caused by temporary facilities and their removal and restore Site to specified condition; if restoration of damaged areas is not specified, restore to pre-construction condition.
- B. Where temporary water service is disconnected from existing line, provide suitable, disinfected, watertight cap or blind flange, as applicable, on service line, per requirements of owner of the waterline.

++ END OF SECTION ++

SECTION 01515

TEMPORARY SANITARY AND FIRST AID FACILITIES

PART 1 - GENERAL

1.1 DESCRIPTION

- A. CONTRACTOR shall provide temporary sanitary and first-aid facilities during the Project, including:
1. Paying all costs for temporary sanitary and first-aid facilities, including installation, maintenance, and removal.
 2. Maintain, service, and clean sanitary and first-aid facilities. Keep sanitary and first-aid facilities continuously supplied with consumables.
 3. Facilities shall be adequate for personnel using the Site.
 4. Provide facilities in compliance with Laws and Regulations.
- B. Temporary sanitary and first-aid facilities provided shall include:
1. Potable drinking water supply and cups.
 2. Enclosed Toilet Facilities: Temporary flush toilets or portable toilets.
 3. Suitable washing facilities for employees.
 4. First-aid stations at or immediately adjacent to Site's major work areas, and inside CONTRACTOR's temporary field office. Locations of first-aid stations shall be determined by CONTRACTOR's safety representative. Other contractors shall provide first-aid stations in their own field office.
 5. Post list of emergency telephone numbers at each hardwired telephone at Site, including emergency medical services, hospitals, and ambulance services.
 6. When Work is in progress, provide at the Site at least one person trained in first-aid. First-aid-trained personnel shall possess valid certificate indicating that they have successfully completed first-aid training course by the American Red Cross or similar entity.
- C. Restrictions:
1. Existing Facilities: Shall not be used by contractors without written permission of OWNER with conditions for use.
 2. Permanent Facilities Provided Under the Project: Shall not be used by contractors.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Location of temporary toilets shall be acceptable to OWNER.

3.2 USE

- A. Use of Temporary Facilities:
 - 1. Properly supervise temporary facilities.
 - 2. Enforce proper use of sanitary facilities, including preventing the committing of nuisances in buildings at the Site.
 - 3. Properly dispose of wastes.

3.3 REMOVAL

- A. Completely remove temporary facilities and materials when no longer required. Repair damage caused by temporary facilities and their removal and restore Site to specified condition; if restoration of damaged areas is not specified, restore to pre-construction condition.

++ END OF SECTION ++

SECTION 01516

TEMPORARY FIRE PROTECTION

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Scope:
 - 1. General CONTRACTOR shall provide temporary fire protection throughout the Project, until OWNER takes occupancy. Remove temporary fire protection when OWNER takes occupancy.
 - 2. Pay all costs associated with temporary fire protection, including installation, maintenance, and removal.
 - 3. All contractors shall conform to provisions of this Section and Laws and Regulations.

- B. Reference Standards and Regulatory Requirements:
 - 1. Comply with applicable provisions of:
 - a. NFPA Standard No. 10, Portable Fire Extinguishers.
 - b. NFPA Standard No. 241, Safeguarding Building Construction and Demolition Operations.
 - 2. Temporary fire protection shall conform to Laws and Regulations.

1.2 REQUIRED TEMPORARY FIREFIGHTING EQUIPMENT

- A. Provide portable fire extinguishers, rated not less than 2A or 5B in accordance with NFPA Standard No. 10 for each temporary building and for every 3,000 square feet of floor area under construction.

- B. Provide portable fire extinguishers 50 feet maximum from all points in protected area.

1.3 FIRE PREVENTION AND SAFETY MEASURES

- A. Prohibit smoking in hazardous areas and inside of OWNER'S buildings. Provide visible, suitable warning signs in areas that are continuously or intermittently hazardous.

- B. Storage of Flammable and Combustible Products:
 - 1. Use metal safety containers for storing and handling flammable and combustible liquids and materials.
 - 2. Do not store flammable or combustible liquids and materials in or near stairways or exits.

- C. Maintain clear exits from all points at the Site.

1.3 COSTS OF INSTALLATION

- A. CONTRACTOR shall pay all costs including installation, maintenance, and removal of temporary fire protection.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

++ END OF SECTION ++

SECTION 01517

TEMPORARY PUMPING

PART 1 GENERAL

1.1 DESCRIPTION

A. Scope:

1. CONTRACTOR shall provide labor, materials, tools, equipment and incidentals shown, specified and required for temporary pumping and handling of fluids during the Work.
2. Design and provide temporary pumping systems, including plugs, bulkheads, and line stops as required; pumps; piping, supports, and valves; temporary control system and instrumentation; fuel, personnel, and appurtenances. The system shall conform to applicable codes, regulations, and requirements of authorities having jurisdiction and shall be suitable for its operating environment.
3. Required capacity of temporary pumping systems is specified in Section 01143, Coordination with OWNER'S Operations. Provide the temporary pumping system with the required capacity with at least one of the largest pumps out of service.
4. Location of the temporary pumping system shall not affect OWNER'S operations and access at the Site, unless approved by the CONSTRUCTION CONTRACT ADMINISTRATOR.
5. Provide electricity and fuel as required for the temporary pumping system. Secondary containment for fuel tanks shall be per applicable regulations. Include temporary fuel tanks in the spill prevention control and countermeasures evaluation and plan.
6. Leakage from the temporary pumping system or improper discharge are not allowed.

B. Coordination:

1. Review installation procedures under other Specification sections and coordinate work that must be performed with or before Work specified herein.

C. Related Sections:

1. Section 01143, Coordination with OWNER'S Operations.

1.2 QUALITY ASSURANCE

- ###### A. Temporary pumping system Supplier shall have a minimum of five years of experience providing temporary pumping systems and shall provide evidence of

furnishing five temporary pumping systems on other projects, similar in size and service to the temporary pumping system required for the Project.

- B. Obtain each temporary pumping system from a single Supplier who shall be responsible for providing a complete system.

1.3 SUBMITTALS

- A. Timing: Provide submittals for temporary pumping system to CONSTRUCTION CONTRACT ADMINISTRATOR at least thirty days prior to the delivery of the temporary pumping system to the Site.
- B. Provide qualifications of the temporary pumping system Supplier.
- C. Provide the following for each temporary pumping system:
 - 1. Manufacturer's data and specifications on each type and size of pump proposed and its capacity, including pump curves. Provide manufacturer's data and specifications for generators and other equipment required for the system.
 - 2. Technical information and specifications on noise controls for noise-generating equipment.
 - 3. Technical data on temporary piping, pipe joints, valves, pipe supports, controls, flow meter, secondary containment for fuel tanks, and other information pertinent to the temporary pumping system.
 - 4. Layout Drawings:
 - a. Sketches showing the proposed layout of the temporary pumping system, including locations of temporary plugs, bulkheads, and line stops; suction and discharge locations; location of the pumps and associated piping and valves; and source of power for the temporary pumping system. Sketches shall be scale drawings acceptable to CONSTRUCTION CONTRACT ADMINISTRATOR, and shall include site plans from the Contract Documents.
 - b. Details of system suction and discharge locations. Discharge details shall include measures to protect the receiving structure and dissipate energy.
 - c. When temporary lines will be buried, provide trench details. Provide sketches and information on other types of protection proposed for temporary piping.
 - 5. A system curve of flow plotted against total dynamic head, and calculations that substantiate the proposed temporary pumping system, including comparison of net positive suction head required and net positive suction head available.
 - 6. Temporary Plugs, Bulkheads, and Line Stops: Manufacturer's literature and fabrication drawings showing the type of plug, bulkhead or line stop as applicable, materials, and the hydrostatic head the plug, bulkhead, or line stop is designed to withstand. Provide complete technical information for CONTRACTOR-proposed line stops, installation procedures, name of the

- proposed line stop installer, and documentation of experience on at least five similar projects.
7. Narrative on temporary pumping system operation, including who will operate the system, staffing, planned frequency of fueling, contingency plan in the event of a pump failure, and statement of systems that may be affected during operation of the temporary pumping system.
 8. Schedule for temporary pumping system set-up, testing, use, and removal from the Site.

PART 2 - PRODUCTS

2.1 TEMPORARY PUMPING SYSTEM

A. General:

1. System components shall be suitable for continuous operation with the fluid pumped.
2. Provide noise controls for the system. Noise emissions from the temporary pumping system shall conform to applicable codes and regulations and shall not exceed 70 db at a distance of thirty feet from the noise source.
3. Fuel consuming temporary pumping system components intended for use when CONTRACTOR is not present shall include fuel tanks sized for at least twenty-four hours of uninterrupted operation at the system's operating capacity, and an a means to automatically notify CONTRACTOR when of suction water level and low fuel level.

B. Instrumentation and Controls:

1. Temporary pumping system shall be provided with a flow meter acceptable to CONSTRUCTION CONTRACT ADMINISTRATOR and suitable for the pumped fluid, pipe material, and hydraulic conditions when the flow being bypassed is a measured flow. Flow meter shall provide accurate flow measurement. Flow meter shall include a local display of the flow rate in gallons per minute or million gallons per day as required, and be capable of providing a 4 to 20 mA DC output signal.
2. Controls: Provide capability to record and store flow measurement.

C. Temporary Piping System:

1. Piping shall be steel, ductile iron, high density polyethylene, or other material accepted by the CONSTRUCTION CONTRACT ADMINISTRATOR, and suitable for the system pressures. Aluminum piping and PVC pipe not mechanically restrained are not allowed. Hoses can be used only for short sections and with approval of CONSTRUCTION CONTRACT ADMINISTRATOR.
2. Piping system shall have watertight joints of the following types: fused joints, restrained couplings, flanged coupling adapters, quick-connects by Camlok or equal, flanged joints, grooved and shouldered end-type

couplings, and other watertight joints accepted by CONSTRUCTION CONTRACT ADMINISTRATOR.

3. Discharge piping shall be sized for a maximum velocity of 10 feet per second.
4. Provide check valves or approved pump control valves as required.
5. Provide air valves on the discharge piping as required. Air valves shall expel air upon pipe filling and admit air upon pipe dewatering, and release small amounts of entrained air during operation. Air valves shall be suitable for service with the pumped fluid.
6. Discharge from the temporary pumping system shall not adversely affect the process or facilities. Provide energy dissipating measures at the discharge point as required.

D. Temporary Plugs, Bulkheads, and Line Stops:

1. Acceptable temporary plugs and bulkheads include inflatable dams specifically designed for such service, brick bulkheads, timber bulkheads, sandbags, and other bulkhead methods suitable for the service.
2. Each plug, temporary bulkhead, and line stop shall be suitable for the maximum pressure encountered.
3. Where temporary plugs and bulkheads are under pressure or surcharged, provide either two plugs or a plug and temporary bulkhead.

PART 3 – EXECUTION

3.1 PREPARATION

A. General:

1. Temporary piping shall be located off of roads, driveways, and sidewalks. Piping shall not be located in environmentally sensitive areas, such as wetlands.
2. Where required for OWNER'S access to and operation of the facility, bury temporary piping that would otherwise inhibit access to processes, buildings, streets, and driveways. In paved areas, provide temporary surfacing, sufficient for H-20 wheel loads, over buried temporary piping.
3. Perform successful hydrostatic testing of the temporary piping system using clean water at a pressure equal to 1.2 times the highest expected operating pressure of the system, for one hour while maintaining the test pressure within 3 psi of the required test pressure. CONSTRUCTION CONTRACT ADMINISTRATOR will witness the hydrostatic test. Hydrostatic test criteria for acceptance: No leakage.
4. Verify that the entire temporary pumping system is ready for operation before commencing shutdown of OWNER'S operations, facility, or systems. Verify that controls and flow meter are properly connected and functional.

3.2 TEMPORARY PUMPING

- A. During Operation of the Temporary Pumping System:
1. Temporary pumping system shall operate continuously. In the event of equipment failure, CONTRACTOR shall immediately make repairs or replace the equipment. Spare parts and redundant units shall be provided as necessary for continuous operation.
 2. CONTRACTOR shall man the temporary pumping system twenty-four hours per day when the system is in service unless otherwise allowed by CONSTRUCTION CONTRACT ADMINISTRATOR.

3.3 DEMOBILIZATION

- A. Upon Conclusion of Temporary Pumping:
1. Remove plugs, bulkheads, and line stops in a manner that allows flow to slowly return to normal, without surging, surcharging, and adverse effects on the system.
 2. Flush out the temporary pumping system with clean water discharged to an appropriate location.
 3. Remove the equipment and appurtenances from the Site.

++ END OF SECTION ++

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SECTION 01522

CONTRACTOR'S FIELD OFFICE AND SHEDS

PART 1 - GENERAL

1.1 DESCRIPTION

- A. CONTRACTOR shall provide field office for CONTRACTOR's use with minimum facilities specified. Provide required storage and work sheds.
- B. Field Office and Furnishings:
 - 1. As required by CONTRACTOR and sufficient for daily Project meetings.
 - 2. Include conference table and chairs sufficient for six people.
 - 3. Telephone service.
 - 4. Computer network and related facilities as required.
 - 5. Light and temperature 65 ° F (winter), 75 ° F (summer).
 - 6. Twelve protective helmets for use by visitors to the Site.
 - 7. Exterior identification sign displaying company name. Sign shall not be larger than four feet by eight feet.
 - 8. Other furnishings at CONTRACTOR's option.
- C. Provide one complete set of Contract Documents in field office for ready reference by interested parties. In addition to the reference set, comply with Section 01782, Record Documents.
- D. Storage and Work Sheds:
 - 1. Provide storage and work sheds sized, furnished, and equipped to accommodate personnel, materials, and equipment involved, including temporary utility services.
- E. Pay for required permits and utilities.
- F. Clean and maintain field offices and sheds as required.
- G. Do not remove field offices and sheds until after Substantial Completion of the entire Work, unless otherwise approved by CONSTRUCTION CONTRACT ADMINISTRATOR. Remove field offices and sheds and restore areas prior to final inspection.

PART 2 - PRODUCTS (NOT USED)

- A. Protection Sign:

1. Provide and maintain one, 8-foot wide by 4-foot high sign constructed of 3/4 – inch exterior high density overlaid plywood. Sign shall bear name of Project, OWNER, CONTRACTOR, CONSTRUCTION CONTRACT ADMINISTRATOR and ENGINEER, and other participating agencies. Lettering shall be blue applied on a white background by an experienced sign painter. Paint shall be exterior type enamel. Information to be included will be provided by CONSTRUCTION CONTRACT ADMINISTRATOR.

PART 3 - EXECUTION (NOT USED)

++ END OF SECTION ++

SECTION 01550

ACCESS ROADS AND PARKING AREAS

PART 1 - GENERAL

1.1 DESCRIPTION

- A. CONTRACTOR shall provide temporary construction roads, walks, parking areas, and appurtenances required during the Project for use by CONTRACTOR, OWNER's operations, other contractors working on the Project, and emergency vehicles. Temporary roads and parking areas shall be designed and maintained by CONTRACTOR and be fully usable in all weather conditions.

- B. Use of Existing Access Roads:
 - 1. CONTRACTOR will be allowed to use OWNER'S existing roads upon obtaining OWNER's written permission.
 - 2. Prevent interference with traffic on existing roads and parking areas. At all times, keep access roads and entrances serving the Site clear and available to OWNER, OWNER's employees, emergency vehicles, and other contractors. Do not use these areas for parking or storage of materials.
 - 3. CONTRACTOR shall indemnify and hold harmless OWNER from expenses caused by CONTRACTOR's operations over existing roads and parking areas.
 - 4. Schedule deliveries to minimize use of driveways and entrances.
 - 5. CONTRACTOR shall provide access to the existing chemical building and existing residuals building as specified in Section 01140 Work Restriction

1.2 SITE ACCESS

- A. Site Access:
 - 1. All access to the site for CONTRACTOR'S employees, material, tools, and equipment shall only be through the designated construction entrance approved by the OWNER.

1.3 TEMPORARY ROADS AND PARKING AREAS

- A. Temporary Roads and Parking in Areas Different from Permanent Pavement: Construct temporary roads and parking areas adequate to support loads and to withstand traffic loads during the Project. Locate temporary roads and parking areas within construction limits shown.
 - 1. Provide reasonably level, graded, well-drained subgrade of satisfactory soil material, compacted to at least 95 percent of maximum dry density in the upper six inches.
 - 2. Where required to support loads and provide separation between subgrade and subbase materials, provide geotextile or geogrid as required.

3. Provide crushed stone or gravel subbase material at least six inches thick, roller-compacted to a level, smooth, dense surface. Subbase for temporary roads and areas traveled by construction vehicles shall be adequate for loads and traffic they will serve.
 4. Provide dust control treatment that is non-polluting and does not contribute to tracking-out onto pavement. Reapply dust control treatment as required.
- B. Temporary Roads and Parking in Same Areas as Permanent Pavement: Construct temporary roads and parking areas adequate to support construction loads and to withstand exposure to traffic during the Project. Locate temporary roads and parking areas in same location as permanent roads and parking areas. Extend temporary roads and parking areas, within construction limits indicated, as required for construction operations.
1. Coordinate elevations of temporary roads and parking areas with permanent roads and parking areas.
 2. Prepare subgrade, subbase, and base for temporary roads and parking areas per appropriate Specification sections in Division 2. Where required by subgrade conditions and construction loads and traffic, provide geotextile or geogrid on compacted subgrade for subbase support and separation of subbase and subgrade materials.
 3. Re-condition granular subbase of temporary roads and parking, including removing and properly disposing of contaminated material, re-grading, proof rolling, compacting, and testing.
 4. Delay installation of final courses of permanent bituminous pavement until road will not be subject to further heavy construction traffic. Repair damage to bituminous base course of pavement before installing permanent top courses.

1.5 CONTRACTOR PARKING

- A. CONTRACTOR employee vehicles shall be parked in an area specifically designated by OWNER, per Section 01561, Security.
- B. Construction vehicles and equipment shall be parked in work areas off of permanent roads and parking areas, in areas of the Site designated for CONTRACTOR staging.

1.6 MAINTENANCE OF ROADS

- A. General:
1. CONTRACTOR shall maintain temporary roads and parking to continuously provide at the Site access for construction vehicles and trucks, OWNER vehicles, deliveries for OWNER, emergency vehicles, and parking areas for OWNER's personnel.
 2. Public roads shall be passable at all times unless a road closure is allowed in writing by authority having jurisdiction.

3. When temporary roads and parking without hard surfacing become contaminated with soil and create a nuisance, remove contaminated material and replace with clean aggregate as required.
 4. Provide snow and ice removal for temporary roads and parking areas.
- B. Clean paved roads and parking areas over which CONTRACTOR's vehicles travel. Cleaning shall be done daily if necessary or more frequently as directed by CONSTRUCTION CONTRACT ADMINISTRATOR, and shall be by mechanical sweeper. Roads to be cleaned include:
1. Roads within limits of the Project.
 2. Permanent roads at Site from Site entrance to work areas and construction parking and staging areas.
 3. Public roads that require sweeping and cleaning due to CONTRACTOR's operations.
- C. Dust resulting from CONTRACTOR's activities shall be controlled by CONTRACTOR to prevent nuisances at Site and nearby areas. Apply water or use other methods subject to CONSTRUCTION CONTRACT ADMINISTRATOR's acceptance that will minimize airborne dust. Do not use water when water will cause hazardous or objectionable conditions such as ice, mud, ponds, and pollution.
- D. Provide temporary, heavy-duty steel roadway plates to protect existing manholes, handholes, valve boxes, vaults, and similar buried facilities.

1.7 REMOVALS AND RESTORATION

- A. Removals:
1. Remove temporary roads, walks, and parking areas that are not intended for, or acceptable for, integration into permanent pavement. Return areas of temporary roads, walks, and parking to pre-construction condition unless otherwise required by the Contract Documents. Remove temporary gates, fencing, and traffic controls associated with temporary roads and parking areas.
 2. Where areas of temporary roads and parking will be permanently landscaped, remove pavement, aggregate, soil and other material that does not comply with requirements for fill or subsoil and landscaping. Remove and properly dispose of materials contaminated with oil, bitumen, and other petrochemical compounds, and other substances that might impair growth of plants and lawns.
- B. Restoration:
1. Repair or replace paving, curbs, gutters, and sidewalks affected by temporary roads and parking, and restore to required conditions, per authorities having jurisdiction.
 2. Restore to pre-construction conditions existing roads, walks, and parking areas damaged by CONTRACTOR, subject to approval of owner of roads, walks, and parking areas.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

++ END OF SECTION ++

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SECTION 01551

MAINTENANCE AND PROTECTION OF TRAFFIC

PART 1 – GENERAL

1.1 DESCRIPTION

- A. CONTRACTOR shall keep all streets and traffic ways open for passage of traffic and pedestrians during the Work, unless otherwise approved by owner of the street, traffic way, or right-of-way, as applicable. Construction traffic shall access the Site only via entrance(s) stated in Section 01550, Access Roads and Parking Areas.
- B. When required to cross, obstruct or temporarily close a street or traffic way, provide and maintain suitable bridges, detours or other approved temporary expedient for the accommodation of traffic. Closings shall be for shortest time practical, and passage shall be restored immediately after completion of backfill and temporary paving or bridging.
- C. Give required advance notice to fire department, police department, and other emergency services as applicable of proposed construction operations.
- D. Give reasonable notice to owners or tenants of private property who may be affected by construction operations. Give minimum 5 day notice.
- E. Provide signs, signals, barricades, flares, lights and other equipment, service, and personnel required to regulate and protect all traffic and warn of hazards. Such Work shall conform to requirements of OWNER and authority having jurisdiction at the Site. Remove temporary equipment and facilities when no longer required, and restore grounds to original or to specified conditions, as applicable.
- F. Howard Street shall not be closed to traffic as specified in Section 01140 Work Restrictions. The St Anthony School 2010-2011 calendar may be obtained from the OWNER.

1.2 TRAFFIC SIGNALS AND SIGNS

- A. Provide and operate traffic control and directional signals required to direct and maintain an orderly flow of traffic in all areas under CONTRACTOR's control, and areas affected by CONTRACTOR's operations.
- B. Provide traffic control and directional signs, mounted on barricades or standard posts at the following locations:
 - 1. Each change of direction of a roadway and at each crossroad.
 - 2. Detours and hazardous areas.

3. Parking areas.

1.3 FLAGMEN

- A. Provide qualified and suitably equipped flagmen when construction operations encroach on traffic lanes, as required for regulation of traffic and in accordance with requirements of the authority having jurisdiction.

1.4 FLARES AND LIGHTS

- A. Provide flares and lights during periods of low visibility, for the following:
 1. To clearly delineate traffic lanes, to guide traffic, and to warn of hazardous areas.
 2. For use by flagmen directing traffic.
- B. Provide adequate illumination of critical traffic and parking areas.

1.5 PARKING CONTROL

- A. Control all CONTRACTOR-related vehicular parking within limits of the Work to preclude interfering with: public traffic or parking, access by emergency vehicles, OWNER's operations, and construction operations. Provide temporary parking facilities for the public, as required because of construction or operations.
- B. Monitor parking of all construction and private vehicles at the Site:
 1. Maintain free vehicular access to and through parking areas.
 2. Prohibit parking on or adjacent to access roads, and in non-designated areas.
 3. Construction vehicles must possess current vehicle registration.
 4. Private vehicles shall park only in designated areas.

1.6 HAUL ROUTES

- A. Consult with authorities having jurisdiction to establish thoroughfares that will be used as haul routes and Site access.
- B. Drawings indicate haul routes, designated by authorities having jurisdiction, that shall be used for construction traffic.
- C. Submit proposed haul routes to CONSTRUCTION CONTRACT ADMINISTRATOR and OWNER and obtain approval of authorities having jurisdiction.
- D. Confine construction traffic to designated haul routes.

- E. Provide traffic control at critical areas of haul routes to expedite traffic flow, and to minimize interference with normal traffic.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

+ + END OF SECTION + +

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SECTION 01561

SECURITY

PART 1 - GENERAL

1.1 DESCRIPTION

A. Scope:

1. CONTRACTOR shall safely guard all the Work, products, equipment, and property from loss, theft, damage, and vandalism until Substantial Completion. CONTRACTOR's duty includes safely guarding OWNER's property in vicinity of the Work and other private property from injury or loss in connection with performance of the Work.
2. Employ watchmen as required to provide required security and prevent unauthorized entry.
3. Costs for security specified in this Section shall be paid by CONTRACTOR.
4. Make no claim against OWNER for damage resulting from trespass.
5. Provide full compensation for damage to property of OWNER and others arising from failure to provide adequate security.
6. Provide temporary fencing in accordance with the Contract Documents.
7. CONTRACTOR's security measures shall be at least equal to those usually provided by OWNER to protect existing facilities during normal operation.

1.2 CONTRACTOR'S SITE ACCESS AND SECURITY PROCEDURES

- A. Conform to requirements of Section 01550, Access Roads and Parking Areas.
- B. Conform to OWNER's security procedures and access restrictions at Site throughout entire Project. CONTRACTOR, including Subcontractors and Suppliers, shall comply with the following:
 1. Personnel Identification: All CONTRACTOR personnel shall wear at all times on-Site a badge bearing CONTRACTOR's name, employee's name and, as applicable, employee number.
 2. Vehicle Identification: While on-Site, all CONTRACTOR vehicles, including employee vehicles, shall display vehicle identification tag in the windshield. Vehicle tag shall include the following information: Site name, CONTRACTOR name, contract number, vehicle license plate number and state of issue, name and employer of vehicle owner, and vehicle owner contact telephone number.
 3. Parking: Do not park outside of designated CONTRACTOR parking area, which is shown on the drawings. Prepare and maintain parking area as required. Personal vehicles are not allowed outside CONTRACTOR parking area.

1.3 TEMPORARY FENCING

- A. If security fencing or barriers are breached or temporarily removed for the Work, provide and maintain temporary security fencing equal to existing, unless otherwise specified, in manner satisfactory to CONSTRUCTION CONTRACT ADMINISTRATOR and OWNER.

- B. Security fencing shall be installed around the construction area in a manner satisfactory to CONSTRUCTION CONTRACT ADMINISTRATOR and OWNER. The security fencing along Grand Avenue and along the west property line shall incorporate green slats within the fencing for screening purposes.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

++ END OF SECTION ++

SECTION 01570

TEMPORARY CONTROLS

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:

1. CONTRACTOR shall provide and maintain methods, equipment, and temporary construction as required to control environmental conditions at the Site and adjacent areas.
2. Maintain controls until no longer required.
3. Upon completion of the Work, remove temporary controls and restore Site to specified condition; if condition is not specified, restore Site to pre-construction condition.

B. Related Sections:

1. Section 01412, Storm Water Pollution Prevention Plan and Permit.

1.2 NOISE CONTROL

A. Noise Control – General:

1. CONTRACTOR's vehicles and equipment shall minimize noise to greatest degree practicable.
2. Noise levels shall conform to Laws and Regulations, including OSHA requirements and local ordinances.
3. Noise levels shall not interfere with the work of OWNER or others.

1.3 DUST CONTROL

- ###### A. Control objectionable dust caused by CONTRACTOR's operation of vehicles and equipment, clearing, or other actions. To minimize airborne dust, apply water or use other methods subject to acceptance of CONSTRUCTION CONTRACT ADMINISTRATOR and approval of authorities having jurisdiction.

1.4 PEST AND RODENT CONTROL

A. Pest and Rodent Control – General:

1. Provide rodent and pest control as required to prevent infestation of the Site and storage areas.
2. Employ methods and use materials that do not adversely affect conditions at the Site or on adjoining properties.

1.5 WATER CONTROL

- A. Water Control – General:
 - 1. Provide methods to control surface water and water from excavations and structures to prevent damage to the Work, the Site, and adjoining properties.
 - 2. Control fill, grading, and ditching to direct water away from excavations, pits, tunnels and other construction areas and to direct drainage to proper runoff courses to prevent erosion, damage, or nuisance.
- B. Equipment and Facilities for Water Control: Provide, operate, and maintain equipment and facilities of adequate size to control surface water.
- C. Discharge and Disposal: Dispose of drainage water in manner to prevent flooding, erosion, and other damage to any and all parts of the Site and adjoining areas, and that conforms to Laws and Regulations.

1.6 POLLUTION CONTROL

- A. Pollution Control – General:
 - 1. Provide methods, means, and facilities required to prevent contamination of soil, water, or atmosphere caused by discharge of noxious substances from construction operations.
 - 2. Equipment used during construction shall conform to federal, state, and local Laws and Regulations.
 - 3. Refer to Section 01413, Contractor’s Hazardous Materials Management Program.
- B. Spills and Contamination:
 - 1. Provide equipment and personnel to perform emergency measures required to contain spillages, and to remove contaminated soils or liquids.
 - 2. Excavate contaminated earth and dispose of off-Site, and replace with suitable compacted fill and topsoil.
 - 3. Refer to Section 01411, Spill Prevention Control and Countermeasures Plan
- C. Protection of Surface Waters: Implement special measures to prevent harmful substances from entering surface waters. Prevent disposal of wastes, effluents, chemicals, or other such substances in or adjacent to surface waters and open drainage routes, in sanitary sewers, or in storm sewers.
- D. Atmospheric Pollutants:
 - 1. Provide systems for controlling atmospheric pollutants related to the Work.
 - 2. Prevent toxic concentrations of chemicals.
 - 3. Prevent harmful dispersal of pollutants into atmosphere.
- E. Solid Waste:
 - 1. Provide systems for controlling and managing solid waste related to the Work.

2. Prevent solid waste from becoming airborne, and from discharging to surface waters and drainage routes.
3. Properly handle and dispose of solid waste.

1.7 EROSION CONTROL

A. Erosion Control – General:

1. Plan and execute construction and earthwork by methods to control surface drainage from cuts and fills, and from borrow and waste disposal areas, to prevent erosion and sedimentation.
2. Coordinate erosion controls with requirements of Article 1.5 of this Section and Section 01412, Storm Water Pollution Prevention Plan and Permit.
3. Hold to a minimum the areas of bare soil exposed at one time.
4. Provide temporary control measures such as berms, dikes, and drains.
5. Construct fills and waste areas by selective placement to eliminate surface silts or clays that will erode.
6. Periodically inspect earthwork to detect evidence of the start of erosion; apply corrective measures as required to control erosion. Continue inspections and corrective measures until permanent vegetation has been established

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

++ END OF SECTION ++

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SECTION 01620

PRODUCT OPTIONS

PART 1 – GENERAL

1.1 DESCRIPTION

- A. Scope:
 - 1. CONTRACTOR's options for selecting products.
 - 2. Requirements for consideration of "or-equal" products.

1.2 TERMINOLOGY

- A. The following words or terms are not defined but, when used in this Section, have the following meaning:
 - 1. "Products" includes materials, equipment, machinery, components, fixtures, systems, and other goods incorporated in the Work. Products do not include machinery and equipment used for preparing, fabricating, conveying, erecting, or installing the Work. Products include OWNER-furnished goods incorporated in the Work where use of such goods is specifically required in the Contract Documents.

1.3 PRODUCT OPTIONS

- A. For products specified only by reference standard or description, without reference to Supplier, provide products meeting that standard, by a Supplier or from a source that complies with the Contract Documents.
- B. For products specified by naming one or more products or Suppliers, provide the named products that comply with the Contract Documents, unless an "or-equal" or substitute product is approved by ENGINEER.
- C. For products specified by naming only one product or manufacturer and followed by words indicating that no substitution is allowed, there is no option and no substitution will be allowed.

1.4 "OR EQUAL" PRODUCTS

- A. For proposed products not named in the Contract Documents and considered as an "or equal" as defined in the General Conditions, CONTRACTOR shall request in writing ENGINEER's approval of the "or equal". Request for approval of an "or equal" product shall accompany the Shop Drawing or product data submittal for the proposed product and shall include:

1. CONTRACTOR's request that the proposed product be considered as an "or equal" in accordance with the General Conditions, accompanied by CONTRACTOR's certifications required in the General Conditions.
2. Documentation adequate to show that proposed product does not require extensive revisions to the Contract Documents, that proposed product is consistent with the Contract Documents, and that proposed product will produce results and performance required in the Contract Documents, and that proposed product is compatible with other portions of the Work.
3. Detailed comparison of significant qualities of proposed product with the products and manufacturers named in the Contract Documents. Significant qualities include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements shown or indicated.
4. Evidence that proposed product manufacturer will furnish warranty equal to or better than specified, if any.
5. List of similar installations for completed projects with project names and addresses, and names and address of design professionals and owners, if requested.
6. Samples, if requested.
7. Other information requested by ENGINEER.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

++ END OF SECTION ++

SECTION 01630

SUBSTITUTION PROCEDURES

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Scope:
1. Administrative and procedural requirements for selecting products for the Project.
 2. Procedural requirements for product substitutions.
 3. Procedural requirements for substitute construction methods or procedures, when construction methods or procedures are specified.

1.2 PRODUCT SUBSTITUTIONS

- A. Submit number of copies of request for substitution as specified for submittal of shop drawings. Submit separate request for each substitution. In addition to requirements in the General Conditions, include in request the following:
1. Product identification, including Supplier's name and address.
 2. Manufacturer's literature with product description, performance and test data, and reference standards with which product complies.
 3. Samples, if appropriate.
 4. Name and address of similar projects on which product was used, and date of installation.

1.3 SUBSTITUTE CONSTRUCTION METHODS OR PROCEDURES

- A. Submit number of copies of request for substitution as specified for submittal of shop drawings. Submit separate request for each substitution. In addition to requirements in the General Conditions, include in request the following:
1. Detailed description of proposed method or procedure.
 2. Itemized comparison of the proposed substitution with the specified method or procedure.
 3. Drawings illustrating method or procedure.
 4. Other data required by ENGINEER to establish that proposed substitution is equivalent to specified method or procedure.

1.4 CONTRACTOR'S REPRESENTATION AND ACCEPTANCE

- A. In making request for substitution, CONTRACTOR represents that:
1. CONTRACTOR has investigated proposed substitution and determined that it is equivalent to item, product, method, or procedure specified, as applicable.

2. CONTRACTOR will provide the same or better guarantees or warranties for proposed substitution as for the specified product, manufacturer, method, or procedure, as applicable.
 3. CONTRACTOR waives all Claims for additional costs or extension of time related to proposed substitution that subsequently may become apparent.
- B. A proposed substitution will not be accepted if:
1. Acceptance will require changes in design concept or a substantial revision of the Contract Documents.
 2. Acceptance will delay completion of the Work or the work of other contractors.
 3. Substitution request is indicated or implied on a Shop Drawing, request for interpretation or clarification, and is not accompanied by CONTRACTOR's formal request for substitution.
- C. If ENGINEER determines that proposed substitute is not acceptable, CONTRACTOR shall provide the specified product, manufacturer, method, or procedure, as applicable.
- D. Approval of a substitution request will not relieve CONTRACTOR from requirement for submitting Shop Drawings as set forth in the Contract Documents.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

++ END OF SECTION ++

SECTION 01651

TRANSPORTATION AND HANDLING OF PRODUCTS

PART 1 - GENERAL

1.1 DESCRIPTION

A. Scope:

1. This Section includes the general requirements for transporting and handling of products.
2. CONTRACTOR shall make all arrangements for transporting, delivery, and handling of products required for prosecution and completion of the Work.
3. Move products stored, when necessary, them without additional compensation or changes to the Contract Times.

1.2 PREPARATION FOR SHIPMENT

A. When practical, factory-assemble products. Match mark or tag separate parts and assemblies to facilitate field assembly. Cover machined and unpainted parts that may be damaged by the elements with strippable, protective coating.

B. Package products to facilitate handling and protect from damage during shipping, handling, and storage. Mark or tag outside of each package or crate to indicate its purchase order number, bill of lading number, contents by name, OWNER's contract name and number, CONTRACTOR, equipment number, and approximate weight. Include complete packing lists and bills of materials with each shipment.

C. Protect products from exposure to the elements and keep thoroughly dry and dust free at all times. Protect painted surfaces against impact, abrasion, discoloration, or other damage. Lubricate bearings and other items requiring lubrication.

D. Advance Notice of Shipments:

1. Keep CONSTRUCTION CONTRACT ADMINISTRATOR informed of delivery of all products to be incorporated in the Work.
2. Upon receipt of Supplier's advance notice of shipment, at least seven days prior to delivery of products, provide CONSTRUCTION CONTRACT ADMINISTRATOR written notice of anticipated date and place of arrival of the following:
 - a. GAC Pressurized Vessels.
 - b. GAC Vertical Lineshaft Pumps.
 - c. Flocculation Equipment
 - d. Plate Settler Cartridge
 - e. Residuals equipment

E. Do not have products shipped until:

1. Related Shop Drawings, Samples, and other submittals have been approved or accepted (as applicable) by CONSTRUCTION CONTRACT ADMINISTRATOR.
2. Related factory testing results, when required in individual Specification Sections, have been reviewed and accepted by CONSTRUCTION CONTRACT ADMINISTRATOR.
3. Required storage facilities have been provided.

1.3 DELIVERY

A. Scheduling and Timing of Deliveries:

1. Arrange deliveries of products in accordance with the accepted Progress Schedule and in ample time to facilitate inspection prior to installation.
2. Schedule deliveries to minimize space required for and duration of on-Site storage of products and equipment.
3. Coordinate deliveries to avoid conflicting with the Work and conditions at Site, and to accommodate the following:
 - a. Work of other contractors, and OWNER.
 - b. Storage space limitations.
 - c. Availability of equipment and personnel for handling products.
 - d. OWNER's use of premises.
4. Deliver products to the Site during regular working hours.

B. Deliveries:

1. Shipments shall be delivered with CONTRACTOR's name, Subcontractor's name (if applicable), Site name, Project name, and contract designation (e.g., "ABC Construction Co., City of Somewhere, Idaho, Wastewater Treatment Plant Clarifier Improvements, Contract 25, General Construction") clearly marked.
2. Site may be listed as the "Ship To" or "Delivery" address; but OWNER shall not be listed as recipient of shipment, unless otherwise directed in writing by CONSTRUCTION CONTRACT ADMINISTRATOR.
3. Provide CONTRACTOR's telephone number to shipper; do not provide OWNER's telephone number.
4. Arrange for deliveries while CONTRACTOR's personnel are on-Site. CONTRACTOR shall receive and coordinate shipment upon delivery. Shipments delivered to the Site when CONTRACTOR is not present will be refused by OWNER, and CONTRACTOR shall be responsible for delays and additional costs, if incurred.

C. Containers and Marking:

1. Have products delivered to Site in manufacturer's original, unopened, labeled containers.
2. Clearly mark partial deliveries of component parts of equipment to identify equipment, to allow easy accumulation of parts, and to facilitate assembly.

- D. Immediately upon delivery, inspect shipment to verify that:
 - 1. Products comply with the Contract Documents and approved or accepted (as applicable) submittals.
 - 2. Quantities are correct.
 - 3. Products are undamaged.
 - 4. Containers and packages are intact and labels are legible.
 - 5. Products are properly protected.

- E. Promptly remove damaged products from the Site and expedite delivery of new, undamaged products, and remedy incomplete or lost products to provide that specified, to avoid delaying progress of the Work.

1.4 PRODUCT HANDLING

- A. Provide equipment and personnel necessary to handle products, including those provided by OWNER, by methods that prevent soiling or damaging products and packaging.

- B. Provide additional protection during handling as necessary to prevent scraping, marring, or otherwise damaging products or surrounding surfaces.

- C. Handle products by methods that prevent bending or overstressing.

- D. Lift heavy components only at designated lifting points.

- E. Handle products in safe manner and as recommended by manufacturer to prevent damage. Do not drop, roll, or skid products off delivery vehicles or at other times during handling. Hand-carry or use suitable materials handling equipment.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

++ END OF SECTION ++

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SECTION 01661

STORAGE AND PROTECTION OF PRODUCTS

PART 1 – GENERAL

1.1 DESCRIPTION

- A. This Section includes general requirements for storing and protecting materials and equipment.

1.2 STORAGE

- A. Store and protect materials and equipment in accordance with manufacturer's recommendations and the Contract Documents.
- B. CONTRACTOR shall make all arrangements and provisions necessary for, and pay all costs for, storing materials and equipment. Excavated materials, construction equipment, and materials and equipment to be incorporated into the Work shall be placed to avoid injuring the Work and existing facilities and property, and so that free access is maintained at all times to all parts of the Work and to public utility installations in vicinity of the Work. Store materials and equipment neatly and compactly in locations that cause minimum inconvenience to OWNER, other contractors, public travel, and owners, tenants, and occupants of adjoining property. Arrange storage in manner to provide easy access for inspection.
- C. Areas available at the Site for storing materials and equipment shall be as shown or indicated in the Contract Documents, or as approved by CONSTRUCTION CONTRACT ADMINISTRATOR.
- D. Store materials and equipment to become property of OWNER to facilitate their inspection and ensure preservation of quality and fitness of the Work, including proper protection against damage by freezing, moisture, and high temperatures with ambient temperatures as high as 100 degrees F. Store in indoor, climate-controlled storage areas all materials and equipment subject to damage by moisture, humidity, heat, cold, and other elements, unless otherwise acceptable to OWNER. When placing orders to Suppliers for equipment and controls containing computer chips, electronics, and solid-state devices, CONTRACTOR shall request, coordinate, and comply with specific temperature and humidity limitations on materials and equipment, because temperature inside cabinets and components stored in warm temperatures can approach 200 degrees F.
- E. CONTRACTOR shall be fully responsible for loss or damage (including theft) to stored materials and equipment.
- F. Do not open manufacturer's containers until time of installation, unless recommended

by the manufacturer or otherwise specified in the Contract Documents.

- G. Do not store materials or equipment in structures being constructed unless approved by CONSTRUCTION CONTRACT ADMINISTRATOR in writing.
- H. Do not use lawns or other private property for storage without written permission of the owner or other person in possession or control of such premises.

1.3 PROTECTION

- A. Equipment shall be boxed, crated, or otherwise completely enclosed and protected during shipping, handling, and storage, in accordance with Section 01651, Transportation and Handling of Products.
- B. Store all materials and equipment off the ground or floor on raised supports such as skids or pallets.
- C. Protect painted surfaces against impact, abrasion, discoloration, and other damage. Painted equipment surfaces that are damaged or marred shall be repainted in their entirety in accordance with equipment manufacturer and paint manufacturer requirements, to the satisfaction of CONSTRUCTION CONTRACT ADMINISTRATOR.
- D. Protect electrical equipment, controls, and instrumentation against moisture, water damage, heat, cold, and dust. Space heaters provided in equipment shall be connected and operating at all times until equipment is placed in operation and permanently connected.

1.4 UNCOVERED STORAGE

- A. The following types of materials may be stored outdoors without cover on supports so there is no contact with the ground:
 - 1. Reinforcing steel.
 - 2. Structural steel.
 - 3. Piping, except polyvinyl chloride (PVC) or chlorinated PVC (CPVC) pipe.
 - 4. Precast concrete materials.
 - 5. Castings.
 - 6. Handrails and railings.
 - 7. Grating.
 - 8. Checker plate.
 - 9. Metal stairs.
 - 10. Metal access hatches.
 - 11. Fiberglass products.
 - 12. Rigid electrical conduit.

1.5 COVERED STORAGE

- A. The following materials and equipment may be stored outdoors on supports and completely covered with covering impervious to water:
 - 1. Rough lumber.
 - 2. PVC and CPVC pipe.
 - 3. Filter media.
 - 4. Masonry units.
 - 5. Grout and mortar materials.
- B. Tie down covers with rope, and slope covering to prevent accumulation of water.
- C. Store loose granular materials, with covering impervious to water, in well-drained area or on solid surfaces to prevent mixing with foreign matter.

1.6 FULLY PROTECTED STORAGE

- A. Store all material and equipment not named in Articles 1.4 and 1.5 of this Section in on supports in buildings or trailers that have concrete or wooden flooring, roof, and fully closed walls on all sides. Covering with visquine plastic sheeting or similar material in space without floor, roof, and walls is not acceptable. Comply with the following:
 - 1. Provide heated storage for materials and equipment that could be damaged by low temperatures or freezing.
 - 2. Provide air-conditioned storage for materials and equipment that could be damaged by high temperatures.
 - 3. Protect mechanical and electrical equipment from being contaminated by dust, dirt, and moisture.
 - 4. Maintain humidity at levels recommended by manufacturers for electrical and electronic equipment.

1.7 HAZARDOUS PRODUCTS

- A. Prevent contamination of personnel, storage area, and the Site. Comply with Laws and Regulations, manufacturer's instructions, and Section 01413, Contractor's Hazardous Materials Management Program.

1.8 MAINTENANCE OF STORAGE

- A. On scheduled basis, periodically inspect stored materials and equipment to ensure that:
 - 1. State of storage facilities is adequate to provide required conditions.
 - 2. Required environmental conditions are maintained on continuing basis.
 - 3. Materials and equipment exposed to elements are not adversely affected.
- B. Mechanical and electrical equipment requiring long-term storage shall have complete manufacturer's instructions for servicing each item, with notice of enclosed instructions shown on exterior of container or package.

1. Comply with manufacturer's instructions on scheduled basis.
2. Space heaters that are part of electrical equipment, shall be connected and operated continuously until equipment is placed in service and permanently connected.

1.9 MICROPROCESSORS, PANELS, AND INSTRUMENTATION STORAGE

- A. Store panels, microprocessor-based equipment, electronics, and other devices subject to damage or decreased useful life because of temperatures below 40 degrees F or above 100 degrees F, relative humidity above 90 percent, or exposure to rain or exposure to blowing dust in climate-controlled storage space.
- B. Requirements:
 1. Storage shall be in third-party owned, bonded, insured, climate-controlled warehouse in Kenton County.
 2. OWNER and CONSTRUCTION CONTRACT ADMINISTRATOR have the right to inspect materials and equipment during normal working hours.
 3. Placed inside each panel or device a desiccant, volatile corrosion inhibitor blocks (VCI), moisture indicator, and maximum-minimum indicating thermometer.
 4. Check panels and equipment at least once per month. Replace desiccant, VCI, and moisture indicator as often as required, or every six months, whichever occurs first.
 5. Certified record of daily maximum and minimum temperature and humidity in storage facility shall be available for inspection by OWNER and CONSTRUCTION CONTRACT ADMINISTRATOR. Certified record of monthly inspection, noting maximum and minimum temperature for month, condition of desiccant, VCI, and moisture indicator, shall be available for inspection by OWNER and CONSTRUCTION CONTRACT ADMINISTRATOR.
- C. Costs for storing climate-sensitive materials and equipment shall be paid by CONTRACTOR. Replace panels and devices damaged during storage, or for which storage temperatures or humidity range has been exceeded, at no additional cost to OWNER. Delays resulting from such replacement are causes within CONTRACTOR's control.
- D. Do not ship panels and equipment to the Site until conditions at the Site are suitable for installation, including slabs and floors, walls, roofs, and environmental controls. Failure to have the Site ready for installation shall not relieve CONTRACTOR from complying with the Contract Documents.

1.10 RECORDS

- A. Keep up-to-date account of materials and equipment in storage to facilitate preparation of Applications for Payment, if the Contract Documents provide for

payment for materials and equipment not incorporated in the Work but delivered and suitably stored at the Site or at another location agreed to in writing.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

++ END OF SECTION ++

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SECTION 01721

PROTECTION OF THE WORK AND PROPERTY

PART 1 – GENERAL

1.1 DESCRIPTION

- A. CONTRACTOR shall be responsible for taking all precautions, providing all programs, and taking all actions necessary to protect the Work and all public and private property and facilities from damage, as specified in the General Conditions and this Section.
- B. To prevent damage, injury, or loss, CONTRACTOR's actions shall include the following:
 - 1. Storing apparatus, materials, supplies, and equipment in an orderly, safe manner that will not unduly interfere with progress of the Work or work of other contractors or utility company.
 - 2. Providing suitable storage facilities for materials subject to injury by exposure to weather, theft, breakage, or otherwise.
 - 3. Placing upon the Work or any part thereof only loads consistent with the safety and integrity of that portion of the Work.
 - 4. Frequently cleaning up refuse, rubbish, scrap materials, and debris caused by CONTRACTOR's operations so that, at all times, the Site is safe and orderly, and workmanlike in appearance.
 - 5. Providing barricades and guard rails around the following: openings, for scaffolding, for temporary stairs and ramps, around excavations, for elevated walkways, and other hazardous areas.
- C. Do not, except after written consent from proper parties, enter or occupy privately-owned land with personnel, tools, materials or equipment, except on lands and easements provided by OWNER.
- D. CONTRACTOR has full responsibility for preserving public and private property and facilities on and adjacent to the Site. Direct or indirect damage done by, or on account of, any act, omission, neglect, or misconduct by CONTRACTOR in executing the Work, shall be restored by CONTRACTOR, at his expense to condition equal to that existing before damage was done.

1.2 BARRICADES AND WARNING SIGNALS

- A. Barricades and Warning Signals – General:
 - 1. Where Work is performed on or adjacent to roadway, access road, right-of-way, or public place, provide barricades, fences, lights, warning signs, danger

signals, watchmen, and take other precautionary measures for protecting persons, property, and the Work.

2. Paint barricades to be visible at night.
3. From sunset to sunrise, furnish and maintain at least one light at each barricade.
4. Erect sufficient barricades to keep vehicles from being driven on or into Work under construction.
5. Furnish watchmen in sufficient numbers to protect the Work.
6. CONTRACTOR's responsibility for maintaining barricades, signs, lights, and for providing watchmen shall continue until the Work is accepted in accordance with the General Conditions.

B. Temporary Fencing: Refer to Section 01561, Security.

1.3 TREE AND PLANT PROTECTION

A. Tree and Plant Protection – General:

1. Protect existing trees, shrubs, and plants on or adjacent to the Site, shown or designated to remain in place, against unnecessary cutting, breaking, or skinning of trunk, branches, bark, or roots.
2. Do not store materials or park equipment within the drip line.
3. In areas subject to traffic, provide temporary fencing or barricades to protect trees and plants.
4. Fires are not allowed.
5. Within the limits of the Work, water trees and plants that are to remain to maintain their health during construction operations.
6. Cover all exposed roots with burlap, which shall be kept continuously wet. Cover exposed roots with earth as soon as possible. Protect root systems from mechanical damage and damage by erosion, flooding, runoff, or noxious materials in solution.
7. If branches or trunks are damaged, prune branches immediately and protect cut or damaged areas with emulsified asphalt compounded specifically for horticultural use in manner acceptable to CONSTRUCTION CONTRACT ADMINISTRATOR.
8. When directed by CONSTRUCTION CONTRACT ADMINISTRATOR, remove and dispose of off-Site damaged trees and plants that die or suffer permanent injury, and replace damaged tree or plant with specimen of equal or better quality.

1.4 PROTECTION OF EXISTING STRUCTURES

A. Underground Facilities:

1. Underground Facilities are defined in the General Conditions.

2. All Underground Facilities known to OWNER and CONSTRUCTION CONTRACT ADMINISTRATOR, except water, gas, sewer, electric, and communications services to individual buildings and properties, are shown. This information is the best available to OWNER and CONSTRUCTION CONTRACT ADMINISTRATOR but, in accordance with the General Conditions, is not guaranteed to be correct or complete.
 3. CONTRACTOR shall explore ahead of trenching and excavation Work and shall uncover obstructing Underground Facilities sufficiently to determine their location, to prevent damage to Underground Facilities, and to prevent service interruption to building or parcels served by Underground Facilities. If CONTRACTOR damages an Underground Facility, CONTRACTOR shall restore it to original condition, in accordance with requirements of the owner of the damaged facility and the General Conditions.
 4. Necessary changes in the location of the Work may be directed by OWNER or CONSTRUCTION CONTRACT ADMINISTRATOR to avoid Underground Facilities not shown or indicated on the Contract Documents.
 5. If permanent relocation of an existing Underground Facilities is required and is not otherwise shown or indicated in the Contract Documents, CONTRACTOR will be directed in writing to perform the Work. When the relocation Work results in a change in the Contract Price, Contract Time, or both, the relocation Work shall be paid after execution of associated Change Order, in accordance with the Contract Documents.
- B. Surface Structures:
1. Surface structures are existing buildings, structures, and other facilities at or above ground surface, including their foundations or any extension below ground surface. Surface structures include, but are not limited to, buildings, tanks, walls, bridges, roads, dams, channels, open drainage, exposed piping and utilities, poles, exposed wires, posts, signs, markers, curbs, walks, and other facilities visible at or above ground surface.
 2. Existing surface facilities, including but not limited to guard rails, posts, guard cables, signs, poles, markers, and curbs that are temporarily removed to facilitate the Work shall be replaced and restored to their original condition at CONTRACTOR'S expense.
- C. Protection of Underground Facilities and Surface Structures:
1. CONTRACTOR shall sustain in their places and protect from direct or indirect injury all Underground Facilities and surface structures located within or adjacent to the limits of the Work. Such sustaining and supporting shall be done carefully and as required by the party owning or controlling such structure or facility. Before proceeding with the Work of sustaining and supporting such structure or facility, CONTRACTOR shall satisfy CONSTRUCTION CONTRACT ADMINISTRATOR that methods and procedures to be used have been approved by party owning same.

2. CONTRACTOR shall bear all risks attending the presence or proximity of all Underground Facilities and surface structures within or adjacent to limits of the Work, in accordance with the Contract Documents. CONTRACTOR shall be responsible for damage and expense for direct or indirect injury caused by his Work to structures and facilities. CONTRACTOR shall repair immediately damage caused by his Work, to the satisfaction of owner of damaged structure or facility.

1.5 PROTECTION OF FLOORS AND ROOFS

- A. Protection of Floors and Roofs – General:
 1. Protect floors and roofs until acceptance of the Work in accordance with the General Conditions.
 2. Use proper protective covering when moving heavy equipment, handling materials or other loads, when painting, handling mortar or grout, and when cleaning walls and ceilings.
 3. Use metal pans to collect oil and cuttings from pipe, conduit, and rod threading machines, and under metal cutting machines.
 4. Do not load concrete floors less than 28 days old without written permission of CONSTRUCTION CONTRACT ADMINISTRATOR. Do not load floors, roofs, or slabs in excess of design loading.
 5. Do not load roofs without written permission of CONSTRUCTION CONTRACT ADMINISTRATOR.
 6. Restrict access to roofs, and keep CONTRACTOR personnel off existing roofs, except as required for the Work.
 7. If access to roofs is required, roofing, parapets, openings, and all other construction on or adjacent to roof shall be protected with suitable plywood or other acceptable means.

1.6 PROTECTION OF INSTALLED PRODUCTS AND LANDSCAPING

- A. Protect installed products to prevent damage from subsequent operations. Remove protection facilities when no longer needed prior to completion of Work.
- B. Control traffic to prevent damage to equipment, materials, and surfaces.
- C. Coverings:
 1. Provide coverings to protect equipment and materials from damage.
 2. Cover projections, wall corners and jambs, sills, and soffits of openings, in areas used for traffic and for passage of products in subsequent work.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

+ + END OF SECTION + +

SECTION 01722

FIELD ENGINEERING

PART 1 - GENERAL

1.1 DESCRIPTION

A. CONTRACTOR shall:

1. Provide civil, structural and other professional engineering services specified or required to execute CONTRACTOR's construction methods.
2. Develop and make all detail surveys and measurements required for construction; including slope stakes, batter boards, and all other working lines, elevations, and cut sheets.
3. Provide material required for benchmarks, control points, batter boards, grade stakes, structure and pipeline elevation stakes, and other items.
4. Keep a transit or theodolite and leveling instrument at the Site at all times, and skilled instrument man available when necessary for laying out the Work.
5. Be solely responsible for all locations, dimensions and levels. No data other than Change Order, Work Change Directive, or Field Order shall justify departure from dimensions and levels required by the Contract Documents.
6. Rectify all Work improperly installed because of not maintaining, not protecting, or removing without authorization established reference points, stakes, marks, and monuments.
7. Provide such facilities and assistance necessary for CONSTRUCTION CONTRACT ADMINISTRATOR to check line and grade points placed by CONTRACTOR. CONTRACTOR shall not perform excavation or embankment work until all cross-sectioning necessary for determining pay quantities have been completed and accepted by CONSTRUCTION CONTRACT ADMINISTRATOR.

1.2 CONTRACTOR'S SURVEYOR

- ###### A. Employ and retain, as needed, at the Site a surveyor with experience and capability of performing surveying and layout tasks required in the Contract Documents and as required for the Work. Surveyor shall be a professional land surveyor registered in same state as the Site. Tasks included are:
1. Provide required surveying equipment, including transit or theodolite, level, stakes, and surveying accessories.
 2. Establish required lines and grades for constructing all facilities, structures, pipelines, and site improvements.
 3. Keep professional, accurate, well organized, and legible notes of all measurements and calculations made while surveying and laying out the Work.

4. Prior to backfilling operations, survey, locate, and record on a copy of the Drawings accurate representation of buried Work and Underground Facilities encountered.
5. Conform to requirements of this Section and the General Conditions.

1.3 SUBMITTALS

- A. Informational Submittals: Submit the following:
1. Field Engineering: When requested by CONSTRUCTION CONTRACT ADMINISTRATOR, submit documentation verifying accuracy of field engineering.
 2. Surveying:
 - a. Complete plan for conducting survey work, submitted ten days prior to beginning survey Work.
 - b. Example of proposed survey field books to be maintained by CONTRACTOR's surveyor. Example shall have sufficient information and detail, including example calculations and notes, to demonstrate that field books will be organized and maintained in a professional manner, conforming to the Contract Documents.
 - c. Submit original field books within two days after completing survey Work.
 - d. Submit certified survey in accordance with this Section.
 3. Certificates: When requested by CONSTRUCTION CONTRACT ADMINISTRATOR, submit certificate signed by professional engineer or professional surveyor certifying that elevations and locations of Work are in conformance with Contract Documents. Explain deviations, if any.
 4. Qualifications Statements:
 - a. Field Engineer: Name and address. When requested by CONSTRUCTION CONTRACT ADMINISTRATOR, submit qualifications.
 - b. Surveyor: Name and address of firm, and resumes of each professional land surveyor and crew chief conducting the survey Work. Submit at least ten days prior to beginning survey Work. During the Project, submit resume for each new registered land surveyor and crew chief working for CONTRACTOR at least ten days prior to starting on the survey Work.

1.4 RECORDS

- A. Maintain at the Site a complete and accurate log of control and survey Work as it progresses.
1. Survey data shall be in accordance with recognized professional surveying standards and prevailing standards of practice in the locality where the Site is located. Original field notes, computations, and other surveying data shall be recorded by CONTRACTOR's surveyor in CONTRACTOR-furnished hard-bound field books, and shall be signed and sealed by CONTRACTOR's surveyor. Completeness and accuracy of survey Work, and completeness and

accuracy of survey records, including field books, shall be responsibility of CONTRACTOR. Failure to organize and maintain survey records in a professional manner that allows reasonable and independent verification of calculations, and to allow identification of elevations, dimensions, and grades of the Work, shall be cause for rejecting the survey records, including field books.

2. Illegible notes or data, and erasures on any page of field books, are unacceptable. Do not submit copied notes or data. Corrections by ruling or lining out errors will be satisfactory if initialed by the surveyor. Violation of these requirements may require re-surveying the data in question.
- B. On completion of foundation walls and major Site improvements, prepare a certified survey, sealed by professional surveyor, showing dimensions, locations, angles and elevations of construction and locations and elevations of Underground Facilities encountered during the Work.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION

3.1 SURVEYING

- A. Reference Points:
1. Refer to the General Conditions regarding reference points.
 2. OWNER's established reference points damaged or destroyed by CONTRACTOR will be re-established by OWNER at CONTRACTOR's expense.
 3. From OWNER-established reference points, establish all lines, grades, and elevations necessary to control the Work. Obtain measurements required for executing the Work to tolerances specified in the Contract Documents.
 4. Establish, place, and replace as required, such additional stakes, markers, and other reference points necessary for control, intermediate checks, and guidance of construction operations.
- B. Surveys to Determine Quantities for Payment:
1. For each application for progress payment, perform such surveys and computations necessary to determine quantities of Work performed or placed. Perform surveys necessary for CONSTRUCTION CONTRACT ADMINISTRATOR to determine final quantities of Work in place.
 2. Notify CONSTRUCTION CONTRACT ADMINISTRATOR at least 24 hours before performing survey work for determining quantities. Unless waived in writing by CONSTRUCTION CONTRACT ADMINISTRATOR, perform quantity surveys in presence of CONSTRUCTION CONTRACT ADMINISTRATOR.

- C. Construction Surveying: Conform to the following:
1. Alignment Staking: Each 50 feet on tangent; each 25 feet on curves.
 2. Slope Staking: Each 50 feet on tangent; each 25 feet on curves; re-stake every ten feet in elevation.
 3. Structure: Stake out structures, including elevations, and check prior to and during construction.
 4. Pipelines: Stake out pipelines including elevations, and check prior to and during construction.
 5. Road: Tops each 50 feet on tangent and each 25 feet on curves.
 6. Cross-sections: Original, intermediate, and final as required, for site work other locations as necessary for quantity surveys.
 7. Easement Staking: Each 50 feet on tangent; each 25 feet on curves. Also provide wooden laths with flagging at 100-foot maximum intervals.
 8. Record Staking: Provide permanent stake where blind flanges or caps are provided for future connections, of material acceptable to CONSTRUCTION CONTRACT ADMINISTRATOR.
- D. Accuracy:
1. Establish temporary survey references points set by CONTRACTOR for CONTRACTOR's use to at least second-order accuracy (e.g., 1:10000). Construction staking used as a guide for the Work shall be set at least third-order accuracy (e.g., 1:5000). Basis on which such orders are established shall provide the absolute margin for error specified below.
 2. Horizontal accuracy of easement staking shall be plus or minus 0.1 feet. Accuracy of other staking shall be plus or minus 0.04 feet horizontally and plus or minus 0.02 feet vertically.
 3. Survey calculations shall include an error analysis sufficient to demonstrate required accuracy.

+ + END OF SECTION + +

SECTION 01723

CUTTING AND PATCHING

PART 1 - GENERAL

1.1 DESCRIPTION

- A. CONTRACTOR shall perform cutting and coring, and rough and finish patching of holes and openings in existing construction.
- B. Cutting, coring, rough patching, and finish patching shall be by CONTRACTOR.
- C. Provide cutting, coring, fitting and patching, including attendant excavation and backfill, required to complete the Work, and to:
 - 1. Remove and replace defective Work;
 - 2. Remove samples of installed Work as specified or required for testing;
 - 3. Remove construction required to provide for specified alterations or addition to existing work;
 - 4. Uncover Work to for CONSTRUCTION CONTRACT ADMINISTRATOR's observation of covered Work or observation by authorities having jurisdiction;
 - 5. Connect to completed Work not performed in proper sequence;
 - 6. Remove or relocate existing utilities and pipes that obstruct the Work in locations where connections must be made;
 - 7. Make connections or alterations to existing or new facilities.
- D. Structural Elements: Do not cut or patch structural elements in manner that would change structural element's load-carrying capacity as load deflection ratio.
- E. Operating Elements: Do not cut or patch operating elements in manner that would reduce their capacity to perform as intended. Do not cut or patch operating elements or related components in manner that would increase maintenance requirements or decrease operational life or safety.

1.2 SUBMITTALS

- A. Action Submittals: Submit the following:
 - 1. Cutting and Patching Request:
 - a. Submit written request to CONSTRUCTION CONTRACT ADMINISTRATOR well in advance of executing cutting or alteration affecting:
 - 1) Design function or intent of Project.
 - 2) Work of OWNER or other contractors.
 - 3) Structural value or integrity of an element of the Project.

- 4) Integrity or effectiveness of weather-exposed or moisture-resistant elements or systems.
 - 5) Efficiency, operational life, maintenance, or safety of operational elements.
 - 6) Visual qualities of sight-exposed elements.
- b. Request shall include:
- 1) Identification of Project and contract name and number.
 - 2) Description of affected Work of CONTRACTOR and work of others.
 - 3) Necessity for cutting.
 - 4) Effect on work of OWNER or other contractors, or on structural or weatherproof integrity of Project.
 - 5) Description of proposed Work, describing: scope of cutting and patching; trades who will be executing the Work; products proposed to be used; extent of refinishing; schedule of operations; alternatives to cutting and patching, if any.
 - 6) Designation of party responsible for cost of cutting and patching, when applicable.
 - 7) Written permission of other contractors whose work will be affected.
2. Should conditions of Work, or schedule, indicate a change of materials or methods, submit written recommendation to CONSTRUCTION CONTRACT ADMINISTRATOR including:
- a. Conditions indicating change.
 - b. Recommendations for alternative materials or methods.
 - c. Submittals as required for substitutions.
- B. Informational Submittals: Submit the following:
1. Submit written notice designating time Work will be uncovered, to provide for observation. Do not begin cutting or patching operations until accepted by CONSTRUCTION CONTRACT ADMINISTRATOR.
- C. Conform to submittal requirements in Specifications for application and installation of materials used for patching.

1.4 WARRANTY

- A. Replace, patch, and repair materials and surfaces cut or damaged during cutting and patching operations, by methods and with materials in manner that does not void required or existing warranties.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

- A. Materials:
1. Use materials in conformance with the Contract Documents.

2. If not shown or indicated in the Contract Documents, use materials and products that are identical to existing materials and products affected by cutting and patching Work.
3. For exposed surfaces, use materials that visually match existing adjacent surfaces to fullest extent possible. If identical materials are unavailable or cannot be used, use materials whose installed performance will equal or surpass that of existing materials.

PART 3 - EXECUTION

3.1 GENERAL

- A. Perform cutting and coring in such manner that limits extent of patching.
- B. Core drill holes to be cut through concrete and masonry walls, slabs, or arches, unless otherwise accepted by CONSTRUCTION CONTRACT ADMINISTRATOR in writing.

3.2 INSPECTION

- A. Examine surfaces to be cut or patched and conditions under which cutting or patching are to be performed before starting cutting or patching Work.
- B. Report unsatisfactory or questionable conditions to CONSTRUCTION CONTRACT ADMINISTRATOR in writing. Do not proceed with the Work until unsatisfactory conditions are corrected.

3.3 PREPARATION

- A. Provide temporary support as required to maintain structural integrity of Project, to protect adjacent Work from damage during cutting, and to support the Work to be cut.
- B. Protect existing construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of the Project that will be exposed during cutting and patching operations.
 1. Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.
 2. Do not cut existing pipe, conduit, ductwork, or other utilities serving facilities scheduled to be removed or relocated until provisions have been made to bypass them.

3.4 CORING

- A. Perform coring with non-impact rotary tool using diamond core drills. Size holes for pipe, conduit, sleeves, equipment or mechanical seals, as required.
- B. Protect existing equipment, utilities and adjacent areas from water and other damage covered by drilling operations.
- C. Vacuum or otherwise remove slurry or tailings from the Work area following drilling.
- D. Do not core-drill through electrical conduit or other utility lines embedded in walls or floors without approval of CONSTRUCTION CONTRACT ADMINISTRATOR. To extent possible, avoid cutting reinforcing steel in floors and walls. After core-drilling, coat exposed concrete and steel with Sika 62 or equal before installing the utility or equipment through the penetration.

3.5 CUTTING

- A. Cut existing construction using methods least likely to damage elements retained or adjoining construction, and that will provide proper surfaces to receive installation or repair.
 - 1. In general, use hand or small power tools designed for sawing or grinding, not hammering and chopping.
 - 2. Cut through concrete and masonry using concrete wall saw with diamond saw blades.
 - a. Provide for control, on both sides of walls, of slurry generated by sawing.
- B. Cut holes and slots as small as possible, neatly to size required, and with minimum disturbance of adjacent surfaces. Provide temporary covering over openings where not in use.
- C. To avoid marring existing finished surfaces, cut or drill from exposed or finished side into concealed side.
- D. Provide adequate bracing of area to be cut prior to start of cutting.
- E. Provide equipment of adequate size to remove cut panel.

3.6 PATCHING

- A. Patch construction by filling, repairing, refinishing, closing-up and similar operations following performance of other Work. Patch with durable seams that are as inconspicuous as possible. Provide materials and comply with installation requirements specified, in the Specifications.
- B. Where feasible, test patched areas to demonstrate integrity of installation.
- C. Fit Work airtight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.

- D. Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in manner that eliminates evidence of patching and refinishing.
 - 1. For continuous surfaces, refinish to nearest intersection.
 - 2. For an assembly, refinish entire unit.

- E. Patch, repair or rehang existing ceilings as necessary to provide an even-plane surface of uniform appearance.

3.7 CLEANING

- A. Clean areas and spaces where cutting, coring and patching are performed. Clean piping, conduit, or similar constructions before applying paint or other finishing materials. Restore damaged coverings of pipe and other utilities to original condition.

+ + END OF SECTION + +

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SECTION 01732

INSTALLATION

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This Section describes general requirements for installing products. Additional product installation requirements are included in the Specification Sections.

1.2 INSTALLATION QUALITY ASSURANCE AND QUALITY CONTROL

- A. Provide appropriate quality assurance for installing products, and provide quality control over Suppliers, products, services, Site conditions, and workmanship to provide Work of specified quality.
- B. Install products in accordance with approved Shop Drawings, the Contract Documents, and Supplier's installation data. If Supplier's data conflict with the Contract Documents, obtain clarification from CONSTRUCTION CONTRACT ADMINISTRATOR before proceeding.
 - 1. Supplier's installation data includes Supplier's written instructions; drawings; illustrative, wiring and schematic diagrams; diagrams identifying external connections, terminal block numbers and internal wiring; and all other such information pertaining to installation of products and equipment that is not furnished with Shop Drawings. Included are all Supplier's printed installation instructions, including those that may be attached to equipment.
- C. CONTRACTOR's installers shall be experienced in the types of Work required.

1.3 SERVICES OF SUPPLIER'S REPRESENTATIVE

- A. When specified, provide competent, qualified representatives of product Supplier to provide services specified, including supervising installation, adjusting, and testing of products.

PART 2 - PRODUCTS

2.1 EQUIPMENT DRIVE GUARDS

- A. Equipment Drive Guards:
 - 1. Unless otherwise shown or specified, provide all-metal guards conforming to 29 CFR 1910, Subpart O, with equipment driven by open shafts, belts, chains, pulleys, sheaves, or gears. Guards shall enclose drive and driven mechanism.

2. If material of guards is not otherwise specified, guards shall be galvanized sheet steel, galvanized woven wire, or expanded metal set in a frame of galvanized steel members, as appropriate.
3. Secure guards in position by steel braces or straps, securely fastened to frame of equipment, floor, or wall as required.
4. Fastenings shall permit removal of guards for servicing equipment.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General:

1. Prior to installing products, complete preparation of surfaces on which products are to be installed. Prior to installing products on new concrete, concrete shall achieve sufficient compressive strength to support the products.
2. Maintain Work area in a broom-clean condition during installation of products.
3. Use proper tools to assemble products. Do not deform or mar surface of shafts, nuts, and other parts.
4. Do not support rigging from building or structure without written permission of CONSTRUCTION CONTRACT ADMINISTRATOR. CONTRACTOR is responsible for and shall repair all damage to building or structure resulting from his operations.
5. During installation, maintain products in neutral position and do not exert undue stress on products.
6. Tighten connections requiring gaskets evenly all around to ensure uniform stress over entire gasket.
7. Use only an oil bath heater to expand couplings, gears, and other mechanical components to be expanded for installation. Do not force or drive couplings, gears, and other mechanical components onto equipment shafts, or subject them to open flame or torch.
8. Do not alter or repair products and do not burn or weld products unless specified in the Contract Documents or allowed by CONSTRUCTION CONTRACT ADMINISTRATOR.
9. Provide plugs in lubrication holes to prevent entry of foreign material.

B. Setting and Erection:

1. Wedging is not allowed. Use minimum number of shims required in leveling equipment being installed. Shims shall be Type 304L stainless steel, clean and free of slag. Provide shims, filling pieces, keys, packing, red or white lead grout, and other products necessary to properly align, level, and secure apparatus in place. Install products plum and level, unless otherwise specified, and demonstrate plumbness and level to CONSTRUCTION CONTRACT ADMINISTRATOR. Bring parts to proper bearing after installation and erection.

2. Using experienced millwrights, carefully set and align equipment on foundations, after equipment soleplates or baseplates, as applicable, have been shimmed to true alignment at anchorages. Set anchorages in place and tighten nuts against shims. Check bedplates or wing feet of equipment after securing to foundations and, after confirming alignments, grout soleplates or baseplates, as applicable, in place.
 3. Anchorages:
 - a. Provide anchorage setting drawings in time to coordinate with fabrication of products and the Work at the Site.
 - b. Anchorages shall conform to Section 05051, Anchor Bolts, Toggle Bolts, and Concrete Inserts. Requests for approval of alternate anchorage methods shall be per the General Conditions and Section 01630, Substitution Procedures.
 4. Ream misaligned holes. Do not “force” bolts or keys.
 5. Where applicable, properly align equipment with associated piping and utility connections, without exerting undue stress on connecting piping and utilities.
- C. Alignment and Leveling:
1. Verify that all shafts, couplings, and sheaves are properly aligned and adjust to required tolerances.
 2. Align couplings while equipment is free from external loads.
 3. Check angular and parallel alignment and record actual alignment and submit to CONSTRUCTION CONTRACT ADMINISTRATOR. Alignment shall be within tolerances specified in Contract Documents and as recommended by Supplier of the product.
 4. Use laser indicators or dial indicators for checking angular and parallel alignment. Using dial indicators requires that, during rotation of half couplings in performance of test, dial indicator shall be maintained in same relative position, and dial indicator readings taken at same place on circumference of coupling.
- D. Threaded Connections:
1. Apply a molybdenum disulfide, anti-seize compound to threads in mechanical connections such as bolts, studs, cap screws, tubing, and other threads, unless otherwise specified.

+ + END OF SECTION + +

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SECTION 01740

CLEANING

PART 1 – GENERAL

1.1 DESCRIPTION

- A. Scope:
1. CONTRACTOR shall execute cleaning during the Work, at completion of the Work, and as required by the General Conditions.
 2. Maintain in a clean manner the Site, the Work, and areas adjacent to or affected by the Work.

1.2 REFERENCES

- A. Standards referenced in this Section are:
1. NFPA 241, Standard for Safeguarding Construction, Alteration, and Demolition Operations.

1.3 PROGRESS CLEANING

- A. General: Clean the Site, work areas, and other areas occupied by CONTRACTOR at least weekly. Dispose of materials in accordance with the General Conditions and the following:
1. Comply with NFPA 241 for removal of combustible waste materials and debris.
 2. Do not hold non-combustible materials at the Site more than three days if the temperature is expected to rise above 80 degrees F. When temperature is less than 80 degrees F, dispose of non-combustible materials within seven days of their generation.
 3. Provide suitable containers for storage of waste materials and debris.
 4. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately.
- B. Site:
1. Keep outdoor, dust-generating areas wetted down or otherwise control dust emissions.
 2. At least weekly, brush-sweep roadways and paved areas at the Site that are used by construction vehicles or otherwise affected by the Work. On any day when activity of CONTRACTOR causes soil to be deposited or flow onto plant roads, parking, or public roadways, CONTRACTOR shall remove soil before end of workday.

- C. Work Areas:

1. Clean areas where Work is in progress to level of cleanliness necessary for proper execution of the Work.
 2. Remove liquid spills promptly and immediately report spills to OWNER, CONSTRUCTION CONTRACT ADMINISTRATOR, and authorities having jurisdiction.
 3. Where dust would impair proper execution of the Work, broom-clean or vacuum entire area of Work, as appropriate.
 4. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.
- D. Installed Work: Keep installed Work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning agents and methods specifically recommended. If manufacturer does not recommend specific cleaning agents or methods, use cleaning agents and methods that are not hazardous to health or property and that will not damage exposed surfaces.
- E. Exposed Surfaces: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration until Substantial Completion.
- F. Cutting and Patching:
1. Clean areas and spaces where cutting and patching are performed. Completely remove paint, mortar, oils, putty, and similar materials.
 2. Thoroughly clean piping, conduit, and similar features before applying paint or other finishing materials. Restore damaged pipe covering to its original condition.
- G. Waste Disposal:
1. Properly dispose of waste materials, surplus materials, debris and rubbish off the Site.
 2. Do not burn or bury rubbish and waste materials at the Site.
 3. Do not discharge volatile or hazardous substances, such as mineral spirits, oil, or paint thinner, into storm sewers or sanitary sewers.
 4. Do not discharge wastes into surface waters or drainage routes.
 5. CONTRACTOR shall be solely responsible for complying with federal, state, and local Laws and Regulations regarding disposal of waste.
- H. During handling and installation of materials and equipment, clean and protect construction in progress and adjoining materials and equipment already in place. Apply protective covering where required for protection from damage or deterioration, until Substantial Completion.
- I. Clean completed construction as frequently as necessary throughout the construction period.

1.4 CLOSEOUT CLEANING

- A. Complete the following prior to requesting inspection for Substantial Completion:

1. Clean and remove from the Site rubbish, waste material, debris, and other foreign substances.
2. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
3. Hose-clean sidewalks and loading areas.
4. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.
5. Leave surface waterways, drainage routes, and gutters open and clean.
6. Repair pavement, roads, sod, and all other areas affected by construction operations and restore them to specified condition; if condition is not specified, restore to original condition.
7. Clean exposed exterior and interior hard-surfaced finishes to dirt-free condition, free of spatter, grease, stains, fingerprints, films, and similar foreign substances.
8. Clean, wax, and polish wood, vinyl, and painted floors.
9. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, and similar spaces.
10. In unoccupied spaces, sweep concrete floors broom-clean.
11. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Replace chipped or broken glass and other damaged transparent materials.
12. Remove non-permanent tags and labels.
13. Touch up and otherwise repair and restore chipped, scratched, dented or otherwise marred surfaces to specified finish and match adjacent surfaces.
 - a. Do not paint over "UL" or similar labels, including mechanical and electrical nameplates.
14. Wipe surfaces of mechanical and electrical equipment, and similar equipment. Remove excess lubrication, paint, and mortar droppings, and other foreign substances.
15. Clean plumbing fixtures to sanitary condition, free of stains, including stains resulting from water exposure.
16. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.
17. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency. Replace temporary lamps provided in permanent fixtures. Replace existing light fixture components that are burned out or noticeably dimmed from use during the Work. Replace defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.
18. Leave the Site clean, and in neat, orderly condition, satisfactory to OWNER and CONSTRUCTION CONTRACT ADMINISTRATOR.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

++ END OF SECTION ++

SECTION 01751

STARTING AND PLACING EQUIPMENT IN OPERATION

PART 1 – GENERAL

1.1 DESCRIPTION

- A. Scope:
1. CONTRACTOR shall initially start up and place equipment installed under the Contract into successful operation, in accordance with manufacturer's written instructions and as instructed by Supplier at the Site.
 2. Provide all material, labor, tools, equipment, chemicals, lubricants, and expendables required to complete start-up.
- B. No system or subsystem shall be started up for continuous operation unless all components of that system or subsystem, including instrumentation, have been tested to the extent practicable and proven to be operable as intended by the Contract Documents.
- C. General Activities Include:
1. Cleaning.
 2. Removing temporary protective coatings.
 3. Flushing and replacing greases and lubricants, where required by manufacturer.
 4. Lubrication.
 5. Checking shaft and coupling alignments and resetting where required.
 6. Checking and setting motor, pump, and other equipment rotation, safety interlocks, and belt tensions.
 7. Checking and correcting (if necessary) leveling plates, grout, bearing plates, anchor bolts, fasteners, and alignment of piping, conduits, and ducts that may put stress on equipment connected to it.
 8. All adjustments required.
- D. Provide chemicals, lubricants, and other required operating fluids.
- E. Provide fuel, electricity, water, filters, and other expendables required for start-up of equipment, unless otherwise specified.
- F. OWNER will provide sufficient personnel to assist CONTRACTOR in starting up equipment, but responsibility for proper operation is CONTRACTOR's. Supplier shall be present during initial start-up and operation, unless otherwise acceptable to CONSTRUCTION CONTRACT ADMINISTRATOR.

- G. Start-up of heating and air conditioning systems is dependent upon the time of year. Return to Site at beginning of next heating or air conditioning season (as applicable) to start the appropriate system.
- H. Do not start up system, unit process, or equipment without submitting acceptable preliminary operations and maintenance manuals by CONTRACTOR, in accordance with Section 01781, Operations and Maintenance Data.
- I. Prior to turning over to OWNER responsibility for operating and maintaining system or equipment:
 - 1. Provide training of operations and maintenance personnel in accordance with Section 01821, Instruction of Operations and Maintenance Personnel.
 - 2. Complete system performance testing in accordance with the Contract Documents.
 - 3. Submit acceptable final operations and maintenance manuals in accordance with Section 01781, Operations and Maintenance Data.
 - 4. Submit request for Substantial Completion.
- J. OWNER shall assume responsibility for operation of the equipment upon completion of start-up and placing equipment in operation. If the OWNER does not assume operational responsibility and in the opinion of the CONSTRUCTION CONTRACT ADMINISTRATOR start-up tasks are completed, the CONSTRUCTION CONTRACT ADMINISTRATOR will notify CONTRACTOR, in writing, of the completion of the start-up period.

1.2 SERVICES OF SUPPLIER

- A. When specified, provide competent, qualified representatives of product Supplier to provide services specified, including supervising installation, adjusting, starting-up, and testing of materials and equipment.
- B. When services by Supplier are required at the Site, within fourteen days after first test operation of equipment, submit to CONSTRUCTION CONTRACT ADMINISTRATOR a letter from Supplier, on Supplier's letterhead, stating that materials and equipment are installed in accordance with Supplier's requirements and installation instructions, and in accordance with the Contract Documents. In lieu of Supplier letter, provide completed form attached to this Section. Also provide copy of letter or completed form, as applicable, with final operations and maintenance data.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION

3.1 MINIMUM START-UP REQUIREMENTS

- A. Bearings and Shafting:
 - 1. Inspect for cleanliness, and clean and remove foreign matter.
 - 2. Verify alignment.
 - 3. Replace defective bearings and those that operate rough or noisy.
 - 4. Grease as necessary, in accordance with manufacturer's recommendations.

- B. Drives:
 - 1. Adjust tension in V-belt drives and adjust vari-pitch sheaves and drives for proper equipment speed.
 - 2. Adjust drives for alignment of sheaves and V-belts.
 - 3. Clean and remove foreign matter before starting operation.

- C. Motors:
 - 1. Check each motor for comparison to amperage nameplate value.
 - 2. Correct conditions that produce excessive current flow and conditions that exist due to equipment malfunction.

- D. Pumps:
 - 1. Check glands and seals for cleanliness and adjustment before running pump.
 - 2. Inspect shaft sleeves for scoring.
 - 3. Inspect mechanical faces, chambers, and seal rings, and replace if defective.
 - 4. Verify that piping system is free of dirt and scale before circulating liquid through pump.

- E. Valves:
 - 1. Inspect manual and automatic control valves, and clean bonnets and stems.
 - 2. Tighten packing glands to ensure no leakage, but allow valve stems to operate without galling.
 - 3. Replace packing in valves to retain maximum adjustment after system is determined to be complete.
 - 4. Replace packing on valves that continue to leak.
 - 5. Remove and repair bonnets that leak.
 - 6. After cleaning, coat packing gland threads and valve stems with surface preparation of "Molycote" or "Fel-Pro".

- F. Pressure Vessels:
 - 1. In accordance with Section 1900, Granular Activated Carbon Pressure Vessel.

- G. Inclined Plate Settlers:
 - 1. In accordance with Section 11228, Inclined Plate Settlers.

- H. Sedimentation Basin Equipment:
 - 1. In accordance with Section 11225, Sedimentation Basin Equipment Rectangular

- I. Verify that control valve seats are free from foreign matter and are properly positioned for intended service.
- J. Tighten flanges and other pipe joints after system has been placed in operation.
 - 1. Replace gaskets that show signs of leakage after tightening.
- K. Inspect all joints for leakage:
 - 1. Promptly remake each joint that appears to be faulty; do not wait for rust or other corrosion to form.
 - 2. Clean threads on both parts, and apply compound and remake joints.
- L. After system has been placed in operation, clean strainers, drives, pockets, orifices, valve seats, and headers in fluid system to ensure freedom from foreign matter.
- M. Open steam traps and air vents, where used, and remove operating elements.
 - 1. Clean thoroughly, replace internal parts, and place back into operation.
- N. Remove rust, scale, and foreign matter from equipment and renew defaced surfaces.
- O. Set and calibrate draft gauges of air filters and other equipment.
- P. Inspect fan wheels for clearance and balance.
 - 1. Provide factory-authorized personnel for adjustment when needed.
- Q. Check each electrical control circuit to ensure that operation complies with the Contract Documents.
- R. Inspect each pressure gauge, thermometer, and other instruments for calibration.
 - 1. Replace items that are defaced, broken, or that read incorrectly.
- S. Repair damaged insulation.
- T. Vent gasses trapped in systems.
 - 1. Verify that liquids are drained from all parts of gas or air systems.

3.2 ATTACHMENTS

- A. The attachment listed below, following the “End of Section” designation, is a part of this Specification Section.
 - 1. Supplier’s Installation Certification Form (one page).

+ + END OF SECTION + +

SUPPLIER'S INSTALLATION CERTIFICATION

Contract No. and Name: _____

Specification Section of Equipment: _____

Equipment Name: _____

Contractor: _____

Manufacturer of Equipment: _____

The undersigned Supplier of the products described above hereby certifies that Supplier has checked the product installation and that the product, as specified in the Contract Documents, has been provided in accordance with the Supplier's recommendations and the Contract Documents, and that the trial operation of the equipment item has been satisfactory.

Comments: _____

Date

Supplier Name (print)

Signature of Supplier

Date

Contractor Name (print)

Signature of Contractor

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SECTION 01752

EQUIPMENT AND SYSTEM PERFORMANCE TESTING

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:

1. CONTRACTOR shall provide all labor, materials, services, equipment, and incidentals required for performance testing as indicated in the Contract Documents.
2. Conduct performance testing for each item of process; mechanical; instrumentation and control; plumbing; heating, ventilating, and air conditioning (HVAC); electrical systems and equipment; and other systems and equipment, to demonstrate compliance with the performance requirements of the Contract Documents.
3. Objectives of performance testing are to:
 - a. Demonstrate to satisfaction of OWNER and CONSTRUCTION CONTRACT ADMINISTRATOR that structures, systems, and equipment tested comply with all functional and performance requirements in the Contract Documents.
 - b. Demonstrate that facility is Substantially Complete
 - c. Establish baseline operating conditions for OWNER's use in establishing standard operating procedures and preventative maintenance programs.
4. Utilities and Consumables:
 - a. CONTRACTOR shall provide the following: electricity, fuel, compressed air, chemicals, temporary piping and appurtenances, and all other items and Work required for completing performance testing.
 - b. OWNER will provide the following: water for initial performance testing. CONTRACTOR shall provide temporary piping and appurtenances required to convey to the testing location utilities and consumables furnished by OWNER. If re-testing is required, cost of utilities and consumables furnished by OWNER for initial testing shall be paid by CONTRACTOR at OWNER's cost or standard rates, as applicable.
5. Sequence: The following general sequence applies to performance testing:
 - a. Furnish submittals required prior to performance testing, in accordance with this Section.
 - b. Complete the Work associated with starting and placing equipment in operation.
 - c. To the extent practicable, complete Site quality control Work specified in Specification Sections for individual equipment items and systems.

- d. Proceed with performance testing in accordance with this Section, simulating the range of actual operating conditions to the greatest extent possible.
- e. Successful completion of performance testing is required to achieve Substantial Completion.

B. Coordination:

- 1. Review procedures under this and other Sections and coordinate installation and testing of items that must be started up and tested with or before performance testing Work.

1.2 TERMINOLOGY

A. The following words or terms are not defined but, when used in this Section, have the following meaning:

- 1. A “system” includes all required items of equipment, devices, and appurtenances connected so that their operation or function complements, protects, or controls the operation or function of the others.

1.3 QUALITY ASSURANCE

A. Qualifications:

- 1. Contractor’s Performance Testing Manager:
 - a. Appoint a performance testing manager, who shall:
 - 1) Manage, coordinate, and supervise CONTRACTOR’s performance testing.
 - 2) Assist in coordinating and documenting Site quality control Work specified in individual Specifications Sections.
 - 3) Prepare, or review and approve, all submittals for the Work under this Section
 - 4) Coordinate activities of Subcontractors and Suppliers relative to performance testing.
 - 5) Be at the Site eight hours per day during performance testing.
 - b. Experience:
 - 1) Performance testing manager shall be an operations engineer or a qualified operations specialist, having at least five years of experience in work similar to that required, or experience on at least five separate projects, in managing performance testing of process, mechanical, instrumentation and control, HVAC, and electrical systems.
 - 2) Operations Engineer: Shall be a graduate of four-year course in mechanical or civil engineering at an accredited college or university.
 - 3) Operations Specialist: Shall have equivalent experience in operation and maintenance of facility similar to the Site.
- 2. Contractor’s Performance Testing Operators:

- a. Coordinate with requirements of authority having jurisdiction over the facility's operating permit.
- B. Pre-performance Testing Conference:
1. After initial submittal of documentation plan and performance testing plan and prior to starting performance testing, arrange a meeting at Site with CONTRACTOR's performance testing manager, CONTRACTOR's other key personnel, equipment Suppliers' technical representatives, authority having jurisdiction over operating permit(s), CONSTRUCTION CONTRACT ADMINISTRATOR, OWNER, and other representatives directly concerned with performance testing Work. Record discussions of conference and decisions and agreements and disagreements and furnish a copy of record to each party attending. Review foreseeable methods and procedures relating to performance testing Work including:
 - a. Review Project requirements including Contract Documents, submittals related to performance testing, requests for interpretations relative to performance testing, and other pertinent documents.
 - b. Review required submittals, both completed and to be completed.
 - c. Review status of the equipment and systems to be performance tested and work to be completed prior to performance testing.
 - d. Review Progress Schedule and testing schedule.
 - e. Review status of utilities and consumables required for performance testing.
 - f. Review required inspections, testing, certifying, and quality control procedures.
 - g. Review methods for complying with Laws and Regulations and requirements of authorities having jurisdiction, such as compliance with facility operating permit requirements, insurance requirements, environmental protection, health, safety, fire, and similar regulations.
 2. Reconvene meeting at earliest opportunity if additional information must be developed to conclude the required topics of the meeting.
 3. Record revisions or changes agreed upon, reasons therefor, and parties agreeing or disagreeing with them.

1.4 SUBMITTALS

- A. Action Submittals: Submit the following:
1. Documentation plan, in accordance with Article 1.5 of this Section.
 2. Performance testing plans, in accordance with Article 1.5 of this Section.
- B. Informational Submittals: Submit the following:
1. Records of pre-performance testing conference.
 2. Testing schedules, in accordance with Article 1.5 of this Section.

3. Notices: Written notice to CONSTRUCTION CONTRACT ADMINISTRATOR and OWNER at least 72 hours prior to beginning each test.
4. Site Quality Control Submittals: All records produced during, and results of, performance testing.
5. Qualifications Statements:
 - a. Testing laboratory qualifications and certifications, if not previously submitted under other Sections.
 - b. Qualifications of CONTRACTOR's performance testing manager and other required performance testing personnel, including copies of valid operators' licenses issued by authority having jurisdiction.

1.5 DOCUMENTATION PLAN, PERFORMANCE TESTING PLAN, AND TESTING SCHEDULE

- A. Documentation Plans: Develop recordkeeping system to document compliance with requirements of this Section and authorities having jurisdiction.
 1. Calibration documentation including identification (by make, manufacturer, model, and serial number) of all test equipment, date of original calibration, date(s) of subsequent calibrations, calibration method, and test laboratory verifying calibration.
 2. Documentation to be provided for each equipment item and system to be tested shall include date of test, equipment tag number or system name, nature of test, test objectives, test results, test instruments employed, and signature spaces for CONTRACTOR's performance testing manager and OWNER's and CONSTRUCTION CONTRACT ADMINISTRATOR's witnesses. Establish separate file for each system and equipment item to be tested. Files shall include the following information, as applicable, when associated tests, source quality control, or Site quality control measures are required in the Contract Documents:
 - a. Metallurgical tests, when required.
 - b. Source quality control (factory) tests.
 - c. Accelerometer recordings made during shipment, when such recordings are required.
 - d. Field calibration tests, in accordance with the Contract Documents.
 - e. Field hydrostatic tests for equipment and systems that operate under pressure, in accordance with the Contract Documents.
 - f. Site quality control testing, in accordance with the Contract Documents
 3. Forms:
 - a. Develop forms specific to each item of equipment and system being tested, to document results of testing.
 - b. c. Provide forms approved by CONSTRUCTION CONTRACT ADMINISTRATOR in sufficient quantity to document all testing Work.

B. Performance Testing Plans:

1. Develop performance testing plans describing in detail coordinated, sequential performance testing of each system and equipment item to be tested. Each performance testing plan shall be specific to the system or equipment item to be performance-tested, and shall identify by specific equipment or tag number each device or control station to be manipulated or observed during performance testing, and specific results to be observed or obtained. Performance testing plans shall also be specific regarding support systems required to complete the performance testing Work, temporary devices and systems required (if any) during performance testing, Subcontractors and Suppliers to be present during performance testing, and planned performance testing duration. Performance testing plans shall include:
 - a. Summary of start-up, check-out, and Site quality control testing required for each system or equipment item prior to starting performance testing.
 - b. Calibration of all field instruments and control devices.
 - c. Description of and information on temporary systems, equipment, and devices proposed for performance testing, including calibration data for temporary instrumentation and controls.
 - d. Plan and procedures for implementing performance testing of systems and equipment. Performance tests shall duplicate the operating conditions described in the Contract Documents.
 - e. Description of data reduction required, if any, and proposed time between collection of data and submittal of results to CONSTRUCTION CONTRACT ADMINISTRATOR.
 - f. Summary of criteria for acceptance of test results. Summary shall include performance tolerances (if any) included in the Contract Documents. Where performance tolerances are not included in the Contract Documents, testing plan shall include proposed performance tolerances.
2. Performance testing plans shall contain complete description of proposed procedures to achieve desired testing environment.
3. Following CONSTRUCTION CONTRACT ADMINISTRATOR's approval of performance testing plans, CONTRACTOR shall reproduce performance testing plans in sufficient quantity for CONTRACTOR'S purposes plus five copies to CONSTRUCTION CONTRACT ADMINISTRATOR and five copies to OWNER. Do not start performance testing until required quantity of approved performance testing plans is provided.

C. Testing Schedule:

1. Provide a testing schedule that sets forth the planned sequence for performance testing Work.
2. Testing schedule shall be part of the Progress Schedule and shall conform to requirements for Progress Schedule, except as specified in this Section.
3. Test schedule shall:
 - a. Detail the equipment and systems to be performance-tested, and the testing duration required for each.

- b. Show planned start date, duration, and completion of each performance test.
- c. Submitted no later than four weeks in advance of the date performance testing is to begin. CONSTRUCTION CONTRACT ADMINISTRATOR will not witness performance testing Work until test schedule is accepted by CONSTRUCTION CONTRACT ADMINISTRATOR.
- d. Be updated weekly and resubmitted to CONSTRUCTION CONTRACT ADMINISTRATOR. Updates shall indicate actual dates of performance testing Work, indicating systems and equipment for which performance testing is in progress, and that are satisfactorily completed in accordance with the Contract Documents.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION

3.1 PREPARATION

- A. Before starting the performance testing, complete the following:
 1. Prepare and align equipment in accordance with equipment Specifications and Section 01732, Installation.
 2. To the extent practicable, complete equipment tests and check-out in accordance with the Contract Documents and manufacturers' recommendations.
 3. Complete other tests required by the Contract Documents, including instrumentation and controls calibration and testing, piping tests, electrical tests, and other tests required prior to full operation of the system or facility.
 4. Complete the Work required in Section 01751, Starting and Placing Equipment in Operation.
- B. Temporary Systems and Devices Required for Performance Testing:
 1. Minimize the need for temporary systems and devices required for performance testing.
 2. Provide temporary connections and bulkheads as required, and make other provisions to re-circulate process fluids and gasses as required or otherwise simulate the range of anticipated operating conditions for the systems and equipment being performance-tested. During performance testing, CONTRACTOR's performance testing manager and team shall monitor the characteristics of each equipment item and system and report unusual conditions to CONSTRUCTION CONTRACT ADMINISTRATOR.
 3. Properly install temporary systems. Test temporary equipment and devices in accordance with manufacturer's instructions to verify suitability for use in performance testing. Test temporary piping using in accordance with requirements for associated permanent piping.

4. Calibration and Loop Testing of Temporary Instruments and Controls: Calibrate and test all loops and associated instruments and control devices, in accordance with instrumentation and controls Sections of Division 13, Special Construction.

3.2 PERFORMANCE TESTING

- A. CONTRACTOR's performance testing manager shall organize teams comprising qualified representatives of Suppliers, Subcontractors, CONTRACTOR's independent testing laboratory (if applicable), and others as appropriate, to efficiently and complete performance testing Work within the Contract Times and in accordance with the accepted Progress Schedule.
- B. Performance testing shall be done in accordance with the approved performance testing plan, approved documentation plan, and accepted testing schedule.
- C. System Performance Tests:
 1. Testing:
 - a. Duration:
 - 1) Operate and performance-test the system (or each portion thereof, as applicable) and equipment for sufficient period of time to determine: operating characteristics of system and equipment, including noise, temperatures, and vibration; observe its performance characteristics; and for initial adjustment of controls and appurtenances.
 - 2) List the proposed performance testing duration in the testing plan and testing schedule.
 - 3) Duration of performance testing shall be in accordance with the approved testing plan and accepted testing schedule.
 - b. When testing requires availability of temporary systems such as temporarily "looped" piping, temporary or standby electrical power, temporary compressed air, or temporary instrumentation and controls, provide acceptable alternate sources that meet the requirements of system and equipment being tested.
 - c. Disposal site for test media that have the potential, upon disposal, to create a Hazardous Environmental Condition, are subject to review and acceptance by OWNER and CONSTRUCTION CONTRACT ADMINISTRATOR.
 - d. During performance testing, CONTRACTOR shall obtain baseline operating data on equipment with motors greater than one horsepower. Baseline data shall include amperage, bearing temperatures, and vibration data obtained at intervals in the approved testing plan. Methods of measurement shall be in accordance with industry standards applicable for the motors being tested.
 2. Test Interruption: Should testing be halted for any reason, repeat the operational testing until specified continuous testing period is completed for the

system or equipment item without interruption, in accordance with the Contract Documents.

3. Test Results and Re-testing: The following applies to the entire system tested and to portions thereof:
 - a. Successful test results shall indicate conformance in accordance with the Contract Documents. If performance tolerances are not specified in the Contract Documents, test results shall conform to tolerances established in approved testing plan submittal.
 - b. When results of performance testing fail to comply with the Contract Documents regarding such test, CONTRACTOR shall make adjustments and repairs as required and shall repeat the tests as required until conform with the Contract Documents is achieved.
 - c. Re-testing because of Disputed Testing Results or Procedures: In the case of an otherwise satisfactory performance test, when there is doubt, dispute, or difference between CONSTRUCTION CONTRACT ADMINISTRATOR and CONTRACTOR regarding testing results, methods, or equipment used in performance testing, CONSTRUCTION CONTRACT ADMINISTRATOR may order CONTRACTOR to repeat the testing. If repeat testing using such modified methods or equipment required by CONSTRUCTION CONTRACT ADMINISTRATOR confirms the previous test, all costs of repeat test will be paid by OWNER. Otherwise all costs, including costs of engineering, labor, testing agencies, and inspections, shall be paid by CONTRACTOR.
4. Post-test Inspection: After completing performance testing, check equipment for proper alignment and realign as required. Check equipment for loose connections, unusual movement, and other indication of improper operating characteristics. Disassemble and inspect equipment and devices that exhibit unusual or unacceptable operating characteristics. Repair or replace defective Work to conform to the Contract Documents at no additional cost to OWNER

+ + END OF SECTION + +

SECTION 01781

OPERATIONS AND MAINTENANCE DATA

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Provide operation and maintenance data, as described in this Section, for use as instructional and reference manuals by operations and maintenance personnel at the Site. At minimum, provide operation and maintenance data for:
 - 1. All equipment and systems.
 - 2. Valves, gates, actuators, and related accessories.
 - 3. Instrumentation and control devices.
 - 4. Electrical gear.

- B. Required Operation and Maintenance Data: For each operation and maintenance manual required, provide the following:
 - 1. Preliminary Submittal: Printed and bound copy of entire operation and maintenance manual, except for test data, service reports by Supplier's representative, and electronic copies.
 - 2. Final Submittal: Printed and bound copy of complete operations and maintenance manual, including test data and service reports by Supplier's representative, with electronic copies.

- C. Prepare each operations and maintenance manual specifically for Project. Include in each manual all pertinent instructions, as-built drawings as applicable, bills of materials, technical bulletins, installation and handling requirements, maintenance and repair instructions, and other printed materials required to provide accurate and comprehensive information for safe and proper operation, maintenance, and repair of products furnished for Project. Include in manual all specific information required by applicable Specification Section, and all data required by Laws and Regulations and by authorities having jurisdiction.

1.2 NUMBER OF COPIES AND TIMING OF SUBMITTALS

- A. Number of Copies Required and Timing of Submittals:
 - 1. Preliminary Submittal:
 - a. Three copies, exclusive of copies required by CONTRACTOR.
 - b. Provide submittal to CONSTRUCTION CONTRACT ADMINISTRATOR by the earlier of: ninety days following approval of Shop Drawings and related submittals, or ten days prior to starting operations and maintenance personnel training and operational testing at the Site.
 - 2. Final Submittal: Provide final submittal prior to Substantial Completion, unless

submittal is specified as required prior to an interim Milestone.

- a. Printed Copies: seven copies.
- b. Electronic Copies: Two copies.

1.3 FORMAT OF HARDCOPIES

A. Binding and Cover:

1. Bind each operation and maintenance manual in durable, permanent, stiff-cover binder(s), comprising one or more volumes per copy as required. Binders shall be minimum one-inch wide and maximum of three-inch wide. Binders for each copy of each volume shall be identical.
2. Binders shall be locking three-ring/"D"-ring type, or three-post type. Three-ring binders shall be riveted to back cover and include plastic sheet lifter (page guard) at front of each volume.
3. Do not overfill binders.
4. Covers shall be oil, moisture, and wear resistant, including identifying information on cover and spine of manual.
5. Provide the following information on cover of each volume:
 - a. Title, "OPERATING AND MAINTENANCE INSTRUCTIONS".
 - b. Name or type of equipment covered in the manual.
 - c. Volume number, if more than one volume is required.
 - d. Name of Project and, if applicable, contract name and number.
 - e. Name of building or structure, as applicable.
6. Provide the following information on spine of each volume:
 - a. Title, "OPERATING AND MAINTENANCE INSTRUCTIONS".
 - b. Name or type of equipment covered in the manual.
 - c. Volume number, if more than one volume is required.
 - d. Project name and building or structure name.

B. Pages:

1. Print pages in manual on 30-pound (minimum) paper, 8.5 inches by 11 inches.
2. Reinforce binding holes in each individual sheet with plastic, cloth, or metal. When published, separately bound booklets or pamphlets are included in the manual, reinforcing of pages within booklet or pamphlet is not required.
3. Provide each page with binding margin of at least one inch wide. Punch each page with holes suitable for the associated binding.

C. Drawings:

1. Bind into the manual drawings, diagrams, and illustrations up to and including 11 by 17 inches in size, with reinforcing specified for pages.
2. Documents larger than 11 inches by 17 inches shall be folded and inserted into clear plastic pockets bound into the manual. Mark pockets with printed text indicating content and drawing numbers. Provide no more than three drawings per pocket.

D. Copy Quality and Document Clarity:

1. All contents shall be original-quality copies, viz., material shall either be original

manufacturer-printed materials or first-generation photocopies indistinguishable from originals. Manuals that contain copies that are not clear, not completely legible, off-center, skewed, or where text or drawings are cut by binding holes, will be rejected. Pages that contain approval or date stamps, comments, or other markings that cover text or drawing are unacceptable. Faxed copies are unacceptable.

2. Clearly mark in ink all components of equipment on catalog pages for ease of identification. In standard or pre-printed documents, indicate options provided or cross out inapplicable material. Use of highlighters is unacceptable.

E. Organization:

1. Coordinate with CONSTRUCTION CONTRACT ADMINISTRATOR and OWNER to develop comprehensive, practical, and consistent indexing system for operations and maintenance data. CONSTRUCTION CONTRACT ADMINISTRATOR and OWNER will review indexing system before operations and maintenance data is submitted.
2. Table of Contents:
 - a. Provide table of contents in each volume of each operations and maintenance manual.
 - b. In table of contents and at least once in each chapter or section, identify products by their functional names. Thereafter, abbreviations and acronyms may be used if their meaning is explained in table bound at or near end of each volume. Using product model or catalog designations for identification is not acceptable.
3. Use dividers and indexed tabs between major categories of information, such as operating instructions, preventive maintenance instructions, and other major subdivisions of data in each manual.

1.4 FORMAT OF ELECTRONIC COPIES

A. Electronic Copies of Manuals:

1. Electronic copy shall include all information provided in hardcopy.
2. Provide each electronic copy on a separate compact disc (CD).
3. File Format:
 - a. Files shall be in “portable document format (PDF)”. Files shall be electronically searchable.
 - b. Provide separate file for each separate document in the hardcopy.
 - c. Within each file, provide bookmarks for the following:
 - 1) Each chapter and subsection listed in the hardcopy document’s table of contents.
 - 2) Each figure.
 - 3) Each table.
 - 4) Each appendix.
4. Also provide drawings and figures in one of the following formats: “.bmp”, “.tif”, “.jpg”, or “.gif”. Provide files in separate directory on CD.

- B. Copies of Programming and Configuration Files:
 - 1. Provide on CD copy of all software programming, such as programmable logic controller programs, prepared specifically for the Project. Third-party, commercially available software is excluded from requirements of this article; provide copies of commercially-available, third-party software as specified in the Contract Documents.
 - 2. Provide on CD copies of system configuration prepared specifically for the Project, such as SCADA display configurations.
 - 3. Provide number of programming and configuration files as specified for electronic copies of operation and maintenance data.

1.5 CONTENT

- A. Provide complete, detailed written operating instructions for each product including: function; operating characteristics; limiting conditions; operating instructions for start-up, normal and emergency conditions; regulation and control; operational troubleshooting; and shutdown. Also include, as applicable, written descriptions of alarms generated by product and proper responses to such alarm conditions.
- B. Provide written explanations of all safety considerations relating to operation and maintenance procedures.
- C. Provide complete, detailed, written preventive maintenance instructions including all information and instructions to keep product or system properly lubricated, adjusted, and maintained so that products function economically throughout design life. Instructions shall include:
 - 1. Written explanations with illustrations for each preventive maintenance task such as inspection, adjustment, lubrication, calibration, and cleaning. Provide pre-startup checklists for each equipment item and maintenance requirements for long-term shutdowns.
 - 2. Recommended schedule for each preventive maintenance task.
 - 3. Lubrication charts indicating recommended types of lubricants, frequency of application or change, and where each lubricant is to be used or applied.
 - 4. Table of alternative lubricants.
 - 5. Troubleshooting instructions.
 - 6. List of required maintenance tools and equipment.
- D. Complete bills of material or parts lists for products provided. Lists or bills of material may be provided on a per-drawing or per-equipment assembly basis. Bills of material shall indicate:
 - 1. Manufacturer's name, address, telephone number, fax number, and Internet website address.
 - 2. Manufacturer's local service representative's or local parts supplier's name, address, phone number, fax number, and Internet and e-mail addresses, if applicable.
 - 3. Manufacturer's shop order and/or serial number(s) for product or assembly

- furnished.
4. For each part or piece provide:
 - a. Parts cross-reference number. Cross-reference number shall be used to identify the part on assembly drawing, Shop Drawing, or other type of illustration where the part is clearly shown.
 - b. Part name or description.
 - c. Manufacturer's part number.
 - d. Quantity of each part used in each assembly.
 - e. Current unit price of the part at the time the operations and maintenance manual is submitted. Price list shall be dated.
 - E. Complete instructions for ordering of all replaceable parts, including reference numbers (e.g., shop order or serial number) that will expedite ordering process.
 - F. Manufacturer's recommended inventory levels for spare parts and consumable supplies for the first two years of operation. Consumable supplies are those items consumed or worn by operation of equipment, and items used in maintaining the operation of product, including items such as lubricants, seals, reagents, and testing chemicals used for calibrating or operating the equipment. Provide estimated delivery times, shelf life limitations, and special storage requirements.
 - G. Provide manufacturer's installation and operation bulletins, diagrams, schematics, and equipment cutaways. Avoid providing catalog excerpts unless they are the only material available showing identification or description of particular component of the equipment. Where materials pertain to multiple models or types, mark the literature to indicate specific product supplied. Marking may be in the form of checking, arrows, or underlining to show pertinent information, or by crossing out or other means of obliterating information that does not apply to the products furnished.
 - H. Provide original-quality copies of each approved and accepted Shop Drawing and submittal, updated to as-installed condition. Reduced drawings are permissible only if reduction is to not less than one-half original size and all lines, dimensions, lettering, and text are completely legible on the reduction.
 - I. Provide complete electrical schematic and wiring diagrams, including complete point-to-point wiring and wiring numbers or colors between all terminal points.
 - J. Programmable Logic Controllers: If programmable logic controllers are provided under the Contract:
 1. Provide complete logic listings in "ladder diagram", "function block diagram", "sequential function chart", "instruction list" OR, "structured text" format.
 2. For ladder diagram logic, include complete cross-referencing of all logic elements. Annotate all elements with clearly understandable tags or descriptive labels.
 3. Provide complete programmable logic controller listing of all input/output

address assignments, tag assignments, and pre-set constant values, with functional point descriptions.

4. Provide complete manufacturer's programming manuals.
- K. Copy of warranty bond and service contract as applicable.
- L. When copyrighted material is used in operations and maintenance manual, obtain copyright holder's written permission to use such material in the operation and maintenance manual.

1.6 SUBMITTALS REQUIRED

- A. Provide operation and maintenance data for the following:
1. All equipment and systems.
 2. Valves, gates, actuators, and related accessories.
 3. Instrumentation and control devices.
 4. Electrical gear.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

++ END OF SECTION ++

SECTION 01782

RECORD DOCUMENTS

PART 1 - GENERAL

1.1 DESCRIPTION

- A. CONTRACTOR shall maintain and provide CONSTRUCTION CONTRACT ADMINISTRATOR with record documents per the Specifications, General Conditions, and Supplementary Conditions.
- B. Maintenance of Record Documents:
1. Maintain in CONTRACTOR's field office, in clean, dry, legible condition, complete sets of the following record documents: Drawings, Specifications, and Addenda; Shop Drawings and submittals, including test records, approved or accepted as applicable, by CONSTRUCTION CONTRACT ADMINISTRATOR; Samples, Change Orders, Work Change Directives, Field Orders, photographic documentation, survey data, and all other documents pertinent to the Work.
 2. Provide files and racks for proper storage and easy access to record documents. File record documents in accordance with the 1995 edition of the Construction Specification Institute's *MasterFormat* used for organizing the Project Manual, unless otherwise accepted by CONSTRUCTION CONTRACT ADMINISTRATOR.
 3. Make record documents available for inspection upon request of CONSTRUCTION CONTRACT ADMINISTRATOR or OWNER.
 4. Do not use record documents for purpose other than serving as project record. Do not remove record documents from CONTRACTOR's field office without CONSTRUCTION CONTRACT ADMINISTRATOR's approval.
- C. Submittal of Record Documents:
1. Provide to CONSTRUCTION CONTRACT ADMINISTRATOR the following record documents:
 - a. Drawings.
 - b. Specifications and Addenda (bound).
 2. Prior to readiness for final payment, deliver to CONSTRUCTION CONTRACT ADMINISTRATOR one copy of final record documents. Submit complete record documents; do not make partial submittals.
 3. Submit record documents with transmittal letter on CONTRACTOR letterhead containing: date of transmittal, Project and Contract names, and title and number of each record document.
 4. With submittal of record documents, provide certification, with original signature of official authorized to execute legal agreements on behalf of CONTRACTOR, reading as follows:

“*[Insert Contractor’s corporate name]* has provided record documentation, per the Conditions of the Contract and Section 01782 of the Contract Documents, for the Northern Kentucky Water District, Taylor Mill, Kentucky. We certify that each record document submitted is complete, accurate, and legible relative to the Work performed under our Contract, and that the record documents conform to the requirements of the Contract Documents.

[Provide signature, print name, print signing party’s corporate title, and date]”

1.2 RECORDING CHANGES

A. General:

1. Label each document to be submitted as, “PROJECT RECORD” in two-inch high, legible, printed letters.
2. Keep record documents current. Make entries on record documents within two working days of receipt of information required to record the change.
3. Do not permanently conceal Work until required information has been recorded.
4. Accuracy of record documents shall be such that future searches for items shown on the record documents may rely reasonably on information obtained from CONSTRUCTION CONTRACT ADMINISTRATOR-accepted record documents.
5. Marking of Entries:
 - a. Use erasable, colored pencils (not ink or indelible pencil) for marking changes, revisions, additions, and deletions to record documents.
 - b. Clearly describe the change by graphic line and note as required. Use straight-edge to mark straight lines. Writing shall be legible and sufficiently dark to allow scanning of record documents into legible electronic files.
 - c. Date all entries.
 - d. Call attention to change by drawing a “cloud” around the area(s) affected.
 - e. Mark initial revisions in red. In the event of overlapping changes, use different colors for subsequent changes.

B. Drawings:

1. Record changes on copy of the Drawings. Submittal of CONTRACTOR-produced drawings as a substitute for recording changes on the Drawings is unacceptable.
2. Record changes on plans, sections, schematics, and details as required for clarity, providing reference dimensions and elevations (to Project datum) for complete record documentation.
3. Record actual construction including:
 - a. Depths of various elements of foundation relative to Project datum.
 - b. Horizontal and vertical location of underground utilities and appurtenances referenced to permanent surface improvements. For each buried pipe fitting, valve, or other improvement not visible at ground

- surface, provide dimensions to at least two permanent surface improvements.
- c. Location of exposed utilities and appurtenances concealed in construction referenced to visible and accessible features of structure.
 - d. Changes in structural and architectural elements of the Work, including changes in reinforcing.
 - e. Field changes of dimensions, arrangements, and details.
 - f. Changes made by Change Orders, Work Change Directives, and Field Orders.
 - g. Details on the Drawings.
4. Recording Changes for Schematic Layouts:
- a. In some cases on the Drawings, arrangements of conduits, circuits, piping, ducts, and similar items is shown schematically and is not intended to portray physical layout. For such cases, final physical arrangement is determined by CONTRACTOR subject to acceptance by CONSTRUCTION CONTRACT ADMINISTRATOR.
 - b. Record on record documents all revisions to schematics on Drawings, including: piping schematics, ducting schematics, process and instrumentation diagrams, control and circuitry diagrams, electrical one-line diagrams, motor control center layouts, and other schematics when included in the Contract. Record actual locations of equipment, lighting fixtures, in-place grounding system, and other pertinent data.
 - c. When plans and sections on the Drawings show the Work schematically, show on the record documents, by dimensions accurate to within one inch in the field, centerline location of items of Work such as conduit, piping, ducts, and similar items
 - 1) Clearly identify the Work item by accurate notations such as “cast iron drain”, “rigid electrical conduit”, “copper waterline”, and similar descriptions.
 - 2) Show by symbol or note the vertical location of Work item; for example, “embedded in slab”, “under slab”, “in ceiling plenum”, “exposed”, and similar designations. For piping not embedded, also provide elevation dimension relative to Project datum.
 - 3) Descriptions shall be sufficiently detailed to be related to Specifications.
 - d. CONSTRUCTION CONTRACT ADMINISTRATOR may provide written waiver of requirements relative to schematic layouts shown on plans and sections when, in CONSTRUCTION CONTRACT ADMINISTRATOR’s judgment, dimensioned layouts of Work shown schematically will serve no useful purpose. Do not rely on waiver(s) being issued.
5. Supplemental Drawings:
- a. In some cases, drawings produced during construction by CONSTRUCTION CONTRACT ADMINISTRATOR or CONTRACTOR supplement the Drawings and shall be included with record documents submitted by CONTRACTOR. Supplemental record

drawings shall include drawings provided with Change Orders, Work Change Directives, and Field Orders and that cannot be incorporated into the Drawings due to space limitations.

- b. Supplemental drawings provided with record drawings shall be integrated with the Drawings and include necessary cross-references between drawings. Supplemental record drawings shall be on sheets the same size as the Drawings.
- c. When supplemental drawings developed by CONTRACTOR using computer-aided drafting/design (CADD) software are to be included in record drawings, provide electronic files for such drawings in AutoCAD 2007 format as part of record drawing submittal. Provide electronic files on compact disc labeled, "Supplemental Record Drawings", together with CONTRACTOR name, Project name, and Contract name and number.

C. Specifications and Addenda:

1. Mark each Section to record:
 - a. Manufacturer, trade name, catalog number, and Supplier of each product and item of equipment actually provided.
 - b. Changes made by Addendum, Change Orders, Work Change Directives, and Field Orders.

1.3 ELECTRONIC FILES FURNISHED BY ENGINEER

A. CADD files will be furnished by ENGINEER upon the following conditions:

1. CONTRACTOR shall provide to ENGINEER a letter on CONTRACTOR letterhead requesting CADD files and providing specific definition(s) or description(s) of how files will be used, and specific description of benefits to OWNER (including credit proposal, if applicable) if the request is granted.
2. CONTRACTOR shall execute ENGINEER's standard agreement for release of electronic files and shall abide by all provisions of the agreement for release of electronic files.
3. Layering system incorporated in CADD files shall be maintained as transmitted by ENGINEER. CADD files transmitted by ENGINEER containing cross-referenced files shall not be bound by CONTRACTOR. Drawing cross-references and paths shall be maintained at all times. If CONTRACTOR alters layers or cross-reference files, CONTRACTOR shall restore all layers and cross-references prior to submitting record documents to ENGINEER.
4. CONTRACTOR shall provide record drawings to ENGINEER same CADD format that files were furnished to CONTRACTOR.

PART 2 - PRODUCTS (NOT USED)

PART 3 -EXECUTION (NOT USED)

++ END OF SECTION ++

SECTION 01783

SPARE PARTS AND MAINTENANCE MATERIALS

PART 1 - GENERAL

1.1 DESCRIPTION

- A. CONTRACTOR shall furnish spare parts data and maintenance materials for products per the Contract Documents.
- B. List of Spare Parts and Maintenance Materials: With the Shop Drawings and product data for each Specification Section, submit to CONSTRUCTION CONTRACT ADMINISTRATOR a complete list of spare parts, extra materials, maintenance supplies, and special tools required for maintenance (“spare parts and maintenance materials”) required for two years of operation, with current unit prices in U.S. funds, and source (or sources) of supply for each.
- C. Packaging and Labeling: Furnish spare parts and maintenance materials required per the Contract Documents in manufacturer’s unopened cartons, boxes, crates, or other original, protective covering suitable for preventing corrosion or deterioration for maximum length of storage normally anticipated by manufacturer. Packaging of spare parts and maintenance materials shall be clearly marked and identified with name of manufacturer or Supplier, applicable equipment, part number, part description, and part location in the equipment. Protect and package spare parts and maintenance materials for maximum shelf life normally anticipated by manufacturer.
- D. Storage Prior to Delivery to Owner: Prior to delivering spare parts and maintenance materials to OWNER, store spare parts and maintenance materials per the Contract Documents and manufacturers’ recommendations.
- E. Delivery Time and Eligibility for Payment:
 - 1. Deliver to OWNER spare parts and maintenance materials no later than date of Substantial Completion for products or system associated with spare parts and maintenance materials. Do not deliver spare parts and maintenance materials earlier than date that start-up commences for associated equipment or system.
 - 2. Spare parts and maintenance materials are not eligible for payment until delivered to OWNER and CONTRACTOR’s receipt of OWNER’s countersignature on letter of transmittal.
- F. Procedure for Delivery to OWNER: Deliver spare parts and maintenance materials to OWNER’s permanent storage rooms at the Site or area(s) at the Site designated by OWNER. When spare parts and maintenance materials are delivered, CONTRACTOR and OWNER will mutually inventory the products delivered to verify compliance with the Contract Documents regarding quantity and part numbers.

Additional procedures for delivering spare parts and maintenance materials to OWNER, if required, will be developed by CONSTRUCTION CONTRACT ADMINISTRATOR and complied with by CONTRACTOR.

G. Transfer Documentation:

1. Provide on CONTRACTOR letterhead a letter of transmittal for spare parts and maintenance materials furnished under each Specification Section. Letter of transmittal shall accompany spare parts and maintenance materials. Do not submit letter of transmittal separate from products.
2. Provide three original, identical, signed letters of transmittal for each Specification Section. Upon delivery of specified quantities and types of products to OWNER, designated person from OWNER will countersign each original letter of transmittal indicating OWNER's receipt of spare parts and maintenance materials. OWNER will retain one fully signed original, CONTRACTOR will furnish one fully signed original to CONSTRUCTION CONTRACT ADMINISTRATOR, and CONTRACTOR will retain one fully signed original for CONTRACTOR's file.
3. Letter of transmittal shall include the following:
 - a. Date of letter.
 - b. Project name, and contract name and number.
 - c. CONTRACTOR'S name and address.
 - d. Transmittal shall list for spare parts and maintenance materials furnished under each Specification Section. List each individual part or product and quantity provided.
 - e. Provide space for countersignature by OWNER as follows: space for signature, space for printed name, and date.

H. CONTRACTOR shall be fully responsible for loss or damage to spare parts and maintenance materials until products are received by OWNER.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

+ + END OF SECTION + +

SECTION 01821

INSTRUCTION OF OPERATIONS AND MAINTENANCE PERSONNEL

PART 1 - GENERAL

1.1 DESCRIPTION

- A. CONTRACTOR shall provide services of Supplier's operation and maintenance training specialists to instruct OWNER's personnel in recommended operation and maintenance procedures for products and equipment per the Specifications.
- B. Supplier shall provide a combination of classroom and field training. All training shall be conducted at the Site, unless otherwise stated in the Specifications.
- C. OWNER reserves the right to videotape training sessions.
- D. Scheduling of Training Sessions:
 - 1. General:
 - a. CONTRACTOR shall coordinate training services with start-up and initial operation of products and equipment on days and times, and in manner, acceptable to OWNER and per the Specifications.
 - b. Training may be required outside of normal business hours to accommodate schedules of operations and maintenance personnel. Provide services as necessary at no additional cost to OWNER.
 - 2. Prerequisites to Training:
 - a. Training of OWNER's personnel shall commence only after acceptable preliminary operation and maintenance data have been provided and Work described in Section 01751, Starting and Placing Equipment in Operation, and Section 01752, equipment and system startup and performance testing, has been completed.
 - b. At option of OWNER or CONSTRUCTION CONTRACT ADMINISTRATOR, training may be allowed to take place before, during, or after equipment start-up.
 - 3. Training Schedule Submittal:
 - a. Training Schedule Required: CONTRACTOR shall prepare and submit proposed training schedule for review and acceptance by CONSTRUCTION CONTRACT ADMINISTRATOR and OWNER. Proposed training schedule shall show all training required under the Contract, and shall demonstrate compliance with specified training requirements relative to number of hours of training, number of training sessions, and scheduling.
 - b. Timing of Submittal: Submit initial training schedule at least sixty days prior to scheduled start of first training session. Submit final training schedule, incorporating revisions per comments of OWNER and

CONSTRUCTION CONTRACT ADMINISTRATOR, no later than thirty days prior to start of first training session. CONSTRUCTION CONTRACT ADMINISTRATOR may reduce the number of days and otherwise modify requirements for submittal of training schedule.

- c. OWNER reserved the right to modify training schedule to meet process or emergency needs at the Site.

1.2 QUALITY ASSURANCE

A. Qualifications:

1. Supplier's instructors shall be factory-trained by manufacturer of equipment or product.
2. Supplier's instructors shall be proficient and experienced in conducting training of type required.
3. Qualifications of instructors are subject to acceptance by CONSTRUCTION CONTRACT ADMINISTRATOR. If CONSTRUCTION CONTRACT ADMINISTRATOR does not accept qualifications of proposed instructor, provide replacement instructor with acceptable qualifications.

B. Training Scheduling Conference:

1. Prior to preparing initial training schedule submittal, schedule and hold training scheduling conference at the Site, to review:
 - a. Training requirements per the Contract Documents.
 - b. Work to be completed prior to starting training.
 - c. Work progress and Progress Schedule relative to start-up and training.
 - d. Scheduling constraints for OWNER's personnel (i.e., days and times of training sessions).
 - e. Preferred days for training.
 - f. Training location and facilities available.
 - g. Required submittals.
 - h. Other issues relative to training of operations and maintenance personnel.
2. Attendance is mandatory for the following:
 - a. CONTRACTOR's project manager.
 - b. CONTRACTOR's Site superintendent.
 - c. Project manager of Subcontractors responsible for providing equipment and products for which training of OWNER's personnel is required.
 - d. Suppliers invited by CONTRACTOR.
 - f. CONSTRUCTION CONTRACT ADMINISTRATOR.
 - g. OWNER's staff responsible for training coordination, and staff responsible for scheduling operations and maintenance personnel.
3. If additional information must be developed to adequately cover agenda items, reconvene conference as soon as possible.
4. CONTRACTOR shall record discussions of conference and decisions and agreements (or disagreements) and provide copy of record to each conference attendee.

1.3 SUBMITTALS

- A. Action Submittals: Submit the following:
 - 1. Training Schedule: Detailed schedule of training sessions, demonstrating compliance with number of training sessions, hours required in the Contract Documents, and specified schedule requirements. Provide training schedule submittals per time frames specified in this Specification Section.

- B. Informational Submittals: Submit the following:
 - 1. Lesson Plan: Acceptable proposed lesson plan for training on each product or equipment item, per Table 01821-A and Specifications. Lesson plan shall conform to requirements of this Specification Section. Include with lesson plan copy of handouts that will be used during training sessions. Provide lesson plan submittals per time frames specified in this Specification Section.
 - 2. Qualifications: Credentials of Supplier's proposed operations and maintenance instructor(s). Credentials shall demonstrate compliance with requirements of this Specification Section and shall include brief resume and specific details of instructor's operation, maintenance, and training experience relative to the specific products for which instructor will provide training.
 - 3. Minutes of training scheduling conference.

- C. Closeout Submittals: Submit the following:
 - 1. Trainee sign-in sheet for each training session. Provide to OWNER's training coordinator.

1.4 LESSON PLAN

- A. Supplier's lesson plan shall describe specific instruction topics, system components for which training will be provided, and training procedures. Handouts to be used in training shall be attached to lesson plan when applicable. Describe in lesson plan "hands-on" demonstrations planned for training sessions.

- B. Provide acceptable lesson plan fourteen days prior to starting associated training.

- C. Lesson plan shall include estimated duration of each training segment.

- D. Lesson plan shall include the following:
 - 1. Equipment Overview (required for all types of operations and maintenance training):
 - a. Describe equipment's operating (process) function and performance objectives.
 - b. Describe equipment's fundamental operating principles and dynamics.
 - c. Identify equipment's mechanical, electrical, and electronic components and features. Group related components into subsystems and describe function of subsystem and subsystem's interaction with other subsystems..

- d. Identify all support equipment associated with operation of subject equipment (i.e., air intake filters, valve actuators, motors).
 - e. Identify and describe all safety precautions and potential hazards related to operation.
 - f. Identify and describe in detail safety and control interlocks.
2. Operations Personnel Training:
- a. Equipment Overview: As described above.
 - b. Operation:
 - 1) Describe operating principles and practices.
 - 2) Describe routine operating, start-up, and shutdown procedures.
 - 3) Describe abnormal or emergency start-up, operating, and shutdown procedures that may apply.
 - 4) Describe alarm conditions and responses to alarms.
 - 5) Describe routine monitoring and recordkeeping procedures.
 - 6) Describe recommended housekeeping procedures:
 - c. Troubleshooting:
 - 1) Describe how to determine if corrective maintenance or an operating parameter adjustment is required.
3. Mechanical Maintenance Training:
- a. Equipment Overview: As described above.
 - b. Equipment Preventive Maintenance:
 - 1) Describe preventative maintenance inspection procedures required to:
 - a) Inspect equipment in operation.
 - b) Spot potential trouble symptoms and anticipate breakdowns.
 - c) Forecast maintenance requirements (predictive maintenance).
 - 2) Define recommended preventative maintenance intervals for each component.
 - 3) Provide lubricant and replacement part recommendations and limitations.
 - 4) Describe appropriate cleaning practices and recommend intervals.
 - 5) Identify and describe use of special tools required for maintenance of equipment.
 - 6) Describe component removal/installation and disassembly/assembly procedures.
 - 7) Perform “hands-on” demonstrations of preventive maintenance procedures.
 - 8) Describe recommended measuring instruments and procedures, and provide instruction on interpreting alignment measurements, as appropriate.
 - 9) Define recommended torquing, mounting, calibrating, and aligning procedures and settings, as appropriate.
 - 10) Describe recommended procedures to check and test equipment following corrective maintenance.
 - c. Equipment Troubleshooting:
 - 1) Define recommended systematic troubleshooting procedures.
 - 2) Provide component-specific troubleshooting checklists.

- 3) Describe applicable equipment testing and diagnostic procedures to facilitate troubleshooting.
 - 4) Describe common corrective maintenance procedures with “hands on” demonstrations.
4. Instrumentation/Controls Maintenance Training:
 - a. Equipment Overview: As described above.
 - b. Preventative Maintenance and Troubleshooting: Per Section 13404, Plant Monitoring and Control System Training. CONSTRUCTION CONTRACT ADMINISTRATOR may grant waiver(s) to allow all training for a given system to be at the Site.

1.5 TRAINING AIDS

- A. Supplier’s instructor shall incorporate training aids as appropriate to assist in the instruction. Provide text and figure handouts. Other appropriate training aids include:
 1. Audio-Visual aids, such as videos, PowerPoint presentations, overhead transparencies, posters, blueprints, diagrams, catalog sheets.
 2. Equipment cutaways and samples, such spare parts and damaged equipment.
 3. Tools, such as repair tools, customized tools, measuring and calibrating instruments.
- B. Handouts:
 1. Supplier’s instructor shall utilize descriptive class handouts during training. Customized handouts developed especially for training at the Site are encouraged.
 2. Photocopied handouts shall be good quality and completely legible.
 3. Handouts should accompany the instruction with frequent reference made to handouts.
 4. Provide at least fifteen copies of handouts per training session.
- C. Audio-visual Equipment: Supplier shall provide audio-visual equipment required for training sessions. If it is available at the Site, OWNER may make available OWNER’s audio-visual equipment; however, do not count on OWNER providing audio-visual equipment. Audio-visual equipment that Supplier shall provide, as required, includes:
 1. Laptop computer, presentation software, and PowerPoint projector.
 2. As required, extension cords and spare bulb for projector.
 3. As required, projection screen, DVD player, television monitor, and any other equipment that may be needed to complete training sessions.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 TRAINING DELIVERY

A. General:

1. Instructors shall be fully prepared for the training sessions. Training delivery shall be communicative, clear, and proceed according to lesson plan accepted by CONSTRUCTION CONTRACT ADMINISTRATOR, with lesson content appropriate for trainees. If OWNER or CONSTRUCTION CONTRACT ADMINISTRATOR deems that training delivery does not conform to requirements of Specifications, training shall be postponed, rescheduled, and re-performed in acceptable manner at no additional cost to OWNER.
2. Trainee Sign-in Sheets: In format acceptable to OWNER, provide sign-in sheet for trainees for each session. Sign-in sheets shall include the Project name, product or system for which training was provided, and type of training (e.g., operations, mechanical maintenance, instrumentation/controls maintenance, or other), and name of each trainee. Upon completion of training, provide copy of each sign-in sheet to OWNER's training coordinator.

B. "Hands-on" Demonstrations:

1. Supplier's instructor shall present "hands-on" demonstrations of operations and maintenance of equipment for each training session, per lesson plan accepted by CONSTRUCTION CONTRACT ADMINISTRATOR.
2. CONTRACTOR and Supplier shall all provide tools necessary for demonstrations.

+ + END OF SECTION + +

SECTION 02220

DEMOLITION & SALVAGE

PART 1 - GENERAL

1.1 SCOPE OF WORK

- A. Provide all labor, materials, equipment and services required for demolition as shown on the Drawings and specified herein.

A.

1.2 RELATED WORK SPECIFIED ELSEWHERE

- A. Earthwork: Section 02300

1.3 PROCEDURE

- A. The procedures proposed for the accomplishment of salvage and demolition work shall be submitted for review. The procedures shall provide for safe conduct of the work, careful removal and disposition of materials specified to be salvaged, protection of property which is to remain undisturbed, coordination with other work in progress and timely disconnection of utility services. The procedures shall include a detailed description of the methods and equipment to be used for each operation, and the sequence of operations.
- B. It is the responsibility of the Contractor to visit the site to familiarize himself with the amount of Work that is included under this Section.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 DUST CONTROL

- A. The amount of dust resulting from the demolition shall be controlled to prevent the spread of dust to occupied portions of the plant and to avoid creation of a nuisance in the surrounding area. Use of water will not be permitted when it will result in, or create, hazardous or objectionable conditions such as ice, flooding and pollution.

3.2 DISCONNECTION OF UTILITY SERVICES

- B. Utilities shall be disconnected at the points indicated by the Owner or Engineer and left in a safe condition.

3.3 BURNING

- A. The use of burning at the project site for the disposal of refuse and debris will not be permitted, unless authorized in writing by the Owner and local authority.

3.4 PROTECTION OF EXISTING WORK

- A. Existing work to remain shall be protected from damage. Work damaged by the Contractor shall be repaired to match existing work.

3.5 BACKFILL OF STRUCTURES

- A. The portion of the demolished structures remaining below grade shall be backfilled with concrete, masonry, etc., from the demolition or any backfill material which is acceptable to the Engineer. The top two (2) feet of the backfill shall be made up of topsoil and graded to match the existing ground. It shall be free of any of the demolition material. The entire backfill shall be compacted in such a manner as to prevent settlement.
- B. It is the responsibility of the Contractor to dispose of all excess demolition material from the site as soon as practicable.

3.6 SALVAGE MATERIAL

- A. All equipment, pumps, controls, valves, piping, etc., is the property of the Owner and care shall be taken in its removal so not to damage it in any way. Such salvage material shall be removed and delivered to the Owner to a site designated by him. The Owner has the right to refuse any salvage material, and in such cases it is the responsibility of the Contractor to dispose of the unwanted material.

++ END OF SECTION ++

SECTION 02223

LIGHT WEIGHT ENGINEERED FILL

PART 1 - GENERAL

1.1 DESCRIPTION

A. Scope:

1. Work included: Provide Engineered Fill at the locations shown on the Drawings, as specified herein, and as needed for a complete and proper installation.
2. Work not included, but related to this Section: Excavation and site preparation for the Light Weight Engineered Fill including drainage considerations and related items such as dewatering, etc., if required, installation of any utilities or services within the Light Weight Engineered Fill, final surface treatment and subsequent pavement.

B. Coordination:

1. Review installation procedures under other Sections and coordinate the installation of items that must be installed with, or before, the Light Weight Engineered Fill (EF).

1.2 QUALITY ASSURANCE

A. Standards:

1. The specialized batching, mixing, and placing equipment shall be automated with bulk handling equipment approved by the manufacturer. Transit mixers are not acceptable for these applications.
2. The certified applicator shall be regularly engaged in the placement of Light Weight Engineered Fill. Light Weight Engineered Fill shall have been successfully applied on five projects which have performed satisfactorily for at least five years.

1.3 SUBMITTALS

A. Qualifications Data:

1. The prime contractor shall declare whom they have selected to perform this work by providing the certified applicator's name as approved by the Engineer.

- 2.. The applicator shall submit a project list complying with the requirements, Manufacturer approval, and reports documenting the physical properties of the Light Weight Engineered Fill.

PART 2 - PRODUCTS

2.1 SYSTEM PERFORMANCE

A. System Description:

1. The Light Weight Engineered Fill shall meet the following:

	Class II	Class III	Class IV
Maximum Cast Density	30 pcf	36 pcf	42 pcf
Minimum Compressive Strength @ 28 days	41 psi	80 psi	120 psi
Coefficient of Permeability(cm/sec) @ 2.0 psi	1×10^{-5}	1×10^{-5}	1×10^{-6}
Frost Heave per BRRL LR90 (250 hour exposure) 4.5" high x 4" diameter	< 0.5"	< 0.5"	< 0.5"

2.2 MANUFACTURERS

A. Light Weight Engineered Fill:

1. Manufactured by Elastizell Corporation of America.
2. Approved Equal.

2.3 MATERIALS

A. Light Weight Engineered Fill:

1. The expansion material shall be Elastizell EF approved in advance by the Engineer to producing Light Weight Engineered Fill meeting the properties of Section 2.1.

- B. Cement:
 - 1. Portland cement shall comply with ASTM C150, C595, or C1157. Pozzolans and other cementitious materials may be used. The manufacturer shall design the mix.
- C. Water:
 - 1. Use potable water.
- D. Admixtures:
 - 1. Admixtures may be used when specifically approved by the Manufacturer of the Light Weight Engineered Fill.

PART 3 - EXECUTION

3.1 INSPECTION

- A. Contractor and its applicator shall examine the areas and conditions under which the Light Weight Engineered Fill is to be performed and notify the Engineer in writing of conditions detrimental to the proper and timely completion of the Light Weight Engineered Fill. Do not proceed with the Light Weight Engineered Fill until unsatisfactory conditions have been corrected in a manner acceptable to the Engineer.

3.2 PREPARATION

- A. Surface Preparation:
 - 1. The installation of the Light Weight Engineered Fill shall be in accordance with procedures provided by the Manufacturer. The area to be filled shall not have any standing water in it prior to fill placement. Items encased in the fill shall be set and stable prior to installation.

3.3 INSTALLATION

- A. Light Weight Engineered Fill:
 - 1. Use automated job site batching, mixing, and placing equipment certified by the Manufacturer. Mix the materials and convey promptly to the point of placement. Cast the Light Weight Engineered Fill in lifts in such a manner to prevent segregation. The final surface finish shall be within ± 0.16 foot of plan elevation.

3.4 FIELD QUALITY CONTROL

A. Site Tests:

1. During placement of the initial batches, check the density and adjust the mix as required to obtain the specified cast density at the point of placement. Take four (4) test specimens for each 300 cubic yards of Light Weight Engineered Fill placed or for each four (4) hours of placing.
2. Test in accordance with ASTM C796 except do not oven dry the load test specimens. The specimens shall be 3" x 6" cylinders covered after casting to prevent damage and loss of moisture. Moisture cure specimens for a period up to 7 days prior to a 28-day compressive strength test. Specimens may be tested at any age to monitor the compressive strength. Manufacturer shall report test reports to the certified applicator for distribution.

++END OF SECTION++

SECTION 02240

DEWATERING

PART 1 - GENERAL

1.1 SCOPE OF WORK

- A. Furnish all labor and equipment required to dewater all excavations.
- B. Dewatering of all excavations shall be the responsibility of the Contractor and no additional compensation will be allowed.

1.2 RELATED WORK SPECIFIED ELSEWHERE

- A. Earthwork is included in Section 02300.
- B. Erosion and sedimentation control is included in Section 02371.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 GENERAL

- A. Dewatering equipment shall be of adequate size and quantity to assure maintaining proper conditions for installing pipe, concrete, backfill or other material or structure in the excavation.
- B. Dewatering shall include proper removal of any and all liquid, regardless of its source, from the excavation and the use of all practical means available to prevent surface runoff from entering any excavation.
- C. The site shall be kept free of surface water at all times. The Contractor shall install drainage ditches, dikes and shall perform all pumping and other work necessary to divert or remove rainfall and all other accumulations of surface water from the excavations. The diversion and removal of surface water shall be performed in a manner that will prevent flooding and/or damage to other locations within the construction area where it may be detrimental. The Contractor shall provide, install and operate sufficient trenches, sumps, pumps, hose piping, well points, deep wells, etc., necessary to depress and maintain the ground water level at least two (2) feet below the base of the excavation during all stages of construction operations. The ground water table shall be lowered in advance of

excavation and maintained a minimum of two (2) feet below the lowest excavation subgrade made until the structure has sufficient strength and weight to withstand horizontal and vertical soil and water pressures from natural ground water.

- D. No liquid from the excavated area shall be discharged into the sanitary sewer system.

++ END OF SECTION ++

SECTION 02260

EXCAVATION SUPPORT AND PROTECTION

PART 1 - GENERAL

1.1 SCOPE OF WORK

- A. This Section includes, but is not limited to, the following:
 - 1. Shoring and bracing necessary to protect existing buildings, streets, walkways, utilities, and other improvements and excavation against loss of ground or caving embankments.
 - 2. Maintenance of shoring and bracing.
 - 3. Removal of shoring and bracing, as required.

- B. Types of shoring and bracing systems include, but are not limited to, the following:
 - 1. Steel H-section (soldier) piles.
 - 2. Timber lagging.
 - 3. Steel sheet piles.
 - 4. Portable Steel Trench Box.

- C. Building excavation is specified in Section 2300 - Earthwork.

1.2 RELATED DOCUMENTS

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

1.3 SUBMITTALS

- A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Section 01340.

- B. Layout drawings for excavation support system and other data prepared by, or under the supervision of, a qualified professional engineer. System design and calculations must be acceptable to local authorities having jurisdiction.

1.4 QUALITY ASSURANCE

- A. Engineer Qualifications: A professional engineer legally authorized to practice in jurisdiction where Project is located, and experienced in providing successful engineering services for excavation support systems similar in extent required for this Project.

- B. Supervision: Engage and assign supervision of excavation support system to a qualified professional engineer foundation consultant.
- C. Regulations: Comply with codes and ordinances of governing authorities having jurisdiction.

1.5 JOB CONDITIONS

- A. Before starting work, verify governing dimensions and elevations. Verify condition of adjoining properties. Take photographs to record any existing settlement or cracking of structures, pavements, and other improvements. Prepare a list of such damages, verified by dated photographs, and signed by Contractor and others conducting investigation.
- B. Survey adjacent structures and improvements, employing qualified professional engineer, establishing exact elevations at fixed points to act as benchmarks. Clearly identify benchmarks and record existing elevations.
- C. During excavation, resurvey benchmarks weekly, maintaining accurate log of surveyed elevations for comparison with original elevations. Promptly notify Engineer if changes in elevations occur or if cracks, sags, or other damage is evident.

1.6 EXISTING UTILITIES

- A. Protect existing active sewer, water, gas, electricity and other utility services and structures.
- B. Notify municipal agencies and service utility companies having jurisdiction. Comply with requirements of governing authorities and agencies for protection, relocation, removal, and discontinuing of services.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. General: Provide adequate shoring and bracing materials which will support loads imposed. Materials need not be new, but should be in serviceable condition.
- B. Structural Steel: ASTM A 36.
- C. Steel Sheet Piles: ASTM A 328.
- D. Timber Lagging: Any species, rough-cut, mixed hardwood, nominal 3 inches

thick, unless otherwise indicated.

- E. Portable Steel Trench Box shall be OSHA approved.

PART 3 - EXECUTION

3.1 SHORING

- A. Wherever shoring is required, locate the system to clear permanent construction and to permit forming and finishing of concrete surfaces. Provide shoring system adequately anchored and braced to resist earth and hydrostatic pressures.
- B. Shoring systems retaining earth on which the support or stability of existing structures is dependent must be left in place at completion of work.

3.2 BRACING

- A. Locate bracing to clear columns, floor framing construction, and other permanent work. If necessary to move a brace, install new bracing prior to removal of original brace.
- B. Do not place bracing where it will be cast into or included in permanent concrete work, except as otherwise acceptable to Engineer.
- C. Install internal bracing, if required, to prevent spreading or distortion of braced frames.
- D. Maintain bracing until structural elements are supported by other bracing or until permanent construction is able to withstand lateral earth and hydrostatic pressures.
- E. Remove sheeting, shoring, and bracing in stages to avoid disturbance to underlying soils and damage to structures, pavements, facilities, and utilities.
- F. Repair or replace, as acceptable to Engineer, adjacent work damaged or displaced through installation or removal of shoring and bracing work.

++ END OF SECTION ++

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SECTION 02270

SLOPE PROTECTION AND EROSION CONTROL

PART 1 - GENERAL

1.1 SUMMARY

- A. Work Included: Erosion control devices.
- B. Related Sections and Divisions: Applicable provisions of Division 1 shall govern work in this section.

1.2 PAYMENT

- A. All costs associated with slope protection and erosion control shall be included in CONTRACTOR's Bid. This work shall include, but is not limited to the work listed below:
 - Erecting fence, excavation, placing posts, backfilling, and attaching woven wire and geotextile fabric.
 - Placing ditch checks.
 - Installing sediment traps.
 - Removing the fence at completion of project.
 - Cleaning and repairing erosion control measures.
 - Removing or spreading accumulated sediment to form a surface suitable for seeding.
 - Replacing silt fence and damages caused by overloading of sediment material or ponding of water adjacent to silt fence.
 - Furnishing labor, tools, equipment, and incidentals necessary to complete the work.

1.3 REFERENCES

- A. Kentucky Best Management Practices for Construction Activity (Ky BMP).

1.4 REGULATORY REQUIREMENTS

- A. CONTRACTOR is required to obtain any necessary federal, state, or local permits for erosion control. The permit requirements are CONTRACTOR's responsibility and shall be included in the prices Bid.
- B. Comply with laws prohibiting pollution of any lake, stream, river, or wetland.

1.5 QUALITY CONTROL

- A. Construct and maintain erosion sediment control measures in accordance with Ky BMP.

- B. Check facilities weekly and after any rainfall event and make needed repairs within 24 hours.

PART 2 - PRODUCTS

2.1 EROSION MATS

- A. Uniform web of interlocking wood excelsior fibers with a net backing on one side. The wood from which the blanket is produced shall have been properly cured to achieve adequately curled and barbed fibers. The blanket shall be of uniform thickness with the wood fibers evenly distributed over the entire area of the blanket. The blanket shall be furnished in rolled strips. The width of the strips shall be 48 inches, ±1-inch. Weight of blanket measured under average atmospheric conditions shall be 78 pounds per 80 square yards, ±10%. Net backing shall have mesh size not exceeding 1 1/2 by 3 inches and may be woven from twisted paper, cotton cord, a biodegradable plastic, or other alternate approved by ENGINEER. The blanket shall be nontoxic to vegetation.

2.2 SILT FENCE

- A. Conform to Kentucky BMP as supplemented herein.
- B. Use geotextile fabric consisting of either woven or nonwoven polyester, polypropylene, stabilized nylon, polyethylene, or polyvinylidene chloride with the following requirements. Fabric shall have the minimum strength values in the weakest principal direction. Nonwoven fabric may be needle punched, heat bonded, resin bonded, or combination thereof.

VALUE MINIMUM REQUIREMENTS ⁽¹⁾

Test	Method	Silty Soils ⁽⁴⁾	Sandy Soils ⁽⁵⁾
Grab Tensile-strength	ASTM D-1682 ⁽²⁾	100	100
Mullen Burst strength (psi)	ASTM D-3786	200	200
Equivalent Opening Size	CW-02215-77	50-140	20-50
U.S. Standard sieve	Corps of Engineers		
Water Flow Rate (gal/min/ft. ² at 50 MM Constant head)	ASTM D-4491 ⁽³⁾	10	10
Ultra Violet Radiation Stability (percent)	ASTM D-4355	90	90

⁽¹⁾ All numerical values represent minimum average roll values (i.e., the average of test results on any roll in a lot should meet or exceed the minimum values in the table.)

⁽²⁾ ASTM D-1682 Grab Test, Method 16, using a 4-inch by 8-inch sample, 3-inch gauge length clamped in 1-inch by 2-inch long grip, tested at a strain rate of 12-inch/min.

⁽³⁾ Water Flow Rate in gal/min/ft shall be determined by multiplying Permittivity in sec. as determined by ASTM D-4491 by a conversion factor of 74.

- (4) Silty Soil: More than 15% by weight passing No. 200 sieve.
- (5) Sandy Soil: Less than 15% by weight passing No. 200 sieve.

- C. Furnish geotextile fabric in a wrapping which will protect the fabric from ultraviolet radiation and from abrasion because of shipping and handling. Keep geotextile dry until installed.
- D. Provide posts, stakes, and wire reinforcement per Kentucky BMP standards.

2.3 GEOTEXTILE FABRIC-TYPE R

- A. For subgrade reinforcement under riprap: Either woven or nonwoven polyester, polypropylene, stabilized nylon, polyethylene, or polyvinylidene chloride. Fabric shall have the minimum strength values in the weakest principle direction. Nonwoven fabric may be needle punched, heat bonded, resin bonded, or combinations thereof.
- B. Insect, rodent, mildew, and rot resistant.
- C. Furnish in a wrapping which will protect fabric from ultraviolet radiation and from abrasion because of shipping and hauling. Keep geotextile dry until installed.
- D. Clearly mark fabric rolls showing fabric type.
- E. If sewn seams are used, furnish a field-sewn seam sample produced from the geotextile fabric and thread and with the equipment to be used on the project prior to installation.
- F. Comply with the following physical properties:

Test	Method	Value
Grab Tensile Strength (lbs) Puncture Strength (lbs) using 5/16-inch Flat-tipped Rod	ASTM D-4632 Modified ASTM D-3787	200 min. 80 min.
Mullen Burst (lbs/in ²)	ASTM D-3786	250 min.
Elongation at Required Strength (percent)	ASTM D-4632	20 min.
Equivalent Opening Size (U.S. Standard Sieve)	ASTM D-4751	30-140
Water Flow Rate (gal/min/ft ²) at 50 mm Constant Head	ASTM D-4491	10 min.

2.4 STRAW BALE BARRIERS

- A. Provide per Kentucky BMP standards.

PART 3 - EXECUTION

3.1 GENERAL

- A. Install devices before construction activities begin.
- B. Proceed carefully with construction adjacent to stream channels to avoid washing, sloughing, or deposition of materials into the stream. If possible, the work area should be diked off and the volume and velocity of water that crosses disturbed areas be reduced by means of planned engineering works (diversion, detention basins, berms).
- C. Unless noted on drawings, do not remove trees and surface vegetation.
- D. Expose the smallest practical area of soil at any given time through construction scheduling. Make the duration of such exposure before application of temporary erosion control measures or final revegetation as short as practicable.

3.2 EROSION MAT INSTALLATION

- A. Place erosion mat immediately after seeding or sodding operations have been completed. Before mat placement, remove all material or clods over 1 1/2 inches in diameter and all organic material or other foreign material which interfere with the mat bearing completely on the soil or sod.
- B. Any small stones or clods which prevent contact of the mats with the soil shall be pressed in the soil with a small lawn-type roller or by other effective means. The mat shall have its lateral edge so impressed in the soil as to permit runoff water to flow over it.
- C. The matting strips shall be rolled on or laid in direction of flow. Spread mat evenly, smoothly, in a natural position without stretching and with all parts bearing on soil and place blanket with netting on top. Overlap adjacent strips at least 4 inches. Overlap strip ends at least 10 inches. Make overlaps with the upgrade section on top.
- D. Bury upgrade end of each strip of fabric or blanket at least 6 inches in a vertical slot cut in the soil and press soil firmly against the embedded fabric or blanket.
- E. Anchor mats in place with vertically driven staples driven until their tops are flush with the soil. Space staples at 3-foot centers along mat edges and stagger space at 3-foot centers through the center. Place staples at 10-inch centers at end or junction slots.
- F. Reseed areas damaged or destroyed during erosion mat placing operations as specified for original seeding.
- G. Dispose of surplus excavated materials, and all stones, clods or other foreign material removed in the preparation of the seeded soil or sodded surface before placing mat.
- H. Following mat placement, uniformly apply water to the area to moisten seedbed to 2-inch depth and in a manner to avoid erosion.

- I. Maintain erosion mat and make satisfactory repairs of damage from erosion, traffic, fires or other causes until work acceptance.

3.3 GEOTEXTILE FABRIC-TYPE R

- A. Before placing fabric, grade area smooth and remove stones, organic matter, or other foreign material which would interfere with fabric being completely in contact with soil.
- B. Place fabric loosely and lay parallel to direction of water movement. Pinning or stapling is acceptable to hold geotextile in place. Overlap or sew together separate pieces of fabric. Overlap joints a minimum 24 inches in the flow direction. After placement, do not expose fabric more than 48 hours before covering.
- C. Cover damaged areas with a patch of fabric using a 3-foot overlap in all directions.

3.4 SILT FENCE INSTALLATION

- A. Erect silt fence before starting construction operations which might cause sedimentation or siltation at site of proposed silt fence.
- B. Construct silt fence in an arc or horseshoe shape with ends pointing up slope. Construct silt fence to the dimensions and details shown on drawings. Remove silt fences after slopes and ditches have been stabilized and turf developed to the extent that future erosion is unlikely. Dispose of materials remaining after removal.
- C. Inspect all silt fences immediately after each rainfall and at least daily. Correct deficiencies immediately. Where construction activity changes the earth contour and drainage runoff, make a daily review to ensure that silt fences are properly located for effectiveness. Where deficiencies exist, install additional silt fences.
- D. Remove and dispose of sediment deposits. Sediment deposits remaining in place after the silt fence is no longer required shall be dressed to conform with the existing grade and the area topsoiled, fertilized, and seeded as required.

3.5 STRAW BALE BARRIERS

- A. Provide as shown on the drawings and as necessary on ditch lines and other drainageways to minimize construction sediment laden runoff to downstream ditches and channels and into streams.
- B. Inspect all barriers immediately after each rainfall and at least daily. Correct deficiencies immediately. Where construction activity changes the earth contour and drainage runoff, make a daily review to ensure that barriers are properly located for effectiveness. Where deficiencies exist, install additional straw bales.

- C. Remove and dispose of sediment deposits. Sediment deposits remaining in place after the barrier is no longer required shall be dressed to conform with the existing grade and the area topsoiled, fertilized, and seeded as required.

END OF SECTION

SECTION 02275

GEOGRID SOIL REINFORCEMENT

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

- A. Work includes furnishing and installing geogrid soil reinforcement, wall fill and reinforced backfill in conjunction with the modular concrete block retaining wall as shown on the Drawings.
- B. Work includes furnishing and installing all appurtenant materials required for construction of the geogrid reinforced soil retaining wall as shown on the Drawings.

1.2 RELATED WORK

- A. Section 02276 - Concrete Block Modular Retaining Wall

1.3 REFERENCE STANDARDS

- A. See specific geogrid manufacturer's reference standards.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Contractor shall check the geogrid upon delivery to assure that the proper material has been received.
- B. Geogrids shall be stored above -20°F.
- C. Contractor shall prevent excessive mud, wet cement, epoxy, and like materials which may affix themselves to the gridwork, from coming in contact with the geogrid material.
- D. Rolled geogrid material may be laid or stood on end for storage.

1.5 RETAINING WALL SYSTEM DESIGN

- A. The design of the geogrid soil reinforcement and the modular concrete block retaining wall shall be accomplished (for the total retaining wall system) by the modular concrete block supplier. The proposed retaining wall heights vary from 1'± high to 12'± high as shown on the Drawings. Spacing and lengths of geogrid soil reinforcing shall vary depending on height of wall.

- B. The retaining wall design shall incorporate a surcharge of 250 psf for the anticipated traffic loadings on the driveway/parking areas adjacent to the proposed retaining wall.
- C. The geotechnical report entitled "Final Report Geotechnical Exploration, Advanced Treatment Facilities, Taylor Mill Treatment Plant, Grand Avenue, Taylor Mill, Kentucky" which includes information on local soils shall implement all recommendations from the report except where they conflict with these specifications, in which case the specifications shall govern.

1.6 SUBMITTALS

- A. Samples of all products used in the work of this section.
- B. Latest edition of manufacturer's specifications for proposed materials, method of installation, and list of material proposed for use.
- C. Design calculations prepared, stamped and signed by Registered Professional Engineer in the State of Kentucky for proposed retaining wall system.

1.7 SOILS COMPACTION TESTING

- A. Soils compaction testing will be accomplished by the Contractor in conjunction with the Contractor's construction of the modular concrete block retaining wall system.

PART 2 - PRODUCTS

2.1 DEFINITIONS

- A. Geogrid products shall be high density polyethylene expanded sheet or polyester woven fiber materials, specifically fabricated for use as soil reinforcement.
- B. Concrete retaining wall units are as detailed on the drawings and are specified under Section: 02276 - Concrete Block Modular Retaining Wall.
- C. Wall fill is a free draining granular material used within the concrete units.
- D. Reinforced backfill is the soil which is used as fill for the reinforced soil mass.
- E. Foundation soil is the in situ soil.

2.2 GEOGRID

- A. Geogrid shall be the type as shown on the Drawings having the property requirements as described within the retaining wall system manufacturer's recommended specifications.

PART 3 - EXECUTION

3.1 FOUNDATION SOIL PREPARATION

- A. Foundation soil shall be excavated to the lines and grades as shown on the construction drawings or as directed by the Engineer.
- B. Foundation soil shall be examined by the Engineer to assure that the actual foundation soil strength meets or exceeds assumed design strength.
- C. Over-excavated areas shall be filled with approved compacted backfill material.
- D. Foundation soil shall be proof rolled prior to fill and geogrid placement.

3.2 WALL ERECTION

- A. Wall erection shall be as specified under Section: 02276 - Concrete Block Modular Retaining Wall.

3.3 GEOGRID INSTALLATION

- A. The geogrid soil reinforcement shall be laid horizontally on compacted backfill. Connect to the modular concrete units by hooking geogrid over fiberglass pins. Pull taut, and anchor before backfill is placed on the geogrid.
- B. Slack in the geogrid at the wall unit connections shall be removed.
- C. Geogrid reinforcement shall be placed at the strengths, lengths, and elevations shown on the construction design drawings or as directed by the Engineer.
- D. Geogrid shall be oriented with the highest strength axis perpendicular to the wall alignment.
- E. To pretension geogrid, pull pinned geogrid taut to eliminated loose folds. Stake or secure back edge of geogrid prior to and during backfill and compaction.
- F. Geogrid reinforcements shall be continuous throughout their embedment lengths and placed side-by-side to provide 100% coverage at each level. Spliced connections between shorter pieces of geogrid or gaps between adjacent pieces of geogrid are not permitted.

3.4 FILL PLACEMENT

- A. Reinforced backfill shall be placed, spread, and compacted in such a manner that minimizes the development of slack or loss of pretension of the geogrid and installation damage.
- B. Reinforced backfill shall be placed and compacted in lifts not to exceed 6 inches where hand compaction is used, or 8 - 10 inches where heavy compaction equipment is used. Lift thickness shall be decreased to achieve the required density as required.
- C. Reinforced backfill material shall be compacted to 95% of Standard Proctor. The moisture content of the backfill material prior to and during compaction shall be uniformly distributed throughout each layer and shall be dry of optimum, + 0%, - 3%.
- D. Only lightweight hand-operated compaction equipment shall be allowed within 3 feet of the back surface of the modular concrete units.
- E. Backfill shall be placed from the wall rearward into the embankment to insure that the geogrid remains taut.
- F. Tracked construction equipment shall not be operated directly on the geogrid. A minimum backfill thickness of 6-inches is required prior to operation of tracked vehicles over the geogrid. Turning of tracked vehicles should be kept to a minimum to prevent tracks from displacing the fill and damaging the geogrid.
- G. Rubber-tired equipment may pass over the geogrid reinforcement at slow speeds, less than 10 MPH. Sudden braking and sharp turning shall be avoided.
- H. At the end of each day's operation, the Contractor shall slope the last lift of reinforced backfill away from the wall units to direct runoff away from wall face. The Contractor shall not allow surface runoff from adjacent areas to enter the wall construction site.

++ END OF SECTION ++

SECTION 02276

MODULAR CONCRETE BLOCK RETAINING WALL

PART 1 - GENERAL

1.1 DESCRIPTION

A. Scope:

1. Work includes furnishing and installing modular concrete block retaining wall units to the lines and grades designated on the Drawings and as specified herein.
2. Work includes preparing foundation soil, furnishing and installing leveling pad, unit drainage fill and reinforced backfill to the lines and grades designated on the Drawings.
3. Furnishing and installing all appurtenant materials required for construction of the retaining wall as shown on the Drawings.

B. Coordination:

1. Review installation procedures under other Sections and coordinate the installation of items that must be installed with, or before, the Modular Concrete Block Retaining Wall.

C. Sections:

1. Section 02275, Geogrid Soil Reinforcement.
2. Section 02240, Dewatering
3. Section 02300, Earthwork
4. Section 03300, Cast-In-Place Concrete
5. Section 03600, Precision Grouting
6. Section 05520, Handrails and Railings

1.2 REFERENCES

- A. ASTM C1372 – Specification for Segmental Retaining Wall Units.
- B. ASTM D422 - Particle Size Analysis
- C. ASTM D4318 - Liquid Limit, Plastic Limit and Plasticity Index of Soils
- D. ASTM D698 - Laboratory Compaction Characteristics of Soil -Standard Effort
- E. ASTM D4595 – Tensile Properties of Geotextiles – Wide Width Strip.
- F. ASTM D5262 – Unconfined Tension Creep Behavior of Geotextiles.
- G. NCMA SRWU-1 – Test method for Determining Connection Strength of SRW

1.3 SUBMITTALS

- A. Qualifications Data:
 - 1. Latest edition of manufacturer's specifications for proposed materials, method of installation and list of material proposed for use.
- B. Samples:
 - 1. Samples of all products used in the work of this section.
- C. Shop Drawings & Product Information:
 - 1. Descriptive Literature, catalog cuts, and dimensional prints clearly indicating all dimensions and materials of construction, shall be submitted on all items specified herein.
 - 2. At the time of submission, the contractor shall in writing, call the Engineer's attention to any deviations that the Drawings may vary from the requirements of the Engineer's Specifications. Comply with the requirements of Section 01330.
- D. Quality Control:
 - 1. Design calculations prepared, stamped and signed by Registered Professional Engineer in the State of Kentucky for proposed retaining wall system.

1.4 DELIVERY, STORAGE AND HANDLING

- A. Acceptance at Site:
 - 1. Contractor shall check the materials upon delivery to assure that proper material has been received.
- B. Storage and Acceptance:
 - 1. Contractor shall prevent excessive mud, wet cement, epoxy, and like materials which may affix themselves, from coming in contact with the materials.
 - 2. Contractor shall protect the materials from damage. Damaged material shall not be incorporated into the retaining wall structure.

1.5 WARRANTY

- A. General Warranty:
 - 1. The guaranty period shall be as set forth in specification Section 01710, "General Conditions". In the event that the manufacturer's guarantee exceeds that as stated in the General Conditions, the manufacturer's guarantee period will stay in effect and shall not be replaced by that previously stated.

PART 2 - PRODUCTS

2.1 SYSTEM PERFORMANCE

A. Design Criteria:

1. The design for the modular concrete block retaining wall system (including geogrid soil reinforcement) shall be accomplished by the modular concrete block supplier. The proposed retaining wall heights vary from 3'± high to 13'± as shown on the Drawings. Wall height is defined as the total height from top to bottom (wall toe). Spacing and lengths of geogrid soil reinforcing shall vary depending on height of wall.
2. The retaining wall designer shall incorporate handrails and drainage pipe into the proposed retaining wall.
3. The geotechnical report entitled "Final Report Geotechnical Exploration, Advanced Treatment Facilities, Taylor Mill Treatment Plant, Grand Avenue, Taylor Mill, Kentucky", dated September 10, 2010 by Thelen Associates, Inc., 1398 Cox Avenue, Erlanger, KY 41018, which includes information on local soils shall implement all recommendations from the report except where they conflict with these specifications, in which case the specifications shall govern.

B. Base Leveling Pad:

1. Leveling pad materials shall be placed as shown on the Drawings, upon approved bearing soils, to a minimum thickness of 6 inches and extend laterally a minimum of 6 inches in front and behind the modular wall unit.
2. Material shall be compacted so as to provide a level hard surface on which to place the first course of units. Compaction shall be to 98% of standard proctor density per ASTM D-698.
3. Leveling pad shall be prepared to provide complete contact of retaining wall unit with base surface.
4. Leveling pad materials shall be to the depths and widths shown on the Drawings.

C. Masonry Units:

1. First course of concrete wall units shall be placed on the base leveling pad at appropriate line and grade. The units shall be checked for level and alignment. The first course is the most important to insure accurate and acceptable results.
2. Insure that units are in full contact with base and properly seated.
3. Place the front of units side-by-side for full length of wall alignment. Alignment may be done by means of a string line or offset from base line. Do not leave gaps between adjacent units. Layout of corners and curves shall be in accordance with manufacturer's recommendations.
4. Install fiberglass connecting pins per manufacturer's recommendations.
5. Place and compact unit drainage fill within and behind wall units. Place and compact backfill soil behind drainage fill. Follow wall erection and drainage fill closely with structure backfill.
6. Sweep all excess material from top of units and install next course. Insure each course is completely unit filled, backfilled and compacted prior to proceeding to next course.

7. Lay up each course insuring that pins protrude into adjoining courses above a minimum of one inch. Two pins are required per unit. Pull each unit forward, away from the embankment, against pins in the previous course and backfill as the course is completed. Repeat procedure to the extent of wall height.
8. As appropriate where the wall changes elevation, units can be stepped with grade or turned into the embankment with a convex return end. Provide appropriate buried units on compacted leveling pad in area of convex return end.
9. Compact all unit drainage fill and reinforced backfill to densities not less than 95% of the standard Proctor maximum dry density, ASTM D698.

D. Cap Units:

1. Place cap block units over projecting pins from units below. Pull forward to set back position. Back fill and compact to finished grade.
2. As required, provide permanent mechanical connection to wall units with all-weather construction adhesive or epoxy recommended by the manufacturer. Apply adhesive or epoxy to bottom surface of cap units and install on units below.

E. Geogrid

1. Follow the requirements of Section 02275 – Geogrid Soil Reinforcement.

2.2 MANUFACTURERS

A. Product and Manufacturer: Provide one of the following:

1. Masonry Units by Keystone.
2. Approved Equal.

2.3 MATERIALS

A. Masonry Units:

1. Modular concrete units shall conform to the following architectural requirements:
 - a. Face color - concrete gray, Owner to verify during submittal review.
 - b. Face finish - sculptured rock face in angular tri-planer configuration. Other face finishes will not be allowed without written approval of Owner.
 - c. Bond configuration - running with bonds nominally located at midpoint vertically adjacent units, in both straight and curved alignments.
 - d. Exposed surfaces of units shall be free of chips, cracks or other imperfections when viewed from a distance of 10 feet under diffused lighting.
2. Concrete wall units shall have a minimum net 28 day compressive strength of 3000 psi. The concrete shall have maximum moisture absorption of 6 to 8 lbs/ft³.
3. Exterior dimensions may vary in accordance with ASTM C90 – 85. Standard

units shall have a minimum of 1 square foot face area each.

4. Modular concrete units shall provide a minimum of 150 psf of wall face area. Fill which is contained within the dimensions of the units may be considered as 80% effective weight.
5. Units shall have angled sides capable of concave and convex alignment curves with a minimum radius of 3.5 feet.
NOTE: Where applicable, for straight walls, use non-angled straight side cap units.
6. Units shall be interlocked with non-corrosive fiberglass pins, two per unit minimum.
7. Units shall be interlocked as to provide a minimum vertical setback 1/8" ± per course (near vertical) or 1"+ per course per the design.
8. Dimensional tolerances: ± 1/8" from nominal unit dimensions not including rough split face, ±1/16" unit height - top and bottom planes.
9. Unit size: 8" (H) x 18" (W) x 21" (D) minimum.
10. Unit weight shall be 100 lbs/unit minimum for standard weight aggregates.
11. Maximum horizontal gap between erected units shall be ≤ 1/2 inch.

B. Fiberglass Connecting Pins

1. Connecting pins shall be 1/2 inch diameter thermoset isophthalic polyester resin-pultruded fiberglass reinforcement rods to provide connection between vertically and horizontally adjacent units.
2. Pins shall have a minimum flexural strength of 128,000 psi and short beam shear of 6,400 psi.
3. Strength of pins shall be applicable over a design temperature of 10 degrees F to + 100 degrees F.
4. Pins shall be capable of holding the geogrid in the proper design position during grid pre-tensioning and backfilling.

C. Base Leveling Pad Material:

1. Material shall consist of compacted crushed stone base or non-reinforced concrete as shown on the Drawings. The compacted leveling pad shall be a minimum 6 inches thick.

D. Construction Adhesive:

1. Material shall conform to ASTM 2339.

E. Unit Drainage Fill:

1. Unit drainage fill material shall consist of clean 1" minus crushed stone or crushed gravel meeting the following gradation tested in accordance with ASTM D-422:

<u>Sieve Size</u>	<u>Percent Passing</u>
1 inch (25 mm)	100

3/4-inch (19 mm)	75-100
No. 4 0	0 - 10
No. 50	0 - 5

2. One cubic foot, minimum, of drainage fill shall be used for each square foot of wall face. Place recommended fill within cores of, between, and behind the retaining wall units. The drainage fill shall extend to at least 12-inches behind the modular concrete retaining wall units.

F. Reinforced Backfill:

1. Reinforced backfill shall be relatively clean, well-graded sand or sand and gravel and shall be free of debris and meet the following gradation tested in accordance with ASTM D-422:

<u>Sieve Size</u>	<u>Percent Passing</u>
2-inch (50 mm)	100
3/4-inch (19 mm)	75-100
No. 40	0-30
No. 2000	0-5
PI <6 per ASTM D4318	

2. The maximum aggregate size shall be limited to 3/4 inch unless field tests have been performed to evaluate potential strength reductions to the geogrid design due to damage during construction.
3. Material can be insitu soils where the above can be met and approved by the Engineer unless otherwise specified in the Drawings. Unsuitable soils for backfill (high plastic clays or organic soils) shall not be used in the backfill or in the reinforced soil mass.
4. Where additional fill is required, contractor shall submit sample and specification to the Engineer to determine if acceptable.
5. Reinforced backfill zone shall extend to encapsulate all geogrids.
6. Contractor shall submit reinforced fill sample and laboratory test results to the Engineer for approval prior to the use of any proposed reinforced fill material

F. Drainage Pipe:

1. The drainage pipe shall be perforated or slotted PVC pipe manufactured in accordance with ASTM F794 and F949 and shall be A-2000 type or equivalent.
2. The drainage pipe shall be wrapped in 3/4" aggregate and filter fabric with drainage composite or aggregate back drain system.

2.4 FILTER FABRIC

- A. The filter fabric shall be a 4.0 oz/sy polypropylene, needlepunched non woven fabric equivalent to C45NW by Contech Construction Products.

PART 3 - EXECUTION

3.1 PREPARATION

A. Foundation Preparation:

1. Foundation soil shall be excavated as required for footing dimensions shown on the Drawings, or as directed by the Engineer.
2. Foundation soil shall be examined by the Engineer to assure that the actual foundation soil strength meets or exceeds assumed design strength. Soils not meeting required strength shall be removed and replaced with acceptable material.
3. Over-excavated areas shall be filled with approved compacted backfill material.

3.2 INSTALLATION

A. Base Leveling Pad

1. Leveling pad materials shall be placed upon an approved foundation as shown on the construction drawings to a minimum thickness of 6”.
2. Aggregate material shall be compacted to provide a dense, level surface on which to place the first course of modular units. Compaction shall be to 95% of Standard Proctor Density as determined in accordance with ASTM D698.

B. Unit Installation

1. The first course of concrete modular wall units shall be carefully placed on the leveling pad. Each unit shall be checked for level and alignment.
2. Units are placed side by side for full length of wall alignment. Alignment may be done by means of a string line or offset from a base line.
3. Install fiberglass connecting pins and fill all voids in and around the modular units with unit fill material. Tamp or rod until fill to insure that all voids are completely filled.
4. Sweep excess material from top of units and install the next course. Ensure that each course is completely unit filled, backfilled and compacted prior to proceeding to next course.
5. Place each subsequent course ensuring that pins protrude into adjoining courses a minimum of 1”. Two pins are required per unit. Pull each unit forward, away from the fill zone, locking against the pins in the previous course and backfill as the course is completed. Repeat procedure to the extent of wall height.

C. Geogrid Installation

1. Geogrid shall be laid at the proper elevations and orientation as shown on the construction drawings or as directed by the Engineer.
2. Correct orientation (roll direction) of the geogrid shall be verified by the contractor with the strongest direction placed perpendicular to the wall.
3. Geogrid soil reinforcement shall be connected to the modular block wall units by placing the geogrid over fiberglass pins and laying the grid back on

compacted fill. Place the next course of units over the geogrid.

4. The geogrid shall be pulled taut to eliminate loose folds and pretension the reinforcement. Stake or secure back edge of geogrid prior to and during backfill and compaction. Geogrid shall be placed side by side with no gaps.

D. Fill Placement

1. Backfill material shall be placed in 8" lifts and compacted to 95% of Standard Proctor density as determined in accordance with ASTM D698. The in-place moisture content shall not exceed the optimum moisture content as determined in accordance with ASTM D698 and be no lower than 3% below optimum moisture content.
2. Backfill shall be placed, spread and compacted in such a manner that minimizes the development of slack or loss of pretension of the geogrid.
3. Only hand-operated compaction equipment shall be allowed within 3' of the back surface of the modular block units.
4. Backfill shall be placed from the wall back towards the embankment to ensure that the geogrid remains taut.
5. Tracked construction equipment shall not be operated directly on the geogrid. A minimum backfill thickness of 6" is required prior to operation of tracked vehicles over the geogrid. Turning of tracked vehicles should be kept to a minimum to prevent tracks from displacing the fill and damaging the geogrid.
6. Rubber-tired equipment may pass over the geogrid reinforcement at slow speeds, [less than 10 mph.] Avoid sudden braking and sharp turning.
7. At the end of each day's operation, the Contractor shall grade the backfill away from the wall and direct runoff away from the wall face. The Contractor shall not allow surface runoff from adjacent areas to enter the wall construction site.

E. Cap Installation

1. Place cap units over projecting pins from units below. Apply adhesive to top surface of unit below and place cap into position. Backfill and compact to finished grade with low permeability soil.

++ END OF SECTION ++

SECTION 02300

EARTHWORK

PART 1 - GENERAL

1.1 DESCRIPTION

A. Scope:

1. Provide all materials, labor, equipment and services necessary to do all clearing and grubbing, undercutting, excavation, backfilling, providing of additional fill material and topsoil, control of surface drainage and ground water, finished site grading and erosion control required to construct the work as shown.

B. Coordination:

1. Review installation procedures under other Sections and coordinate the installation of items that must be installed with, or before, the Earthwork.

C. Sections:

1. State and local code requirements shall control the disposal of trees and shrubs.
2. All burning shall be controlled by applicable local regulations.
3. Section 02260, Excavation Support and Protection.
4. Section 02270, Slope Protection and Erosion Control.
5. The geotechnical report entitled "Final Report Geotechnical Exploration, Advanced Treatment Facilities, Taylor Mill Treatment Plant, Grand Avenue, Taylor Mill, Kentucky". Dated September 10, 2010, by Thelen Associates, Inc. 1398 Cox Avenue, Erlanger, KY 41018 which includes information on local soils shall implement all recommendations from the report except where they conflict with these specifications, in which case the specifications shall govern.

1.2 CONDITIONS

A. Existing Site Conditions:

1. Existing Utilities: Prior to commencement of work, the Contractor shall locate existing underground utilities in areas of the work. If utilities are to remain in place, provide adequate means of protection during earthwork operations.
2. Protection of Persons and Property: Barricade open excavations occurring as part of this work and post with warning lights.
 - a. Operate warning lights as recommended by authorities having jurisdiction.

- b. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations.

B. Environmental Requirements:

1. Weather: Earthwork operations shall be suspended at any time when satisfactory results cannot be obtained on account of rain, snow, ice, drought or other adverse weather conditions.
2. Use of Explosives: The Contractor (or any of his Subcontractors) shall not bring explosives onto site or use in work without prior written permission from the Owner. All activities involving explosives shall be in compliance with the rules and regulations of the State Department of Mines, and Minerals, Division of Explosives and Blasting. Contractor is solely responsible for handling, storage, and use of explosive materials when their use is permitted.
3. Dust Control: Use all means necessary to control dust on or near the project site where such dust is caused by the Contractor's operations or directly results from conditions left by the Contractor.
4. All activities involving utility line construction covered under NATIONWIDE PERMIT # 12 shall meet the following conditions:
 - a. The general Water Quality Certification is limited to the crossing of intermittent and perennial streams by utility lines.
 - b. The construction of permanent or temporary access roads will impact less than 300 linear feet of intermittent and perennial streams and less than one acre of jurisdictional wetlands.
 - c. Utility lines shall be located at least 50 feet away from a stream which appears as a blue line on a USGA 7 ½ minute topographic map except where the utility line alignment crosses the stream. Utility lines 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 utility line excavation shall not be allowed to enter the flowing portion of the stream.
 - d. The activities shall not result in any permanent changes in preconstruction elevation contours in waters or wetlands or stream dimension, pattern or profile.
 - e. Utility line construction projects through jurisdictional wetlands shall not result in conversion of the area to non-wetland status.
 - f. Measures shall be taken to prevent or control spills of fuels, lubricants, or other toxic materials used in construction entering the watercourse.
 - g. 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 and reseeding will be accomplished with 14 days after disturbance.

- h. To the maximum extent practicable, all in stream work under this certification shall be performed during low flow.
- i. Heavy equipment, e.g. bulldozers, backhoes, draglines, etc., if required for this project, should not be used or operated within the stream channel. In those instances where such in stream work is unavoidable, then it shall be performed in such a manner and duration as to minimize turbidity and disturbance to substrates and bank or riparian vegetation.
- j. Any fill shall be of such composition that it will not adversely affect the biological, chemical, or physical properties of the receiving waters and/or cause violations of water quality standards. If riprap is utilized, it is to be of such weight and size that bank stress or slump conditions will not be created because of its placement.
- k. Removal of existing riparian vegetation should be restricted to the minimum necessary for project construction.
- l. Should evidence of stream pollution or jurisdictional wetland impairment and/or violations of water quality standards occur as a result of this activity (either from a spill or other forms of water pollution), the Kentucky Division of Water shall be notified immediately by calling 800/928-2380.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Soil Materials:

- 1. Definitions:
 - a. Satisfactory soil materials are defined as those complying with ASTM D2487 soil classification groups GW, GP, GM, SM, SW, SP, GC, SC, ML, and CL.
 - b. Unsatisfactory soil materials are defined as those complying with ASTM D2487 soil classification groups MH, CH, OL, OH and PT. The Contractor shall notify the CCA if these soil materials are encountered.
 - c. Subbase Material: Naturally or artificially graded mixture of crushed gravel, crushed stone or natural or crushed sand.
 - d. Drainage Fill: Washed, evenly graded mixture of crushed stone or uncrushed gravel, with 100 percent passing a 1/2 inch sieve and not more than 5 percent passing a No. 4 sieve.
 - e. Backfill and Fill Materials: Satisfactory soil materials shall consist of clean, low-plasticity, cohesive soils free of topsoil, vegetation, trash, construction or demolition debris, organic soils, frozen materials, particles more than 2 inches maximum dimension or other deleterious

materials. The plasticity index (ASTM D4318) of the fill soils should be 24 percent or less.

PART 3 - EXECUTION

3.1 PREPARATION

A. Clearing and Grubbing:

1. Work shall consist of cutting and removing designated trees, stumps, brush, logs, fences, or other loose and projecting material. Unless otherwise specified, it shall also include the grubbing of stumps, roots, and other natural obstructions which, in the opinion of the CCA, must be removed to execute properly the construction work and operate properly the facility upon the completion of construction.
2. Trees, bushes, and all natural vegetation shall only be removed with the approval of the CCA. No cleared or grubbed materials shall be used in backfills or embankment fills. All stumps, roots, and other objectionable material shall be grubbed up so that no roots larger than 1 inch in diameter remain less than 18 inches below the ground surface. All holes and depressions left by grubbing operations shall be filled with suitable material and compacted to grade, per these specifications.
3. Disposal shall be by burning or other methods satisfactory to the CCA; however, burning will be permitted only when the Contractor has obtained written permission from the local regulatory agency and Owner.
4. The Contractor shall also remove from the site and satisfactorily dispose of all miscellaneous rubbish including, but not limited to, masonry, scrap metal, rock, pavement, etc., that is within, under or above the fill, or to be removed as shown on the Drawings, specified herein, or directed by the CCA.
5. Existing improvements, adjacent property, utilities and other facilities, and trees, plants, and brush that are not to be removed shall be protected from injury or damage resulting from the Contractor's operations.
6. Trees and shrubs designated to remain or that are beyond the clearing and grubbing limit, which are injured or damaged during construction operations shall be treated or replaced at the Contractor's expense by experienced tree surgery personnel.

B. Erosion Control:

1. Temporary measures shall be applied throughout the construction period to control and to minimize siltation to adjacent properties and waterways. Such measures shall include, but not be limited to, the use of berms, silt barriers, gravel or crushed stone, mulch, slope drains and other methods.
2. These temporary measures shall be applied to erodible material exposed by any activity associated with the construction of this project.

3. Refer to Section 02270, Slope Protection and Erosion Control for requirements.

3.2 INSTALLATION

A. Excavation:

1. Excavation of every description and of whatever substances encountered within the grading limits of the project shall be performed to the lines and grades indicated on the Drawings. All excavation shall be performed in the manner and sequence as required for the work.
2. All excavated materials that meet the requirements for fill, subgrades or backfill shall be stockpiled within the site for use as fill or backfill, or for providing the final site grades. Where practicable, suitable excavated material shall be transported directly to any place in the fill areas within the limits of the work. All excavated materials that are not suitable for fill, and any surplus of excavated material that is not required for fill shall be properly disposed offsite by the Contractor.
3. The site shall be kept free of surface water at all times. The Contractor shall install drainage ditches and dikes, and shall perform all pumping and other work necessary to divert or remove rainfall and all other accumulations of surface water from the excavations. The diversion and removal of surface water shall be performed in a manner that will prevent flooding and/or damage to other locations within the construction area where it may be detrimental. The Contractor shall provide, install and operate sufficient trenches, sumps, pumps, hose piping, well points, deep wells, etc., necessary to depress and maintain the ground water level at least two (2) feet below the base of the excavation during all stages of construction operations. The ground water table shall be lowered in advance of excavation and maintained a minimum of two (2) feet below the lowest excavation subgrade made until the excavation is backfilled or the structure has sufficient strength and weight to withstand horizontal and vertical soil and water pressures from natural ground water.
4. Excavations for concrete structural slabs on grade shall extend to the bottom of the drainage fill layer or the bottom of the concrete mud mat layer shown on the plans. The over excavation shall be filled with drainage fill or concrete mud mat up to design bearing level per the plans.
5. Excavations for the construction shall be carefully made to the depths required. Bottoms for footings and grade beams shall be level, clean and clear of loose material, the lower sections true to size. Bottoms of footings and grade beams, in all locations, shall be at a minimum depth of 30 inches below adjacent exterior finished grade or 30 inches below adjacent existing grade, whichever is lower, whether so indicated or not. Footings and grade beam bottoms shall be inspected by the CCA before any concrete is placed thereon.
6. In excavations for structures where, in the opinion of the CCA, the ground is soft and spongy or otherwise unsuitable for the contemplated foundation, the Contractor shall remove such unsuitable material and replace it with

suitable material properly compacted in accordance with these specifications.

7. Sheeting and shoring shall be provided as necessary for the protection of the work, for the safety of the personnel, and for the protection from damage to existing ground, structures and infrastructure near the excavations. The clearances and types of the temporary structures, insofar as they affect the character of the finished work, will be subject to the review of the CCA, but the Contractor shall be responsible for the adequacy of all sheeting, bracing and cofferdamming, in accordance with all Federal, State and Local regulations. All shoring, bracing and sheeting shall be removed as the excavations are backfilled in a manner such as to prevent injurious caving; or, if approved by the CCA, shall be left in place. Sheeting left in place shall be cut off 18 inches below the surface.
8. Excavation for structures which have been carried below the depths indicated without specific instructions shall be refilled to the proper grade with suitable material properly compacted in accordance with these specifications, except that in excavation for columns, walls or footings, the concrete footings shall extend to this lower depth. All work of this nature shall be at the Contractor's expense.

B. Fill:

1. All existing fill below proposed structure and embankment fill areas, except the PT/GAC structure, shall be undercut and replaced with compacted backfill and materials, and the native ground below the proposed embankment fill areas shall be horizontally benched to at least two (2) feet below the original ground surface per the recommendations in the Geotechnical Report. All existing fill within the top four (4) feet below subgrade level shall be undercut from below proposed pavement areas. The upper six (6) inches of the natural subgrade below shall be scarified and recompacted at optimum moisture to at least ninety-five percent (95%) of Standard Proctor Density ASTM D 698 (latest revision).
2. All vegetation, such as roots, brush, heavy sods, heavy growth of grass and all decayed vegetable matter, rubbish and other unsuitable material within the area upon which fill is to be placed shall be stripped or otherwise removed before the fill is started. In no case will such objectionable material be allowed to remain in or under the fill area. Existing fill from excavated areas on site shall be used as fill for open and/or planted areas, except not in the proposed fill embankment areas. Additional fill stockpiled at the site can be used for fill if it meets the criteria for backfill and fill materials in this specification and is approved by the CCA. Any additional material necessary for establishing the indicated grades shall be furnished by the Contractor and approved by the CCA. All fill material shall be free from trash, roots and other organic material. Material larger than 3 inches maximum dimension shall not be permitted in the upper 6 inches of the fill area. Fill material can be placed in successive layers and thoroughly tamped or rolled in a manner approved by the CCA, each layer being

moistened or dried to near optimum moisture content (ASTM D698) such that the specified degree of compaction shall be obtained. No fill shall be placed or compacted in a frozen condition or on top of frozen material. No fill material shall be placed when free water is standing on the surface of the area where the fill is to be placed and no compaction of fill will be permitted with free water on any point of the surface of the fill to be compacted.

3. Where concrete slabs are placed on earth, all loam and organic or other unsuitable material shall be removed. Where fill is required to raise the subgrade for concrete slabs to the elevations as indicated on the Drawings or as required by the CCA, such fill shall consist of suitable material and shall be placed in layers. Each layer shall be moistened or dried to near optimum moisture content (ASTM D698) such that the specified degree of compaction can be obtained. All compaction shall be accomplished in a manner and with equipment as approved by the CCA. When the subgrade is part fill and part excavation or natural ground, the excavated or natural ground portion shall be scarified to a depth of 12 inches and compacted as specified for adjacent fill.

C. Backfilling

1. After completion of footings, grade beams and other construction below the elevation of the final grades and prior to backfilling, all forms shall be removed and the excavation shall be cleaned of all trash and debris. Material for backfilling shall be as specified for suitable material, placed and compacted as specified hereinafter. Backfill shall be placed in horizontal layers of the thickness specified and shall have a moisture content near optimum moisture content (ASTM D698) such that the required degree of compaction is obtained. Each layer shall be compacted by mechanical tampers or by other suitable equipment approved by the CCA to the specified density. Special care shall be taken to prevent wedging action or eccentric loading upon or against the structure. Trucks and machinery used for grading shall not be allowed within 45 degrees above the bottom of the footings or grade beams.

D. Compaction

1. Suitable material as hereinbefore specified shall be placed in maximum 8" thick horizontal layers. Compaction shall be performed by rolling with approved compaction equipment. The degree of compaction required is expressed as a percentage of the maximum dry density obtained by the test procedure presented in ASTM D-698. Laboratory moisture density tests shall be performed on all fill material. Material shall be moistened or aerated as necessary to provide the moisture content that will readily facilitate obtaining the specified compaction. Compaction requirements shall be as specified below:

Fill Utilized For	Minimum Required Density (%)	Maximum Permissible Lift Thickness As Compacted, Inches
Backfill & Utility Trenches Under Foundations & Pavements	98	8
Backfill Around Structures	95	8
Field and Utility Trench Backfill Under Sidewalks and Open Areas	95	8

2. Field density tests shall be performed in sufficient number to determine that the specified density is being obtained. Tests shall be in accordance with ASTM Standards D 1556 or D 2922/D 3017 and shall be performed by the Owner. Tests will be performed by the Owner's Testing Agency. Contractor shall provide suitable notification for coordination of testing. Delays due to the lack of adequate advance notification shall be the responsibility of the Contractor.

E. Site Grading

1. Where indicated or directed, topsoil shall be removed without contamination with subsoil and spread on areas already graded and prepared for topsoil, or transported and stockpiled convenient to areas for later application, or at locations specified. Topsoil shall be stripped to full depth and, when stored, shall be kept separate from other excavated materials and piled free of roots, stones, and other undesirable materials.
2. Following stripping, fill areas shall be prepared as recommended in the Geotechnical Report to provide bond between existing ground and the fill material. Material should be placed in successive horizontal layers not exceeding twelve (12) inches uncompacted thickness. In general, layers shall be placed approximately parallel to the finished grade line.
3. In general and unless otherwise specified, the Contractor may use any type of earth moving equipment he has at his disposal, provided such equipment is in satisfactory condition and of such type and capacity that the work may be accomplished properly and the grading schedule maintained. During construction, the Contractor shall route equipment at all times, both when loaded and empty, over the layers as they are placed, and shall distribute the travel evenly over the entire area.
4. The material in the layers shall be of the proper moisture content before rolling or tamping to obtain the prescribed compaction. Wetting or drying throughout the layer shall be required. Should the material be too wet to permit proper compaction or rolling, all work on the fill thus affected shall be delayed until the material has dried to the required moisture content. If the material is too dry, it shall be sprinkled with water and manipulated to obtain the uniform moisture content required throughout a layer before it is compacted.

5. Each layer of the fill shall be compacted by rolling or tamping to the standard specified in Paragraph 3.2.D. The Contractor shall use kneading-type of compaction equipment for the corrosive fill such as sheepsfoot rollers. Such equipment shall be in satisfactory condition and of such design, type, size, weight, and quantity to obtain the required density in the embankment. If at any time the required density is not being obtained with the equipment then in use by the Contractor, the CCA may require that different and/or additional compaction equipment be obtained and placed in use at once to obtain the required compaction.
6. The Contractor shall be responsible for the stability of all embankments and shall replace any portion which, in the opinion of the CCA, has become displaced due to carelessness or negligence on the part of the Contractor.

F. Topsoil:

1. Provide all labor, materials, equipment and services required for furnishing and placing topsoil. Samples of topsoil shall be submitted to the Engineer for review before topsoil is placed. The material shall be good quality loam and shall be fertile, friable, mellow; free from stones larger than one (1) inch, excessive gravel, junk metal, glass, wood, plastic articles, roots and shall have a liberal amount of organic matter. Light sand loam or heavy clay loam will not be acceptable.
2. The topsoil shall be 3 inches thick in all areas to be seeded. No topsoil shall be placed until the area to be covered is excavated or filled to the required grade. Imported backfill material will be stockpiled on site for structure backfilling and top soiling.

++ END OF SECTION ++

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SECTION 02318

CRUSHED STONE AND GRAVEL

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Scope:
 - 1. CONTRACTOR shall furnish and place crushed stone and gravel of the types specified at locations shown and as directed by the ENGINEER.
- B. Related Sections:
 - 1. Section 02300, Earthwork.
 - 2. Section 02505, Pipe embedment and Backfill Material.

1.2 REFERENCES

- A. Standards referenced in this Section are listed below:
 - 1. American Society for Testing and Materials, (ASTM).
 - a. ASTM C 131, Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.
 - b. ASTM C 136, Test Method for Sieve Analysis of Fine and Coarse Aggregates.
 - c. ASTM D 75, Practice for Sampling Aggregates.
 - d. ASTM D 448, Classification for Sizes of Aggregate for Road and Bridge Construction.

1.3 SUBMITTALS

- A. Shop Drawings: Submit the following:
 - 1. Furnish representative samples of the crushed stone and gravel to the ENGINEER and advise of the source location.
 - 2. Test reports, including sieve analyses, showing material compliance with specified requirements.
- B. Sampling and sieve analysis shall be performed in accordance with the requirements of ASTM D 75 and ASTM C 136.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Bank Run Gravel:
1. Bank run gravel shall consist of well graded hard, sound, tough, durable particles of uncrushed gravel free from soft, thin, elongated or laminated pieces, organic matter and other deleterious substance. The percentage by weight passing a No. 100 square mesh sieve shall not exceed ten percent, and it shall not contain stones larger than 6-inches.
- B. Crushed Stone or Gravel for Subdrain Filters: The materials shall be sand and gravel well graded from coarse to fine with the following specific requirements:
1. Fine Material: Diameter of 15 percent size - 2.0 mm. (U.S. #10 Sieve).
 2. Coarse Material: Diameter of 85 percent size - 19.0 mm. (U.S. 3/4 inch Sieve).
 3. CONTRACTOR shall submit samples conforming to the above requirements to an approved commercial testing laboratory for sieve analysis. The laboratory analysis results shall be approved by the ENGINEER before any material is ordered.
 4. After the materials are delivered to the Site, the ENGINEER will take two samples from each shipment of material. CONTRACTOR shall have a sieve analysis performed on these samples by a commercial testing laboratory. If the results of the samples taken in the field do not conform to those previously approved, the material will be rejected and shall be modified or removed from the Site.
- C. Crushed Stone or Screened Gravel for Foundations:
1. CONTRACTOR shall furnish and place crushed stone or screened gravel fill under pipe or structures, in addition to that required under other Sections. This material shall be placed at such locations as directed by the ENGINEER, in writing, to replace material unsuitable for the foundations of the pipe or structure or to increase the load carrying capacity of the pipe. It shall also be used to refill over excavations by CONTRACTOR.
 2. Crushed stone and gravel shall be clean, hard, sound, durable, uniform in quality, and free of any detrimental quantity of soft, friable, thin elongated, or laminated pieces, disintegrated material, organic matter, oil, alkali, or other deleterious substance.
 3. The loss by abrasion in the Los Angeles abrasion machine, determine as prescribed in ASTM C 131, Grading A, shall not exceed ten percent, by weight, after 100 revolutions nor 40 percent after 500 revolutions.
 4. Crushed Stone:
 - a. Crushed stone shall consist of the product obtained by crushing rock, stone, or gravel so that at least 50 percent by weight of aggregate retained on the No. 4 sieve for 3/4-inch or larger maximum sizes, and 50 percent retained on the No. 8 sieve for maximum sizes less than 3/4-inch shall consist of particles which have at least one rough, angular surface produced by crushing.
 - b. The gradation of crushed stone shall comply with the requirements of ASTM D 448.

5. Gravel:
 - a. Material designated herein as gravel shall be composed entirely of particles that are either fully or partially rounded and water-worn.
 - b. Crushed rock obtained by crushing rock which exceeds ASTM D 448 maximum gradation sizes may be combined provided it is uniformly distributed throughout and blended with the gravel. The quality and gradation requirements shall be as stated in this Section.

D. Road Gravel:

1. Road gravel shall be well graded bank run gravel consisting of hard, sound, tough, durable particles of uncrushed gravel free from soft, thin, elongated or laminated pieces, organic matter and other deleterious substance. This gravel is for roads not receiving bituminous treatment.
2. The percentage by weight passing a No. 100 square sieve shall not exceed ten percent and all stones larger than 3-inches shall be removed by screening or by hand.

E. Filter and Bedding Gravel:

1. CONTRACTOR shall furnish and place all material required for filter layers and riprap bedding as shown or directed by the ENGINEER, in writing. Graded gravel or layers of sand and gravel or crushed rock are required for filters or riprap bedding.
2. Filter and bedding gravel may be furnished either as a graded gravel conforming to the size distributions specified below or as a two layer filter consisting of layers of sand and crushed rock or gravel.
3. If a single layer is used, it shall consist of a mixed sandy and gravelly material well graded between the limits shown below:

<u>Sieve Size</u>	<u>Percent Passing</u>
3-inch	100
3/4-inch	75 to 85
No. 4	55 to 65
No. 60	10 to 20
No. 100	less than 5

4. If a two layer filter is used, it shall be composed of sand and gravel well graded between the limits shown.

Crushed Stone or Gravel

<u>Sieve Size</u>	<u>Percent Passing</u>
1-1/2-inch	95 to 100
3/4-inch	35 to 70

3/8-inch	10 to 30
No. 4	0 to 5

Sand

<u>Sieve Size</u>	<u>Percent Passing</u>
3/8-inch	100
No. 8	75 to 80
No. 60	10 to 20
No. 100	less than 5

5. All sand shall consist of clean, hard, durable particles free from organic or other deleterious matter. Crushed stone, crushed or uncrushed gravel shall be clean, hard, durable material of acceptable quality.
6. Material used on slopes shall be crushed gravel or crushed stone. Screened river gravel is not acceptable.
7. Samples of all material shall be submitted to the OWNER for approval.

PART 3 - EXECUTION

3.1 PLACING

- A. Crushed Stone, Gravel and other materials shall be spread in layers of uniform thickness not exceeding 8-inches and shall be thoroughly compacted with suitable power driven tampers or other power driven equipment. The placing of crushed stone or gravel shall conform to applicable requirements of Section 02505, Pipe Embedment and Backfill Material, except as noted above.
- B. Filter and Bedding Gravel: If a single layer is used it shall be placed to the lines and grades shown and thoroughly compacted in place by means approved by ENGINEER. If a two-layer filter is used, it shall be placed as shown such that the coarse layer is always separated from the compacted embankment or slope by a layer of sand of the thickness shown. If the riprap bedding is placed in two layers, 6-inches of sand shall be placed against the embankment fill, and a 6-inch layer of crushed stone or gravel shall be used between the sand and the riprap.

++ END OF SECTION ++

SECTION 02319

RIPRAP

PART 1 – GENERAL

1.1 DESCRIPTION

- A. Scope:
 - 1. CONTRACTOR shall provide all labor, materials, equipment, and incidentals required to furnish and install riprap at locations shown and indicated in the Contract Documents.
- B. Coordination:
 - 1. Review procedures under this and other Sections and coordinate the Work that must be performed with or before riprap.
- C. Related Sections:
 - 1. Section 02300, Earthwork.
 - 2. Section 02505, Pipe Embedment and Backfill Material.
 - 3. Section 02371, Geotextile Filter Fabric.

1.2 REFERENCES

- A. Standards referenced in this Section are:
 - 1. AASHTO T085-91-UL, Method of Test for Specific Gravity and Absorption of Coarse Aggregate.
 - 2. National Stone, Sand, and Gravel Association (NSSGA), NSSGA-293, Aggregate Handbook.

1.3 SUBMITTALS

- A. Acton Submittals:
 - 1. Product Data: Source or quarry name, gradation, and other information required by ENGINEER. Submit for each source of material proposed.
- B. Informational Submittals:
 - 1. Certification: Where material is specified according to state Department of Transportation (DOT) item number, submit copy of valid certification of Supplier and material issued by associated state DOT.

PART 2 – PRODUCTS

2.1 MATERIAL

A. Riprap:

1. Material:

- a. Stone for riprap shall be hard, angular field or quarry stone that is sound, durable, free of shale seams and coatings, and of such characteristics that stone will not disintegrate when subjected to action of water.
- b. Stones shall have minimum specific gravity of 2.5, as determined according to AASHTO T085-91-UL.
- c. Stones shall be free of dirt, debris, and deleterious material.
- d. Stones salvaged from excavations and conforming to the Contract Documents may be used for riprap if approved by ENGINEER in writing.

2. Size:

- a. Each load of riprap shall be well-graded, from smallest to largest size.
- b. Proportions: Width and thickness of each stone shall not be less than one-third the length of the stone
- c. Gradation shall be in accordance with Table 02319-A:
- d. Acceptance of gradation will be based on visual inspection.

**TABLE 02319-A
RIPRAP GRADATION REQUIREMENTS
(PERCENT PASSING THROUGH SQUARE OPENINGS)**

Size (inches)	Class, Size No. (NSSGA-293)					
	R-8	R-7	R-6	R-5	R-4	R-3
42	100					
30		100				
24	15-50		100			
18		15-50		100		
15	0-15					
12		0-15	15-50		100	
9				15-50		
6			0-15		15-50	100
4				0-15		
3					0-15	15-50
2						0-15
Nominal Placement Thickness (inches)	48	36	30	24	18	12

PART 3 – EXECUTION

3.1 PREPARATION

- A. Clear ground surface of brush, trees, stumps, and other objectionable material, and dress to a smooth surface. Clearing and grubbing, where required, shall conform to Section 02300, Earthwork.
- B. Remove all soft or spongy material to depth shown on the Drawings or as directed by ENGINEER and replace with approved material. Excavation, removal of unsuitable material, if any, and backfilling shall conform to Section 02270, Slope Protection and Erosion Control.
- C. Placing of geosynthetics, where required, shall conform to Section 02371, Geotextile Filter Fabric.

3.2 INSTALLATION

- A. Riprap Placing:
 - 1. Minimum total thickness of riprap shall be as shown on the Drawings.
 - 2. Place riprap stones so that weight of stone is carried by underlying material and not by adjacent stones. Carefully place the stones on geosynthetics, where shown, to produce an even distribution of pieces, with minimum of voids and without tearing geosynthetic. Place the full-course thickness in one operation while preventing segregation and avoiding displacement of underlying material. Do not place stones in layers, by dumping into chutes, or by other methods that cause segregation or damage to geosynthetic, if any. Rearrange individual stones, if necessary, for uniform distribution.
 - 3. Riprap may be placed using equipment; however, care shall be taken during placing to obtain an installation of firm and solid riprap. Level the top surface of riprap to required alignment and slope by hand-placing stones to fill large voids and to make surface even.
 - 4. On slopes, place the largest stones at the bottom. Riprap shall be properly sized to form compact, solid blanket to protect the slope or channel, as applicable. On slopes steeper than one foot vertical to 1.5 feet horizontal, do not use rounded boulders or cobbles without grouting stones in place.

+ + END OF SECTION + +

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SECTION 02475

DRILLED PIERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification sections, apply to work of this section.
- B. Installation shall include the furnishing of all labor, materials, equipment and services necessary to mobilize equipment, to excavate, and install Drilled Piers to the depths and sizes as indicated on the drawings, or as required. All equipment used for this construction shall be in first-class condition and shall be so maintained and efficiently operated at all times. Drilled Piers shall be installed by a contractor who specializes in Drilled Pier construction. A description of the method proposed to be used in Drilled Pier excavation and installation shall be submitted to the CCA, in writing, at least 15 days before start of the work.
- C. The geotechnical report entitled "Final Report Geotechnical Exploration, Advanced Treatment Facilities, Taylor Mill Treatment Plant, Grand Avenue, Taylor Mill, Kentucky", dated September 10, 2010 by Thelen Associates, Inc., 1398 Cox Avenue, Erlanger, KY 41018, which includes information on local soils shall implement all recommendations from the report except where they conflict with these specifications, in which case the specifications shall govern.

1.2 DESCRIPTION OF WORK

- A. Extent of Drilled Piers is shown on drawings, including locations, diameters of shafts, top elevations, and details of construction.

1.3 QUALITY ASSURANCE

- A. Codes and Standards: Comply with provisions of American Concrete Institute (ACI) "Standard Specification for the Construction of End Bearing Drilled Piers" (ACI 336.1), and as herein specified.

Where provisions of above standard conflict with building regulations in effect for this project, building regulations will govern, but only to establish minimum requirements.

- B. Drilled Pier Installer Qualifications: Not less than three (3) successfully completed contracts with similar soil and groundwater conditions, shaft sizes,

depths and volumes of work contained in this project. Submit satisfactory proof of compliance to CCA.

- C. Concrete Testing: All testing shall be in accordance with the provisions of Section 03300 - Cast-In-Place Concrete, except that one strength test shall be made for each 50 cubic yards of concrete or fraction thereof placed in any one day.

1.4 SUBMITTALS

- A. Reports: Submit following reports directly to CCA, with copy to others as designated.
 - 1. Concrete Materials Test Reports as proposed for use in concrete mixes.
 - 2. Preliminary Drilled Pier Report of actual allowable bearing capacity at bottom of each shaft, after reviewing the bottom of shaft at each excavation.
 - 3. Final Drilled Pier Report for each Drilled Pier, recording actual elevation at bottom and top, elevation of bedrock, final centerline location at top, variation of shaft from plumb, actual allowable bearing capacity of bottom, depth of socket, levelness of bottom, elevation of bottom and top of any casing left in place, any unusual conditions or deviations, from original design, dates of starting excavation, completing excavation, inspection, testing, and placement of concrete (include any delays in concreting and location of construction joints in shafts).

1.5 JOB CONDITIONS

- A. Site Information: Data on indicated subsurface conditions are not intended as representations or warranties of continuity of such conditions. It is expressly understood that Owner will not be responsible for interpretations or conclusions drawn there from by Contractor. Data are made available for convenience of Contractor and are not guaranteed to represent conditions that may be encountered.
- B. Additional test borings and other exploratory operations may be made by Contractor at no additional cost to Owner.

PART 2 - PRODUCTS

2.1 CONCRETE

- A. Concrete work shall conform to all applicable requirements of Section 03300 - Cast-In-Place Concrete, and to the additional requirements herein specified.
- B. Concrete for Drilled Piers shall be proportioned to have a 28 day compressive strength of not less than 4,000 pounds per square inch. Concrete placed by tremie through water, if permitted in writing by the Engineer, shall have one extra sack

of cement per cubic yard, up to a level of not less than 10 feet above the initial water level.

PART 3 - EXECUTION

3.1 DRILLED PIER EXCAVATION

- A. General: Excavate holes for Drilled Piers to required bearing elevation, which includes a 3-foot socket into unweathered bedrock, as indicated on the project plans and in the Geotechnical Report. Excavate holes for closely spaced Drilled Piers, and those occurring in fragile or sand stratas, only after adjacent holes are filled with concrete and allowed to set.

Drilled Pier design dimensions shown are minimums. The design of Drilled Piers is based on assumed strata bearing capacity. If bearing strata is not capable of maintaining bearing capacity assumed, foundation system will be revised as directed by Engineer. Revisions will be paid for in accordance with contract conditions relative to changes in work.

- B. Construction Tolerances: Locate centerline of Drilled Piers within the following tolerances:
1. Maximum permissible variation of location not more than 1/24th of shaft diameter or 3", whichever is less.
 2. Shafts out of plumb, not more than 1.5% of length nor exceeding 12.5% of shaft diameter or 15", whichever is less.
 3. Concrete cut-off elevation, plus 1" to minus 3".
 4. If above tolerances are exceeded, provide corrective construction to compensate for excessive eccentricity. Submit proposed corrective construction methods to CCA for review before proceeding.
- C. Temporary Shaft Protections: When required, provide full-length watertight steel casings of sufficient thickness to withstand compressive, displacement and withdrawal stresses and to maintain shaft walls. Temporary casings must be withdrawn as concrete is placed.
- D. The work of this section includes demolition and removal of rock boulders and other subsurface obstructions which are clearly indicated by contract documents, or by available subsurface exploration data, and such work will not be considered a change in work.
- E. Dewatering: Provide and maintain pumping equipment to keep excavations free of water before placing concrete. If water is encountered in amounts that cannot be controlled and removed by reasonable pumping equipment and methods and drilling operations must be halted, consult with CCA before using alternate methods of construction.

Discharge water to general site run-off ditches and disposal areas with discharge lines. Provide ditching as required to conduct water to site drainage facilities.

- F. Inspection: Each Drilled Pier excavation must be inspected by the Owner's testing agency before placing reinforcing steel and concrete.
- G. Provide facilities as required to assist inspection and testing of excavations, and cooperate with Owner's inspecting and testing personnel to expedite work.
- H. Notify Owner and testing facility at least 24 hours prior to time excavations will be ready for inspection.

3.2 REINFORCING STEEL AND DOWELS

- A. Fabricate and erect reinforcing cages in shafts as one continuous unit using inner ring re-steel. Place reinforcement accurately and symmetrically about axis of hole and hold securely in position during concrete placement.
- B. Use templates to set anchor bolts, leveling plates and other accessories furnished under work of other sections. Provide blocking and holding devices to maintain required position during concrete placement.
- C. Protect exposed ends of dowels and anchor bolts from mechanical damage and exposure to weather.

3.3 CONCRETE PLACEMENT

- A. General: Fill Drilled Pier excavations with concrete immediately after inspection and approval by Owner's testing laboratory. Use protection sheets (cut out to receive concrete) over excavation openings, extending at least 12" beyond edge. Place concrete continuously and in a smooth flow without segregating the mixed materials. Provide mechanical vibration for consolidation of at least top 25' of each shaft. Place concrete by means of bottom discharge bucket, flexible drop chute, elephant trunk hopper, or tremie. Use chutes or tremies for placing concrete where a drop of more than 8' is required, or pump concrete into place. Place concrete in-the-dry unless placing underwater is approved in writing by the CCA. If water occurs, and reasonable attempts to dewater by pumping or seal off water flow have failed, allow water level to attain its normal level and place concrete by tremie method. Control placement operations to insure that tremie is not broken during continuous placing from bottom to top. Other methods of depositing concrete underwater may be used, if approved in writing by the CCA. Maintain a sufficient head of concrete to prevent reduction in diameter of Drilled Pier shaft by earth pressure and to prevent extraneous material from mixing with fresh concrete. Coordinate withdrawal of temporary casings with concrete placement operations to maintain the level of concrete in the casing at least 5 feet

above the hydrostatic water level in the formation and at least 5 feet above casing bottom. Stop concrete placement at cut-off elevation shown, screed level, and apply a scoured, rough finish.

- B. Where cut-off elevation is above ground elevation, form top section above grade and extend shaft to required elevation. Interrupted placing operations of over one hour duration will require a cold joint installation. Measures shall be taken to avoid cold joints. Cold joints will only be permitted in the event of equipment breakdown. Leave resulting shaft surface approximately level and insert steel dowels as shown on drawings. At resumption of concrete placing, clean off surface laitance, roughen as required, and slush with a 1-to-1 cement grout or commercial bonding agent before remainder of concrete is placed.
- C. Cold Weather Placing: Protect concrete work from physical damage or reduced strength which could be caused by frost, freezing actions, or low temperatures, in compliance with ACI 306 and as herein specified. When air temperature has fallen to or is expected to fall below 40°F (4°C), uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50°F (10°C), and not more than 80°F (27°C) at point of placement. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials. Do not use calcium chloride, salt and other mineral containing antifreeze agents or chemical accelerators, unless otherwise accepted by CCA.
- D. Hot Weather Placing: When hot weather conditions exist that would seriously impair quality and strength of concrete, place concrete in compliance with ACI 305 and as herein specified. Cool ingredients before mixing to maintain concrete temperature at time of placement below 90°F (32°C). Mixing water may be chilled, or chopped ice may be used to control concrete temperature provided water equivalent of ice is calculated to total amount of mixing water. Place concrete immediately upon delivery. Keep exposed concrete surfaces, and formed shaft extensions, moist by fog sprays, wet burlap or other effective means. Do not use retarding admixtures without acceptance of CCA.

3.4 FIELD QUALITY CONTROL

- A. Tests shall be performed by the Owner. Payment for Field Quality Tests shall be by the Owner.
- B. Sample test concrete for quality control during placement, as follows:
 - 1. Sampling Fresh Concrete: ASTM C 172, except modified for slump to comply with ASTM C 94.
 - 2. Slump: ASTM C 143; one test for each concrete load at point of discharge; and one for each set of compressive strength test specimens.
 - 3. Air Content: ASTM C 231, pressure method; one for each set of compressive strength test specimens.

4. Compression Test Specimens: ASTM C 31; one set of 4 standard cylinders for each compressive strength test, unless otherwise directed. Mold and store cylinders for laboratory cured test specimens except when field-cure test specimens are required.
5. Concrete Temperature: Test when air temperature is 40°F (4°C) and below, and when 80°F (27°C) and above; and each time a set of compression test specimens made.
6. Compressive Strength Tests: ASTM C 39; one set for each 50 cubic yards or fraction thereof placed in one day. One specimen tested at 7 days, 2 specimens tested at 28 days, and one specimen retained in reserve for later testing if required.
7. When strength of field-cured cylinders is less than 85% of companion laboratory-cured cylinders, evaluate current operations and provide corrective procedures for protecting and curing in-place concrete.
8. Report test results in writing to CCA and Contractor on same day tests are made. Include in reports project identification name and number, date of concrete placement, name of contractor, name of concrete supplier and truck number, name of concrete testing service, concrete type, location of Drilled Pier, design compressive strength at 28 days, concrete mix proportions and materials; compressive breaking strength and type of break for both 7-day test and 28-day tests.
9. Additional Concrete Tests: Testing service may take core samples of in-place concrete when test results are such that there is reasonable doubt specified concrete strengths have not been attained.
10. Continuous coring of Drilled Piers may be required at Contractor's expense, where time for removal of temporary casings exceeded specified limits, or where observations or placement operations indicate cause for suspicion of quality of concrete, presence of voids, segregation or other possible defects.
11. Inspection and Tests for Drilled Pier: Soil testing facility shall perform and report specified test, and additional tests which may be required. Conduct tests and provide reports as soon as possible to not delay concreting operations for acceptable excavations. Bottom elevations and bearing capacities and lengths of Drilled Piers are estimated from available soil data. Actual elevations, Drilled Pier lengths, and bearing capacities will be determined by soil testing facility from conditions found in excavations. Final evaluations and acceptance of data will be determined by CCA.

3.5 MEASUREMENT AND PAYMENT

- A. Basis of Bids: Bids shall be based on number of Drilled Piers, design length from top elevation to satisfactory bearing strata and diameter of shaft as shown on drawings and indicated in the Geotechnical Report.
- B. Basis for Payment: Payment for Drilled Piers will be made on actual net length (measured from design top elevations to approved bearing elevations) of Drilled Piers in place and accepted. The actual length may vary to coincide with

elevation where satisfactory bearing strata is determined by Owner's testing services, and with stability and characteristics of soil strata.

- C. There will be no additional compensation for excavation, concrete fill, reinforcing, casing, or other costs due to unauthorized over-excavating shafts. No payment will be made for rejected Drilled Piers.
- D. Prices quoted include full compensation for labor, materials, tools, equipment, and incidentals required for excavation, obstruction removal, trimming, shoring, casing, dewatering, reinforcement, concrete, and other items for complete installation.
- E. Unit Prices: Unit prices for the following items, as set forth in contract conditions, will apply in event additions to or deductions from work are required and authorized by written order from CCA to Contractor.

Drilled Concrete Piers

Per Linear Foot

++ END OF SECTION ++

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SECTION 02505

PIPE EMBEDMENT AND BACKFILL MATERIALS

PART 1 - GENERAL

1.1 DESCRIPTION

A. Scope:

1. Provide all labor, materials, equipment and services required for furnishing and installing all buried piping embedment and backfill materials as shown on the Drawings and specified herein.

B. Coordination:

1. Review installation procedures under other Sections and coordinate the installation of items that must be installed with, or before, the Pipe Embedment and Backfill Materials.

C. Related Sections:

1. Section 02300, Earthwork
2. Section 15100, Valves and Appurtenances
3. Section 15051, Buried Piping Installation
4. The geotechnical report entitled "Final Report Geotechnical Exploration, Advanced Treatment Facilities, Taylor Mill Treatment Plant, Grand Avenue, Taylor Mill, Kentucky", dated September 10, 2010 by Thelen Associates, Inc., 1398 Cox Avenue, Erlanger, KY 41018, which includes information on local soils shall implement all recommendations from the report except where they conflict with these specifications, in which case the specifications shall govern.

1.2 QUALITY ASSURANCE

- A. Contractor shall submit a gradation analysis for all embedment and backfill materials as a shop drawing consistent with Section 01330, Submittal Procedures.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Classes of Embedment and Backfill Materials are defined in ASTM D2321. Embedment Materials are those used for bedding, haunching and initial backfill.

- B. Class 1A and Class 2 materials are acceptable for Pipe Embedment.
- C. Class 1, 2, 3 and 4A materials are acceptable for Final Backfill, compacted 95% Standard Proctor Density per ASTM D698 except that Class 4A material is not allowed for backfill under pavement or traffic areas or in trenches where uncontrolled water content may cause instability.
 - 1. No rocks larger than 3" shall be incorporated into the Final Backfill materials.
- D. Material Classes:
 - 1. Class 1A Manufactured Aggregates: Open graded clean, angular, crushed stone or rock.
 - 2. Class 1B Manufactured, Processed Aggregate: Dense graded clean, angular crushed stone. Compact to 95% Standard Proctor Density with hand tampers or vibratory compaction.
 - 3. Class 2: Clean, coarse-grained materials, such as gravel, coarse sands, and gravel/sand mixtures (1" maximum size). The materials are classified by the Unified Soil Classification System as GW, GP, SW, SP, and GW-GC or SP-SM. Hand tamping or mechanical vibration is required to provide the necessary 95% Standard Proctor Density.
 - 4. Class 3: Coarse-grained materials with fines including silty or clayey gravels or sands.
 - 5. Gravel or sand must comprise more than 50% of Class 3 materials (1" maximum size). Soils classified as GM, GC, SM or SC meets these requirements. Hand tamping or mechanical vibration is required to provide the necessary 95% Standard Proctor Density.
 - 6. Class 4: Fine-grained materials, such as fine sands and soils, containing 50% or more clay or silt. Soils classified as Class 4A (ML or CL) have medium to low plasticity. Soils classified as Class 4B (MH or CH) have high plasticity and are NOT allowed as embedment or backfill materials.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Excavation For Pipeline Trenches:
 - 1. Trenches in which pipe is to be laid shall be excavated in accordance with Section 02300 to the depths shown on the Drawings or as specified by the CCA. Minimum cover for all piping shall be 3 feet.
- B. Pipe Bedding:
 - 1. Pipe bedding material and methods shall be in accordance with the

Trenching and Bedding Detail on Detail Sheet C-10-505 for all site piping.

C. Backfilling Pipeline Trenches:

1. Backfilling of pipeline trenches shall be accomplished with the requirements set forth in Section 02300 and as shown on the Drawings.
2. Before final acceptance, the Contractor will be required to level off all trenches or to bring the trench up to grade. The Contractor shall also remove from roadways, rights-of-way and/or private property all excess earth or other materials resulting from construction.
3. In the event that pavement is not placed immediately following trench backfilling in paved areas, the Contractor shall be responsible for maintaining the trench surface in a level condition at proper pavement grade at all times.
4. Method and type of backfill shall be in accordance with the Standard Details in the Contract Drawings.

++ END OF SECTION ++

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SECTION 02532

SANITARY SEWER MANHOLES, FRAMES, AND COVERS

PART 1 - GENERAL

1.1 SCOPE OF WORK

- A. Provide all labor, materials, equipment and services required for furnishing and installing all manholes and appurtenances specified herein and shown on the Drawings.

1.2 RELATED WORK SPECIFIED ELSEWHERE

- A. Earthwork: Section 02300.
- B. Buried Process Piping Installation: Section 15051.

1.3 SUBMITTALS

- A. Submit manufacturer's data and shop drawings for the materials specified herein. Comply with all requirements of Section 01340.

PART 2 - PRODUCTS

2.1 MANHOLES

- A. Manholes of the form and dimensions shown on the Drawings shall be constructed of ASTM C 478 precast reinforced concrete manhole sections erected on 3,000 psi concrete foundation.
- B. Precast concrete manhole bottom sections may be substituted for "cast-in-place" foundations subject to the Owner's review.
- C. The excavation shall be kept free of water while the manhole is being constructed and the manhole shall not be backfilled until inspected by the CCA.
- D. Standard Manholes:
 - 1. The standard manhole shall be 4' -0" in diameter and not greater than six (6) feet in depth, measured from the top of the cover frame to the invert of the outlet and shall be cone type- top construction as shown on the Drawings.
 - 2. Manholes greater than six (6) feet in depth, measured as above, shall be paid for as a standard six foot manhole, plus the additional vertical depth at the Contract unit price.

E. Shallow Manholes:

1. The shallow manholes shall be five (5) feet or less in depth, measured from the top of the cover frame to the invert of the outlet and shall be of flat top construction as shown on the Drawings.

F. Concrete Manhole Sections:

1. Precast concrete manhole sections (risers and grade rings) shall conform to ASTM C 478.

G. Precast Concrete Eccentric Cones:

1. Precast concrete eccentric cones shall be of the size and shape shown on the Drawings and shall conform to ASTM C 478.

H. Precast Manhole Section Joints:

1. Precast manhole section joints shall be jointed with one of the following products:

ASTM C 443 rubber gaskets
AASHTO M-198-75 preformed flexible butyl type joint sealant
Hamilton-Kent "Kent-Seal No. 2"
K.T. Snyder Co. "Rub'r-Nek"
Press Seal Gasket "E-Z stik"
Concrete Sealants, Inc. "Conseal"

or equal, or jointed with bituminous mastic joint sealing compound. When making joints with mastic compound prime and seal all joints with primer supplied with the joint compound. Manhole section joints shall be watertight. These requirements apply to all joints, including manhole risers, cones, and grade rings.

I. Manhole Inverts:

1. Manhole inverts shall be formed with 3,000 psi concrete. Inverts shall be constructed as shown on the Contract Drawings and shall form a smooth finish. Inverts may be shop fabricated or constructed on site.

J. Manhole Steps:

1. Plastic manhole steps shall be PS1-PF (Press Fit) polypropylene plastic as manufactured by MA Industries, Peachtree City, Georgia or equal. Steps shall be driven into specially sized holes cast into the manhole section. Holes shall be formed in the manhole section using an insert plug that is removed upon curing.
2. Steps shall be aligned vertically above the outlet, in line with the flow through. Step spacing shall be 15".

K. Manhole Frames and Covers:

1. Manhole castings shall consist of cast iron frames with a minimum clear opening of twenty-two (22) inches. Casting shall have a minimum of four (4) bolt holes for the purpose of anchoring the casting to the manhole cone or grade ring.
2. Manhole covers must set neatly in the rings, with contact edges machined for even bearing and tops flush with ring edge. They shall have sufficient corrugations to prevent slipperiness and be marked in large letters, "SANITARY SEWER". The covers shall have two concealed pick holes. Covers on sanitary sewer manholes shall not be perforated.
3. Acceptable manufacturers are J.R. Hoe & Sons, Middlesboro, KY; John Bouchard & Sons Co., Nashville, TN; and Neenah Foundry Company, Neenah, WI., or equal.
4. Where indicated on the Drawings or in the Specifications, Traffic Weight Manhole frames and covers shall be provided. These shall weigh a minimum of 325 pounds.
5. Non-Traffic Weight: Manhole frame and cover weight to be minimum of 250 pounds.

L. Watertight Manhole Covers:

1. Watertight manhole covers shall consist of cast iron frames with machined bearing surfaces, continuous gasket seal preinstalled into slots with dovetail design and shall be of the self-sealing type as manufactured by Neenah Foundry Company or equal. Watertight manhole covers shall have sufficient corrugations to prevent slipperiness and be marked in large letters "SANITARY SEWER". Weight of manhole covers shall be as specified in Paragraph 2.01.K of this specification.

M. Pipe Connections Into Manholes:

1. Sewer pipe shall be sealed in the manhole section pipe openings with a resilient connector meeting the requirements of ASTM C923. Resilient connector shall be A-Lok by A-Lok Products, Inc. or equal.
2. Resilient connector shall be cast integrally into the wall of the manhole section at time of manufacture. There shall be no mortar placed around the connector on the outside of the manhole and no mortar shall be placed around the top half of the connector on the inside of the manhole when completing the invert work.
3. Resilient connectors requiring compression clamps or take up clamps will not be approved.
4. Wherever plastic sewer pipe is to be field grouted into manhole openings, pipe-to-manhole connector seal shall be Fernco Concrete Manhole Adapters manufactured by Fernco, Inc., Division, Michigan, or equal. Adapter shall be mounted on pipe and shall be positioned about the center of the manhole wall.

N. Precast Concrete Manhole Base Sections:

1. Precast concrete manhole base sections, if provided in lieu of cast-in-place foundations, shall be "monolithic", consisting of base slab, and base riser section. Upon review and approval by the Owner and Engineer, precast base sections may include floor invert channel and apron. All precast base sections with pipe openings shall be furnished with ASTM C 923 pipe-to-manhole connector gaskets, as specified hereinbefore. Precast base sections shall be furnished with an integral anti-flotation footing, thickness as specified hereinafter, with 6-inch projection, as shown in the Details. Precast base sections shall be set on a 6-inch deep pad (compacted thickness) of dense graded aggregate, placed to proper elevation and leveled. The Engineer reserves the right to inspect precast manhole base sections at the construction site and to reject the use of such sections if the Engineer determines the products unsuitable for the Owner's installation.
2. Precast concrete manhole base slab thickness shall comply with the following schedule:

0' - 10'	Vertical Height - 6" Slab
10.1' - 15'	Vertical Height - 8" Slab
15.1' - 20'	Vertical Height - 10" Slab
20.1' - 25'	Vertical Height - 12" Slab
25.1' - 30'	Vertical Height - 14" Slab

O. Drop Connections into Manholes

1. Where indicated on the Drawings, drop connections into manholes shall be installed. Drop connections shall be cast-in-place or precast, and shall conform to the requirements shown on the Details.

2.2 COMPRESSION COUPLINGS

- A. When joining different types of pipe together or new pipe to existing pipe, the Contractor shall use Fernco Compression Couplings, or equal, that are resistant to corrosion by soil and sewage and that will provide a permanent watertight joint. The compression coupling shall meet the physical test and joint-leak requirements specified in ASTM C-594. The bands for attaching pipes shall be stainless steel conforming to ASTM C-594. Each coupling shall bear the manufacturer's name and an indication of its size.

PART 3 - EXECUTION

3.1 EXCAVATION FOR MANHOLE INSTALLATION

- A. Unless otherwise directed by the Engineer, excavation in which manholes are to be installed shall be excavated in open cut to the depths required by field conditions or as specified by the Engineer. In general this shall be interpreted to

mean that machine excavation in earth shall not extend below an elevation permitting the manhole to be properly bedded.

- B. Excavation may be undercut to a depth below the required invert elevation that will permit installing the manhole on a bed of granular material to provide continuous support for the manhole base. When this method is used, the bedding shall be as set out in Paragraph 3.02 hereinafter.
- C. Excavations shall be of sufficient dimensions to provide free working space on all sides of the manhole and to permit proper backfilling around the manhole. All excavated materials shall be placed a minimum of two feet (2') back from the edge of the excavation.
- D. The excavation shall be straight and uniform so as to permit installation of the manhole to lines and grades given by the Engineer. It shall be kept free of water during the installation of the manhole and until the manhole has been backfilled. Removal of water shall be at the Contractor's expense. Dry conditions shall be maintained in the excavations until the backfill has been placed. During the excavation, the grade shall be maintained so that it will freely drain and prevent surface water from entering the excavation at all times. When directed by the Owner or the Engineer, temporary drainage ditches shall be installed to intercept or direct surface water which may affect work. All water shall be pumped or drained from the excavation and disposed of in a suitable manner without damage to adjacent property or to other work.

3.2 MANHOLE BEDDING

- A. All manholes shall be supported on a bed of granular material. In no case shall manhole be supported directly on rock. Bedding shall not be a separate pay item unless otherwise set out in the Detailed Specifications. Bedding shall be provided in earth bottom excavations, as well as rock bottom excavations. Bedding material shall be free from rock, foreign material, frozen earth, and be acceptable to the Engineer. Bedding shall be a minimum of 6" below manhole base.
- B. Granular bedding shall be Size #9-m or ASTM C 33, Size #7 crushed stone, fine gravel, or sand, and is not a separate pay item.
- C. Where undercutting and granular bedding is involved it shall be of such depth that the bottom of the manhole will be at least six inches above the bottom of the excavation. Undercutting is not a separate pay item.
- D. In wet, yielding, mucky locations where the manhole is in danger of sinking below grade or floating out of line or grade, or where backfill materials are of such a fluid nature that such movements of the pipe and/or manhole might take place during the placing of the backfill, the pipe and/or manhole must be weighted or secured permanently in place by such means as will prove effective. When

ordered by the Engineer, yielding and mucky materials in subgrades shall be removed below ordinary excavation depth in order to prepare a proper bed for the manhole. Crushed stone or other such granular material, if necessary, as determined by the Engineer to replace poor subgrade material, shall be a separate pay item and classified as "Special Granular Fill". Removal of poor material is not a separate pay item.

3.3 SPECIAL GRANULAR FILL

- A. As noted in Paragraph 3.02D, granular material for "Special Granular Fill" when directed by the Engineer shall be Department of Transportation crushed limestone, Size #9. Payment for "Special Granular Fill" must have approval from the Engineer prior to installation.

3.4 MANHOLE FRAME INSTALLATION

- A. The manhole frame casting shall be centered over the opening in the cone or grade ring of the manhole, with a bituminous mastic joint sealing compound applied between the concrete and the casting.
- B. The frame shall be bolted to the cone or grade ring with wedge anchors.

3.5 TESTING

- A. This specification shall govern the vacuum testing of sanitary sewer manholes and structures and shall be used as a method of determining acceptability by the Owner, in accepting maintenance of a sanitary sewer manhole or structure on behalf of the public. Other forms of testing of some manholes may be required, as deemed necessary by the Owner.
- B. Manholes shall be tested after installation with all connections in place.
 - 1. Lift holes, if any, shall be plugged with an approved, non-shrinkable grout prior to testing.
 - 2. Drop connections shall be installed prior to testing.
 - 3. The vacuum test shall include testing of the seal between the cast iron frame and the concrete cone, slab or grade rings.
 - 4. The manholes shall be backfilled and finished to design grade.
- C. Test Procedure:
 - 1. Temporarily plug, with the plugs being braced to prevent the plugs or pipes from being drawn into the manhole, all pipes entering the manhole at least eight inches into the sewer pipe(s). The plug must be inflated at a location past the manhole/pipe gasket.
 - 2. The test head shall be placed inside the frame at the tope of the manhole and inflated, in accordance with the manufacturer's recommendations.

3. A vacuum of 10" of mercury shall be drawn on the manhole. Shut the valve on the vacuum line to the manhole and disconnect the vacuum line.
4. The pressure gauge shall be liquid filled, having a 3.5 inch diameter face with a reading from zero to thirty inches of mercury.
5. The manhole shall be considered to pass the vacuum test if it holds at least 9 inches of mercury for the following time durations:

Manhole Depth	Time (Minutes)		
	4" Diameter	5' Diameter	6' Diameter
20 Feet or Less	1	2	3
20.1 to 30 Feet	2	3	4

6. If a manhole fails the vacuum test, the manhole shall be repaired with a non-shrinkable grout or other suitable material based on the material of which the manhole is constructed and retested, as stated above.
7. All temporary plugs and braces shall be removed after each test.
Manholes will be accepted as having passed the vacuum test requirements if they meet the criteria stated above.

++ END OF SECTION ++

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SECTION 02630

STORM SEWERS AND DRAINAGE STRUCTURES

PART 1 – GENERAL

1.1 SUMMARY

The CONTRACTOR shall provide for all materials, equipment, tools, supplies, services, and labor necessary to install storm sewers and drainage structures as shown on the plans, project specifications, and contract documents and as may be further set out in any Special Provisions, Addenda, and Change Orders.

1.2 STANDARDS AND SPECIFICATIONS

1.2.1 SD1 Technical Specifications: Although this section has been developed to serve primarily as a stand-alone document, reference is made to other sections of the Sanitation District No. 1 (SD1) Technical Specifications. The ENGINEER or CONTRACTOR of a storm sewer project is responsible for obtaining a current edition of the SD1 Technical Specifications when designing or performing work that either involves SD1 funding or is to be accepted by SD1. Copies of the SD1 Technical Specifications may be obtained from:

Sanitation District No. 1
Capital Improvements Program
1045 Eaton Drive
Ft. Wright, KY 41017

and

<http://www.sd1.org/>

1.2.2 KTC Standard Specifications and Drawings: In this section, reference is made to the current Kentucky Transportation Cabinet (KTC) Standard Specifications for Road and Bridge Construction and the KTC Standard Drawings. In addition, construction requirements and material specifications not specifically covered in this section or in the referenced SD1 Technical Specifications shall conform to KTC Standards. The ENGINEER or CONTRACTOR of a storm sewer project is responsible for obtaining a current edition of the KTC Standard Specifications and the latest edition of the KTC Standard Drawings when designing or performing work that either involves SD1 funding or is to be accepted by SD1.

Copies may be obtained from:

Kentucky Transportation Cabinet
Manager, Policy and Procedures
Development Branch
112 State Office Building
Frankfort, Kentucky 40622

- 1.2.3 Latest Revisions: Wherever reference is made to any published standards, codes or standard specifications, it shall mean the latest standard code, specification or tentative specification of the technical society, organization or body to which reference is made. Where specified articles, sections, paragraphs or other subdivisions of the referenced publications are not stated, the referenced publication shall apply in full.

1.3 SUBMITTALS

- 1.3.1 For projects that are approved and funded, designed, or bid by SD1, submittals shall be required as follows:

A. Product Data: For the following:

- Pipe and fittings.
- Precast concrete manholes and drainage structures.
- Structure frames and grates.
- Any other items as requested by the ENGINEER or SD1.

B. Shop Drawings: For the following:

- Manholes: Include plans, elevations, sections, details, and frames and covers.
- Drainage Structures: Include plans, elevations, sections, details, and frames, covers, and grates.
- Cast-in-place and Precast Structures: Include plans, elevations, reinforcing, concrete mix design, and structural calculations stamped by a Professional Engineer, registered in the State of Kentucky, competent in structural design.
- Pipe material and layout for prefabricated sections
- Any other items as requested by the ENGINEER or SD1.

C. Test Reports: The CONTRACTOR shall submit test reports for materials supplied to SD1 whenever SD1 has not received certified letters from suppliers that materials meet the applicable specifications called for, or there is visible evidence on the work site that the materials do not conform to the applicable specifications. These tests would include any concrete tests and soil tests performed for the project.

- 1.3.2 For privately-funded storm sewer projects that include components to be dedicated to SD1 or another public entity, submittals shall be provided at the request of the ENGINEER or SD1.

1.4 UNDERGROUND STRUCTURES AND UTILITIES

- 1.4.1 The CONTRACTOR shall verify the locations of all underground structures and utilities prior to the start of construction. The CONTRACTOR shall avoid damaging existing utilities while verifying their locations. The CONTRACTOR shall notify the Kentucky Underground Utility Protection, Inc. at 1-800-752-6007, SD1, the Northern Kentucky Water District (Campbell and Kenton Counties), and/or Boone County Water District (Boone County) 48 hours in advance of any construction.
- 1.4.2 The CONTRACTOR shall be responsible for the protection of any structure or utility encountered on the site. The cost of repair, removal, replacement, relocation, etc. of such facilities arising because of carelessness or negligence on the part of the CONTRACTOR shall be the CONTRACTOR'S responsibility. The CONTRACTOR shall make every effort to protect private structures and utility service connections whether in right-of-way/easement or on private property, including sanitary and storm sewer facilities.
- 1.4.3 Should uncharted or incorrectly charted utilities be encountered, consult SD1 and the Utility Owner for directions. It shall be the sole responsibility of the CONTRACTOR to meet the requirements of the respective utility.

PART 2 – STORM SEWER PIPE

2.1 MATERIALS

Storm sewer pipe shall be as specified on the approved design plans. Design Engineer may select the following material types described in this section. Any pipe that is found defective, or otherwise not meeting the Specifications, shall be rejected and replaced by pipe meeting these Specifications at no cost to SD1. The CONTRACTOR shall furnish one copy of the supplier's certification stating that pipe materials were manufactured, sampled, tested and inspected in accordance with the applicable standards and specifications.

- 2.1.1 Reinforced Concrete Pipe (RCP): Circular RCP shall meet the requirements of ASTM C 76, Standard Specification for Reinforced Concrete Culvert, Storm Drain and Storm Pipe. Elliptical RCP shall meet the requirements of ASTM C 507, Standard Specification for Reinforced Concrete Elliptical Culvert, Storm Drain and Sewer Pipe.

Rubber and plastic joints, or approved equal, shall be the jointing method for RCP and shall meet the requirements of AASHTO M 315/ASTM C 443. Other methods of joining RCP will only be allowed upon explicit approval from SD1.

Minimum Class III RCP shall be required beneath all street pavements or driveways.

- 2.1.2 Corrugated Metal Pipe (CMP): Corrugated steel pipe shall meet the requirements of AASHTO M36. Corrosion protection shall be provided through an aluminized coating conforming to AASHTO M274. Aluminum alloy spiral pipe shall meet the requirements of AASHTO M196. Coating materials shall be evaluated on a per project basis.

Joints for CMP shall be made using coupling bands and gaskets meeting the requirements of AASHTO M 36 and AASHTO M 274.

2.1.3 Polyvinyl Chloride (PVC) Pipe: The following PVC pipe types are permitted in storm sewer applications:

- A. Smooth-Wall: PVC pipe meeting the requirements of ASTM D 3034, Standard Specification for Type PSM Polyvinyl Chloride (PVC) Sewer Pipe and Fittings. Unless shown otherwise on the Plans or in the Contract, SDR 35 pipe shall be required.
- B. Large Diameter: PVC pipe meeting the requirements of ASTM F 679, Standard Specification for Polyvinyl Chloride (PVC) Large Diameter Plastic Gravity Sewer Pipe and Fittings. Unless shown otherwise on the Plans or in the Contract, SDR 35 shall be required.
- C. Profile-Wall: PVC open or closed profile pipe meeting the requirements of ASTM F 794, Standard Specification for Polyvinyl Chloride (PVC) Profile Gravity Sewer Pipe and Fittings Based on Controlled Inside Diameter.
- D. Corrugated: Corrugated PVC pipe meeting the requirements of ASTM F 949, Latest Revision, "Polyvinyl Chloride (PVC) Corrugated Sewer Pipe with a Smooth Interior and Fittings".

Joints for PVC pipe shall be gasket, bell and spigot, push-on types which meet the requirements of ASTM D 3212, Standard Specification for Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals. Gaskets shall meet the requirements of ASTM F 477, Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe.

2.1.4 High Density Polyethylene (HDPE) Corrugated Pipe: Corrugated polyethylene pipe with an integrally formed smooth interior shall meet the requirements of AASHTO M 294, Standard Specification for Corrugated Polyethylene Pipe, 12 to 48 inch diameter, for Type S pipe, only for installations approved by SD1.

HDPE pipe shall be joined using an inline bell (IB) & spigot joint meeting AASHTO M252, AASHTO M294 or ASTM F2306. The joint shall be soil-tight and gaskets shall meet the requirements of ASTM F477.

Installation of HDPE pipe, regardless of diameter, shall follow the requirements of ASTM D2321, Standard Practice for Underground Installation of Thermoplastic Pipe. For installations of HDPE pipe 30 inches or greater in diameter, full time inspection will be required during the bedding and backfill operations.

2.2 DESIGN REQUIREMENTS

Pipe selected shall be designed for the cover and loading requirements to each project. Design calculations for pipe wall thickness and structural design shall be provided by the ENGINEER, during the plan review process as requested by SD1. Engineer shall consider depth of burial, soil

modulus of in situ material, type of in situ material in which the pipe is installed, bedding material required, etc when submitting calculations. A minimum vertical separation of 18 inches shall be required between storm pipes, sanitary pipes and water pipes, unless specifically waived by SD1. Minimum cover for all pipe types shall be 3 feet unless specifically waived by SD1. For PVC SDR 35 pipe, the maximum cover depth shall be 20 feet.

PART 3 – DRAINAGE STRUCTURES

3.1 GENERAL

- 3.1.1 Concrete for all cast-in-place storm drainage structures (including channels and benches) shall conform to Section 03300 of the SD1 Technical Specifications. Per that specification, the concrete design mix shall have a minimum 28-day compressive strength of 4,000 psi, a minimum slump of 1 inch and a maximum slump of 6 inches.
- 3.1.2 Grout shall consist of a mixture of water and cement or cement with fly ash, one part cement or cement with fly ash to two parts mortar sand as defined in Section 601.03.03B of the KTC Standard Specifications, by volume.
- 3.1.3 Non-shrink grout shall be an approved non-shrink, non-staining grout consisting of either a mixture of hydraulic cement, water, fine aggregate, and an approved nonferrous expansive admixture, or a packaged commercial product and shall meet the requirements of Section 601.03.03B of the KTC Standard Specifications.

3.2 MANHOLES AND STRUCTURES

- 3.2.1 Precast storm drainage structures with knockout panels shall only be used for catch basins and can be no greater than 6 feet in depth, unless load calculations are supplied. For precast rectangular structures (other than those with knockout panels), at least 6 inches of wall (measured from the interior corner) is required on each side of the pipe beyond the precast opening for the pipe. This rule is not applicable for structures which have pipe installed in opposite walls or where one outlet RCP is utilized.
- 3.2.2 Steps shall be provided when structure is greater than 4 feet in depth and shall be Neenah R1982-J or an approved equal. Manhole and catchbasin steps shall be cast, epoxy grouted, or attached by mechanical means into the walls of the manholes in such manner as to conform with ASTM C 478. No steps shall be aligned over the flow channel. Step spacing shall be 12 inches. Omit steps for structures less than 4 feet deep unless otherwise shown on the plans.
- 3.2.3 Castings for storm sewer manholes and drainage structures shall be heavy duty ductile iron conforming to ASTM A 536, Grade 60-40-18. Manhole frames and covers shall be Neenah R1642 with the words “Storm Sewer” cast into the lids, or an approved equal, unless shown otherwise on the project plans. Catch basins and other structure castings shall be as specified on the standard details or project plans.

- 3.2.4 Round precast structures shall conform to ASTM C 478; square and rectangular precast structures shall meet the requirements of ASTM C 913. Structural calculations shall be provided for all precast structures. Benching is required in the bottom of all drainage structures (catch basins, manholes) per SD1 standard details.

All inlets shall conform to the appropriate Standard Drawings No. STM-08 through STM-11. Precast manholes shall conform to SD1's Standard Specifications, Section 02606. All cone and transition sections shall be concentric in shape unless that requirement is specifically waived by SD1. Joints between precast manhole sections shall be sealed with either rigid mortar or wrapped in filter fabric from the exterior to provide a silt-tight connection between precast manhole sections. Base and riser sections shall be custom-made with openings to meet indicated pipe alignment conditions. The minimum distance allowed between precast holes, measured from edge to edge, in a manhole section shall be 12 inches. The maximum inside diameter (or horizontal dimension) of pipe to be used with a given size of manhole shall be as specified on SD1 standard drawing STM-13.

- 3.2.5 For precast structures with openings cast into the unit, the minimum vertical distance from the pipe openings to the top of the structure or segment wall shall be 12 inches. If this distance is less than 12 inches, then additional reinforcing steel shall be furnished for this section. The top slab must be designed for HS-20 loading.
- 3.2.6 Grading rings shall be used for all precast and masonry manholes to adjust height of manhole frame casting where required.
1. Grade rings shall be a maximum of 10 inches in height, constructed on the roof slab or cone section on which the manhole frame and cover shall be placed.
 2. The height of the grade ring shall be such as is necessary to bring the manhole frame to the proper grade.
 3. One piece precast concrete rings shall be used for grade adjustment greater than 6 inches and up to 10 inches in height. Rings shall be set concentrically on top of the cone section or top slab if used.
 4. High density polyethylene risers shall be used for grade adjustment from 2 inches to a maximum of 6 inches in height. Rings shall be set concentrically on top of the cone section or top slab if used.
 5. The rings shall be set in a bed of butyl rubber sealant and this joint shall be pointed with cement mortar to a smooth finish unless a second row of sealant is installed.
 6. Polyethylene grade rings shall be sealed using two rows of butyl rubber sealant.
- 3.2.7 Cast-in-place benches shall be of 4,000 psi concrete as described in 3.1.1 and shall conform to the shapes indicated on the Plans, SD1 Standard Drawings, or as otherwise directed. The invert channels shall be so constructed as to cause the least possible resistance to flow. The shapes of the invert channels shall conform uniformly to inlet and outlet pipes. Smooth and uniform finishes will be required. Inverts may also be precast into the structure.

3.3 HEADWALLS AND OUTFALLS

- 3.3.1 Headwalls and outfalls shall be constructed of either cast-in-place or precast reinforced concrete that conforms to KTC Standard Specifications for Road and Bridge Construction.
- 3.3.2 Safety guards and railings: Safety guards and railings shall be provided along the top and sloped/winged sidewalls on all headwall inlet and outlet structures having a vertical drop of 4 feet-0 inches or greater. Such guards or railings shall be at least 42 inches in height measured vertically above the wall. Guards or railings shall not have an ornamental pattern that would provide a ladder effect. Vinyl coated chain link fencing is an acceptable guard type.
- 3.3.3 Grates: Grates shall be provided on inlet headwalls for all pipes 24 inches and less and, as deemed necessary by SD1, where the downstream pipe system poses a potential safety hazard such as pipe size, bends, etc. Cases for pipes larger than 24 inches that would require a grated headwall include, but are not limited to, a propensity for debris to enter the sewer and become lodged, considerable length, drop structures or bends in the pipe run, etc.

3.4 CONNECTIONS

- 3.4.1 Flexible connections at manholes shall be used and shall be elastomeric gaskets or couplings, manufactured in accordance with ASTM C 1478, Standard Specification for Storm Drain Resilient Connectors Between Reinforced Concrete Structures, Pipes, and Laterals, for pipes less than or equal to 48 inches in diameter. Connections for pipes larger than 48 inches shall be designed on a case-by-case basis. In these cases, either a flexible connection or hydrophilic sealant and Okum rope with the pipe grouted in place may be used to create the connection.
- 3.4.2 For precast catch basins (other than those with knockout panels), the opening around the pipe shall either be filled with non-shrink grout for the wall thickness of the structure or the pipe shall be encased with minimum 6-inch collar of concrete from the inside face of the wall to 1 foot-0 inches outside the outer face of the wall. The pipe shall be adequately supported to prevent settling while the grout or the concrete encasement is curing. The inside faces of the structure walls shall be finished with a trowel. The opening shall be no more than 3 inches greater than the outside diameter of the pipe.
- 3.4.3 For precast structures with knockout panels, holes for the pipes shall not be cut into the structural members (i.e., top beams and corner columns) and non-shrink grout shall not be allowed to be placed around the pipes. The pipes shall be encased with a minimum 6 inch concrete collar around the outside of pipe or a minimum of 3 inches beyond the hole knocked in the wall, whichever is greater. Also, the concrete encasement shall extend from the inside face of the wall to 1 foot-0 inches outside the outer face of the wall.

PART 4 – EXCAVATION AND BACKFILL

4.1 MATERIALS

- 4.1.1 Bedding: Pipe bedding shall be clean natural or washed sand and gravel, crushed gravel or crushed stone, free from cementitious substances and flat or flaky particles in an amount to cause caking, packing, yielding or uneven support for the pipe. Lime sand will not be acceptable. All material shall be of such sizes that 100% passes the 1½-inch screen, 40% or less passes the No. 40 sieve, and 10% or less passes the No. 200 sieve. Bedding material shall not consist of any organic soil or stone larger than 1½ inch in any dimension.
- 4.1.2 Select Fill: Select fill shall be well graded sand and gravel, free from organic matter. Not more than 70% by weight shall pass through a No. 40 sieve; not more than 10% by weight shall pass through a No. 200 sieve; and 100% shall pass through a 3-inch square sieve. See SD1 technical specification 02220 for further requirements of Select Fill.
- 4.1.3 General Backfill: General backfill shall be soil materials that are free of rock thicker than 6 inches or larger than 24 inches maximum in any dimension, debris, waste, frozen materials, vegetation and other organic matter and other deleterious materials. Previously excavated materials meeting these requirements may be used for backfill. All rock shall be excluded from fill within 24 inches of the pipe. If the excavated trench material does not meet these requirements, this material shall be wasted and suitable imported material shall be used for backfill.
- 4.1.4 Rip Rap / Channel Lining: Cyclopean stone rip rap, channel lining, Class II and Class III, per the requirements of the “Slope Lining and Channel Protection” section contained in the KTC Standard Specifications for Road and Bridge Construction shall be used. Installation of riprap or other channel lining systems shall conform to the “Slope Lining and Channel Protection” section contained in the “Kentucky Transportation Cabinet, Standard Specifications for Road and Bridge Construction,” current edition.
- 4.1.5 Control Density Fill (CDF): Control Density Fill shall be used where shown on the drawings or as directed by SD1. CDF materials shall conform to Section 02220 of the SD1 Technical Specifications. Per that specification, CDF shall achieve an initial traffic bearing strength within four hours of placement and an ultimate strength of between 50 and 100 psi.

4.2 EXCAVATION

- 4.2.1 The CONTRACTOR shall perform all excavation, necessary or required, for the construction of the storm sewers and drainage structures. The excavation shall include the removal of all materials of whatever nature encountered and disposal of unsuitable material, including water and all obstructions that would interfere with the proper construction and completion of the storm sewers and drainage structures.

4.2.2 Excavation shall include the removal and subsequent handling of all materials required and disposal of unsuitable material for the installation of the sewer. This includes, but is not limited to, earth, loose rock, gravel, shale, layered rock, monolithic rock, vegetation, debris, junk, brick, stone and other foreign matter encountered within the excavation, and soils of any moisture content as encountered. Excavation operations shall conform to all safety standards set by the Occupational Safety and Health Administration (OSHA). An experienced supervisor representing the CONTRACTOR shall be onsite during all excavation and trenching operations.

4.2.3 Any required blasting shall be performed in accordance with Section 02222 of the SD1 Technical Specifications.

4.3 TRENCHING

4.3.1 Trench construction shall be per SD1 pipe bedding and trench condition details (same as KTC requirements) and ASTM D2321 for thermoplastic pipe as follows:

- A. No more than 200 feet of trench may be opened in advance of pipe laying.
- B. Trench width shall be minimized to greatest extent practical but shall conform to the following:
 - 1. Sufficient to provide room for installing, jointing and inspecting piping, but a minimum of pipe barrel OD plus 2 feet for 36-inches and less diameter pipe. For pipe that is greater than 36-inches in diameter, the trench width shall be the OD of the pipe plus 4 feet.
 - 2. Enlargements at pipe joints may be made if required and approved by SD1.
 - 3. Sufficient for shoring and bracing, or shielding and dewatering.
 - 4. Sufficient to allow thorough compaction of bedding material adjacent to bottom half of pipe.
 - 5. Do not use excavating or compaction equipment which requires the trench to be excavated to excessive widths.
- B. Depth of trench shall be as shown on the plans. If required and approved by SD1, depths may be revised.
- C. Where pipe is installed in a trench excavation, pipe bedding shall be carefully placed and compacted over the full trench width before the pipe is laid. Depth of pipe bedding below the pipe shall be at least 6 inches but not more than 8 inches. After laying pipe, the balance of the backfill shall be placed as described herein.
- D. Excavate for pipe bells in bedding carefully so as not to disturb the surrounding compacted material and lay pipe so that the bell bears uniformly on the compacted trench bedding material below the pipe.
- E. Place all bedding and backfilling in pipe trenches in horizontal layers not exceeding 6 inches in depth up to a point 12 inches or more above the top of the pipe and thoroughly compact each layer before the next layer is placed. Bedding material shall be sliced or worked in along the length of the pipeline during each 6-inch layer lift and then

compacted.

- G. No pipe shall be brought into position until the preceding length has been bedded and secured in its final position.

4.3.2 If the CONTRACTOR undercuts the trench bottom as described above more than 8 inches, the undercuts shall be backfilled with compacted bedding material.

4.4 STRUCTURES

4.4.1 The excavation for storm sewer manholes and other structures shall be of the width necessary to provide a minimum clearance of 12 inches from the outside of the structure to the sides of the excavation to provide proper working space and maintain natural stability of the sides of the excavation.

4.4.2 The excavation bottom for manholes and other structures shall extend to a point that undercuts the structure not less than 6 inches, nor more than 8 inches, below the entire base section. The undercut shall be backfilled bank to bank with bedding material and leveled to evenly support the manhole in plumb with no settling.

4.4.3 Bottom slabs or foundation footings may be poured against vertical sides of the excavation, thereby eliminating the need for form work for these items, unless the sides of the excavation will not stand almost vertical, in which case a form shall be required.

4.4.4 If the CONTRACTOR undercuts the excavation below the bottom of manholes and other structures more than 8 inches, other than when directed by SD1, the CONTRACTOR shall refill the undercut with compacted bedding material or other suitable fill material as approved by SD1 and consolidate suitable fill material to a density equal to the original in-site material. Any costs incurred in refilling unauthorized undercuts shall be borne by the CONTRACTOR. The cost for this work shall be considered incidental to the unit price for structure installation.

4.4.5 CONTRACTOR shall be required to compact bedding material around the entire circumference of the manhole and manhole excavation area to at least 12 inches above the highest incoming or outgoing pipe.

4.5 UNSTABLE SOIL AND DEWATERING

4.5.1 If in the course of excavation, unstable soil is encountered at the point of the bottom of the required excavation, the CONTRACTOR shall be required to undercut sufficiently to remove all the unstable soil to the limits specified and approved in writing by SD1 and in conjunction with a Geotechnical report.

4.5.2 The CONTRACTOR shall refill the undercuts with bedding material or other suitable fill material as approved by SD1 and consolidate same to the required density of the material, unless other means of refill are specified or ordered by the District. CONTRACTOR is to provide reports from a qualified Geotechnical Engineering Firm indicating compliance with the required compaction limits. Any costs incurred in refilling authorized undercuts

in unstable soil shall be reimbursable to the CONTRACTOR on the basis of extra work or as otherwise set forth in the contract.

4.5.3 Ground Water: Pipe trenches and structure excavations shall be kept free from water during trench bottom preparation, pipe laying and jointing, pipe embedment and manhole installation as approved by a SD1 inspector or an authorized agent of SD1.

4.5.4 Where the trench or excavation bottom is saturated or otherwise unstable because of ground water, or where the ground water elevation is above the bottom of the trench or excavation, the ground water shall be lowered by means acceptable to SD1 to the extent necessary to keep the trench or excavation free from water while construction is in progress. The discharge of ground water from the trench or excavation area shall be to natural drainage channels, gutters, drains, or storm sewers which will conduct the water away from the trench or excavation area. CONTRACTOR shall divert surface water away from the trench or excavation area in a manner acceptable to SD1; surface water shall be prevented from entering the trench or excavation area.

4.6 BACKFILL AND COMPACTION

4.6.1 Backfill Placement: Backfill shall be placed in horizontal loose lifts not exceeding 8-12 inches in thickness and shall be mixed and spread in a manner assuring uniform lift thickness.

4.6.2 Compaction requirements are as follows:

A. Select Fill and Pipe Bedding: For fill and bedding beneath structures and foundations, compact granular materials that exhibit a well-defined moisture density curve to at least 98% of the standard proctor maximum dry density (ASTM D698). For all other fill and bedding, compact granular materials that exhibit a well-defined moisture-density curve to at least 95% (ASTM D698). Moisture-condition fill materials to within a range of 2% below to 3% above optimum moisture content (ASTM D698). Compact granular materials that do not exhibit a well-defined moisture-density curve to at least 85% relative density (ASTM D4253 and D4254) beneath structures and foundations, and to at least 75% relative density (ASTM D4253 and D4254) for all other areas.

B. General Backfill: Compact materials that exhibit a well-defined moisture density curve to at least 98% of the standard proctor maximum dry density (ASTM D698) beneath structures, foundations and the top 1 foot below pavements, and at least 95% (ASTM D698) in all other areas. Moisture-condition fill materials to within a range of 2 % below to 3% above optimum moisture content (ASTM D698). Compact granular or rock materials that do not exhibit a well-defined moisture-density curve to at least 85% relative density (ASTM D4253 and D4254) beneath structures and foundations, and to at least 75% relative density (ASTM D4253 and D4254) for all other areas.

1. After the pipe sections have been embedded up to a point 12 inches or more above the top of the pipe, the pipe sections have been encased in concrete, or the structures or appurtenances have been constructed, as specified on the drawings, in non-ROW areas, the remainder of the trench or excavated area shall be backfilled using trench or structure excavated material if it meets the requirements set forth under 4.1.3

Excavation and Backfill: General Backfill. If the material does not meet these requirements, the trench or structure excavated material shall be wasted and suitable imported material shall be used for backfill.

2. Backfill shall be placed in horizontal loose lifts not exceeding 8-12 inches in thickness and shall be mixed and spread in a manner assuring uniform lift thickness after placing. Backfill shall then be compacted as specified under 4.6.2 *Compaction Requirements* up to existing ground level or finished grade level if same has been established.

4.6.3 Rock Backfill

- A. Where the trench is located in areas from which rock had to be excavated in a quantity other than isolated stones, the excavated rock may be used as part of the backfill above a point 2 feet or more above the top of the pipe, or above a point 1 foot above pipe encasement, but shall not be used under pavement areas, unless specifically authorized by the ENGINEER.
- B. The rock fragments used in the backfill shall not exceed rock thicker than 6 inches or larger than 24-inches maximum in any dimension, shall not be dropped into the trench directly over the pipe centerline and shall be used with sufficient smaller dimensioned material so that voids between larger fragments shall be filled. Compaction shall meet the requirements specified under 3.11 *Compaction Specifications* up to existing ground level or finished grade level if same has been established.
- C. Rock shall not be used in the top 12 inches of the backfill, except across creeks, gullies, ravines or areas designated by the ENGINEER, where the rock may be used to the existing ground level as specified on the drawings.

4.6.4 Backfill in ROW Areas

- A. For storm sewers and structures located within the public ROW, refer to local subdivision regulations for backfill material requirements.

4.6.5 If the specified densities are not obtained because of improper control of placement or compaction procedures, or because of inadequate or improperly functioning compaction equipment, or because of soil moisture content, the CONTRACTOR shall perform whatever work is required to provide the required densities. This work shall include complete removal of unacceptable bedding, backfill or fill areas, and replacement and recompaction until acceptable densities are provided.

4.6.6 The CONTRACTOR shall repair, at no additional cost to SD1, any settlement that occurs within the construction area for one year following the completion of the work. The CONTRACTOR shall make all repairs and replacements necessary within 30 days after notice from SD1.

4.6.7 Any methods of backfilling other than the above shall not be used unless special instructions have been issued by SD1 calling for other methods. Water flooding or jetting shall not be used in any instance. Water shall only be used in minor quantities to improve

compaction qualities of backfill materials when so ordered by the Geotechnical Engineer.

- 4.6.8 In all methods of backfilling that are used, no backfill material shall be dumped into the trench, or allowed to fall directly on the sewer centerline when the previously deposited bedding cover is less than two feet above the top of the pipe. All backfill material shall be slowly shoved or "rolled" into the trench.

PART 5 – EXECUTION

5.1 CLEARING AND GRUBBING

- 5.1.1 The CONTRACTOR shall clear the area within the limits of the sewer easement that is necessary to construct the sewer, including but not limited to brush, hedges and trees (unless designated as not to be disturbed on the plans or by direction of SD1), stumps, logs and loose or projecting material so as to allow the construction work to be completed. The cleared debris shall be removed and legally disposed of off-site unless otherwise approved by SD1 in writing.
- 5.1.2 All existing fencing and retaining walls shall be temporarily removed where crossing the sewer easement, and shall be completely restored to a preconstruction condition after construction work has been completed. Materials used shall be equal to or better than the original materials in the existing fences or retaining walls. The cost for such restoration shall be considered incidental to pipe construction unless otherwise stated in the contract.
- 5.1.3 A surveyor licensed in the state of Kentucky must put any and all survey monumentation encountered and removed during the course of construction back in its original location at the completion of construction. Any dedication of said established monuments that are disturbed during construction shall be the sole responsibility of the CONTRACTOR.
- 5.1.4 Temporary closures shall be erected, maintained and removed at the completion of construction where livestock are in evidence or where directed by SD1. Trees designated as not to be disturbed shall be protected from harm by machinery, materials or the construction work.

5.2 PIPE INSTALLATION

- 5.2.1 Install piping, beginning at the farthest downstream structure and consistent with the approved plans, true to grades and alignment indicated with unbroken continuity of invert. Place bell ends of piping facing upstream. Install gaskets, seals, sleeves, and couplings according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements. Maintain swab or drag in line and pull past each joint as it is completed.
- 5.2.2 Install piping at constant slope between points and elevations indicated. The CONTRACTOR shall use laser beam alignment or other suitable methods and equipment to determine the exact position of each pipe section at the bottom of the trench. No pipe sections shall be disturbed in any manner after being laid and joints made. As the pipe

sections are laid and joined, the interior of the pipe shall be cleaned of all dirt and foreign matter (water shall be excluded). Pipe laying shall not be performed in severe cold or wet weather.

- 5.2.3 At the end of any work or whenever pipe laying ceases, the end of the pipe shall be closed with a suitable close fitting stopper. All pipe ends, branch connections and leads not to be used immediately or connected to other facilities or structures shall be closed with a stopper or bulkhead and sealed in a manner as the pipe joints, unless otherwise called for.

5.3 STRUCTURE INSTALLATION

- 5.3.1 Manholes shall be neatly and accurately built in accordance with the Plans and SD1 Standard Drawings. When the manhole base slab will consist of cast-in-place concrete on an existing storm sewer line, the pipe and the lower precast barrel section shall be in place and supported by concrete blocks prior to placing concrete for the base. Inlets, catch basins, drains, junction structures, and other drainage structures shall be neatly and accurately built in accordance with the plans or SD1 Standard Drawings. The structure shall be either of cast-in-place concrete or precast concrete. Precast manhole or structure sections shall be installed in accordance with ASTM C 891.
- 5.3.2 All cast-in-place structures shall be built using 4,000 psi concrete as described in 3.1.1. The structures shall be built on prepared foundations and conform to the dimensions and shapes shown on the Plans and SD1 Standard Drawings. The construction shall conform to the methods, forms, placement, protection, and curing for concrete as specified in accordance with KTC and SD1 Standards. Any required reinforcement shall conform to the Plans and SD1's Standard Drawings. Installed concrete reinforcing shall be inspected and approved by SD1 before any concrete is placed.
- 5.3.3 Headwalls and outfalls shall be constructed of either cast-in-place or precast reinforced concrete in conformance with SD1's Standard Drawings and KTC Standard Specifications for Road and Bridge Construction.
- 5.3.4 Connections for inlet and outlet pipes shall conform to the sizes, alignments, and elevations shown on the Plans. Inlet and outlet pipes shall be cut-off flush with the inside surfaces of the wall. Pipe bells shall not be allowed inside the structure wall. The pipes shall intersect at the structure so that the invert bench between the inlet and outlet pipes can be smoothly formed. No hammer modifications are allowed to precast structures. Neat saw cuts or core drilling shall be utilized when modifying an existing structure.

5.4 PIPE / STRUCTURE ABANDONMENT

- 5.4.1 Pipe and structure abandonment under roadways shall consist of completely filling the designated pipes with controlled density fill (CDF), grout or other approved materials. Appreciable deposits of debris shall be removed from other structures prior to placement of CDF, grout or other approved materials. Inlets / outlets shall be plugged by use of bulkheads containing small openings at the tops through which the fill may be pumped at a minimum pressure of 15 pounds per square inch. Bulkheads shall be 12-inch thick,

brick masonry or concrete construction, threaded metal caps, plastic plugs, or other acceptable methods suitable for the size and type of material being closed. Do not use wood plugs. Pipes and structure under roadways shall be filled completely.

- 5.4.2 Structure abandonment shall be per SD1 standard drawings and consist of removing structure frames, covers, grates, and similar items. All connecting pipes shall be bulkheaded. The walls shall be lowered to 2 feet below final grade if in earth or to 12 inches below subgrade if in pavement. The remaining structure shall be filled with crushed stone or sand.

5.5 STORM SEWER PIPE TESTING

- 5.5.1 Pipe shall be fully backfilled and compacted at least 30 days prior to testing.
- 5.5.2 Deflection: The CONTRACTOR shall test all flexible storm sewer piping by use of a calibrated mandrel, or other device/method approved by SD1, to ensure that no pipe deflection has occurred greater than 5% of the inside diameter of the pipe. The CONTRACTOR shall test the entire length of the sewer installed. Any pipe section exhibiting greater than 5% deflection shall be repaired in a manner approved and acceptable to SD1 and retested, at no additional cost to SD1. If the repair method is not acceptable to SD1 and the pipe fails a second deflection test, the pipe shall be replaced and retested at no additional cost to SD1.
- 5.5.3 Displacement: Storm sewer pipe sections may be checked by SD1 to determine if any displacement of the pipe sections from alignment and grade has occurred as each portion of the sewer is completed between structure locations. When the test is performed, it shall be as follows:
- A. Flashing a light beam by means of a strong flashlight or reflecting sunlight through the portion of the sewer between structure locations or by utilizing a laser beam.
 - B. When viewed from the opposite end of the portion of the sewer from the light location, the light beam should be full throughout the sections, but not less than two-thirds full under any circumstances. There shall be no "dips" in the grade of the pipe invert.
 - C. If the pipe sections show any misalignment, displacement or any other defects in the sections or joints, the CONTRACTOR shall remedy the defect, at the CONTRACTOR'S sole cost, to the satisfaction of SD1.
 - D. The test shall be conducted after the final backfill has been in place at least 30 days.
- 5.5.4 Rigid pipe may be inspected at SD1's discretion and cost. If defects are identified, the pipe shall be repaired or replaced by the CONTRACTOR, at the CONTRACTOR'S sole cost, to the satisfaction of SD1.

5.6 LANDSCAPING / RESTORATION

5.6.1 Landscaping / restoration shall be performed in accordance with Section 02900 of the SD1 Technical Specifications.

5.7 ENVIRONMENTAL AND EROSION/SEDIMENT CONTROLS

5.7.1 Environmental and erosion/sediment controls shall be performed in accordance with the Regional Stormwater Management Program and SD1 Technical Specifications.

++ END OF SECTION ++

SECTION 02700

ASPHALTIC CONCRETE PAVING

PART 1 - GENERAL

1.1 SCOPE OF WORK

- A. The asphalt concrete paving replacement work includes the construction of an aggregate base course, asphalt binder and wearing courses to match existing courses and as specified herein. This work is to replace paving disturbed by the construction and any damages to paving by Contractor's operations, as well as new pavement and driveways, within the limits shown on the plans.

1.2 RELATED WORK SPECIFIED ELSEWHERE

- A. Earthwork: Section 02300

1.3 APPLICABLE STANDARDS

- A. All references in this section to the standard specifications shall refer to the most recent Edition of Standard Specifications for Road and Bridge Construction with all amendments thereto as published by the Kentucky Transportation Cabinet.

1.4 ENVIRONMENTAL REQUIREMENTS

- A. Weather Limitations: Apply prime and tack coats only when ambient air temperature is above 50 degrees F., and when temperature has not been below 35° for 12 hours immediately prior to application. Do not apply when base is wet or contains an excess of moisture.
- B. Construct asphalt concrete surface courses only when ambient air temperature is above 40°F., and when base is dry. Aggregate base course may be placed when air temperature is above 35°F. and rising.
- C. Grade Control: Establish and maintain required lines and elevations.

1.5 QUALITY ASSURANCE

- A. Hot Mix Asphalt Producer Qualifications: Engage a firm experienced in producing hot-mix asphalt similar to that indicated for this Project and with a record of successful in-service performance.
- B. Producer firms shall be qualified through the Kentucky Transportation Cabinet as an approved Asphalt Mix Producing Firm.

- C. Testing and inspection: The Owner shall retain a qualified testing laboratory for testing and inspection.

PART 2 - PRODUCTS

2.1 AGGREGATES

- A. General: Use materials and gradations that have performed satisfactorily in previous installations.
- B. Aggregate Base Course: Dense Graded Aggregate Base (DGA) complying with Section 302 and 805 of the current Kentucky Transportation Cabinet Standard Specifications.
- C. Coarse Aggregate: Sound, angular crushed stone, or crushed gravel, complying with the current Kentucky Transportation Cabinet Standard Specification Section 805.
- D. Fine Aggregate: Natural sand or sand prepared from stone, gravel, properly cured blast-furnace slag, or combinations thereof complying with the current Kentucky Transportation Cabinet Standard Specification Section 804.
- E. Recycled (Reclaimed) Asphalt Pavement (RAP): milled or removed asphalt pavement may be utilized in accordance with the current Kentucky Transportation Cabinet Standard Specification Section 409.

2.2 ASPHALT MATERIALS

- A. Asphalt Binder: AASHTO MP 1, Performance Graded Binder PG 64-22 for general applications.
- B. Tack Coat: Comply with provisions in the current Kentucky Transportation Cabinet Standard Specification Section 406

2.3 MIXES

- A. Hot-Mix Asphalt: Hot-laid, hot-mix asphalt plant mixes meeting the requirements of the Standard Specifications of the Kentucky Transportation Cabinet (KTC) or Asphalt Institute (AI) MS-2 and complying with the following requirements:
 1. Base Course: Produce KTC mixture designation Class 2 Base. There shall be no restrictions on polish resistant aggregates (utilize KTC Type "D" aggregates). Recycled Asphalt Pavement (RAP) may be utilized in accordance with Standard Specifications Section 409.
 2. Surface Course: KTC mixture designation Class 2 Surface. The mixture gradation may pass through the restricted zone and there shall be no

restriction on polish resistant aggregates (utilize KTC Type “D” aggregates). Recycled Asphalt Pavement (RAP) may be utilized in accordance with Standard Specifications Section 409.

- B. Hot-Mix Asphalt: Hot-laid, hot-mix asphalt plant mixes designed according to procedures established by the Kentucky Transportation Cabinet (KTC) and complying with the following requirements.
 - 1. Provide mixes complying with composition, grading, and tolerance requirements Standard Specifications for the following nominal, maximum aggregate sizes:
 - a. Base Course: Mixture with a nominal maximum aggregate size of 0.75 inch with a minimum Voids in the Mineral Aggregate (VMA) of 12 percent.
 - b. Surface Course: Mixture with a nominal maximum aggregate size of 0.38 inch with a minimum VMA of 14 percent.

PART 3 - EXECUTION

3.1 INSPECTION

- A. Pavement installer must examine the areas excavated and backfilled and conditions under which pavement is to be constructed. Notify the Contractor in writing of conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until satisfactory embankments and subgrade have been established to a uniform line, properly shaped and compacted.
- B. Verify that subgrade is dry and in suitable condition to support paving and imposed loads.
- C. Proof-roll subbase using loaded dump trucks or heavy rubber-tired construction equipment to locate areas that are unstable or that require further compaction.
- D. Proceed with paving only after unsatisfactory conditions have been corrected.
- E. Repairs to Base Course: Fill excavated pavements with hot-mix asphalt base mix and, while still hot, compact flush with adjacent surface.
- F. Patching: Partially fill excavated pavements with hot-mix asphalt base mix and, while still hot, compact. Cover asphalt base course with compacted, hot-mix surface layer finished flush with adjacent surfaces.

3.2 AGGREGATE BASE COURSES

- A. Place aggregate base course on subgrades free of mud, frost, snow, or ice in accordance with Section 302 of the Standard Specifications.

- B. On prepared subgrade, place base course as follows:
1. Shape base course to required crown elevations and cross-slope grades.
 2. Place base course that exceeds 6 inches in compacted thickness in layers of equal thickness, with no compacted layer more than 6 inches thick or less than 3 inches thick.
 3. Compact base course at optimum moisture content to required grades, lines, cross sections, and thickness to not less than 98 percent of maximum dry unit weight according to ASTM D698 or in accordance with Section 302.03.04 of the Standard Specifications.

3.3 SURFACE PREPARATION

- A. General: Immediately before placing asphalt materials, remove loose and deleterious material from substrate surfaces. Ensure that prepared subgrade is ready to receive paving.
1. Sweep loose granular particles from surface of unbound-aggregate base course. Do not dislodge or disturb aggregate embedded in compacted surface of base course.
- B. Tack Coat: Comply with provisions in Standard Specifications Section 406. Apply to the surface of concrete surfaces, existing asphalt surfaces and, when necessary, to newly constructed asphalt surfaces.

3.4 HOT-MIX ASPHALT PLACING

- A. Machine place hot-mix asphalt on prepared surface, spread uniformly, and strike off. Place asphalt mix by hand to areas inaccessible to equipment in a manner that prevents segregation of mix. Comply with applicable provisions of KTC Standard Specifications Section 403 for delivery, placement, spreading and compaction of the mixture.
1. Average Density: 92 percent of reference maximum theoretical density according to ASTM D 2041, but not less than 90 percent.

3.5 FIELD QUALITY CONTROL

- A. Thickness Tolerances: Compact each course to produce the thickness indicated within the following tolerances:
1. Aggregate and asphalt base Course: Plus or minus 1/2 inch.
 2. Asphalt surface course: Plus or minus 1/4 inch.
 3. Provide a minimum fall of 2% to facilitate drainage unless otherwise indicated on the Drawings.

- B. Surface Smoothness: Compact each course to produce a surface smoothness with the following tolerances as determined using a 10-foot straightedge applied transversely or longitudinally to paved areas:
1. Aggregate base course: 3/8 inch.
 2. Asphalt base course: 1/4 inch.
 3. Asphalt surface course: 1/8 inch.
 4. Crowned surfaces: Test with crowned template centered and at a right angle to crown. Maximum allowable variance from template is 1/4 inch.
- C. In-Place Density: Filed density test of in-place compacted aggregate base will be determined by nuclear method in accordance with ASTM D 2940. Field density of in-place compacted pavement will be determined by nuclear method according to ASTM D 2950 and correlated with ASTM D 1188 or ASTM D 2726. Test will be made for every 1,000 square yards or less of installed pavement.
- D. Core Sampling: If required to confirm either thickness tolerances or compaction of asphalt courses, core samples shall be taken and tested according to ASTM D 3549 for thickness and ASTM D 1188 or ASTM D 2726 for compaction. Determination of need for core samples will be made by the Engineer.

++ END OF SECTION ++

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SECTION 02720

AGGREGATE BASE COURSE

PART 1 - GENERAL

1.1 SCOPE OF WORK

- A. Provide all labor, materials, equipment and services required to construct the access roads and parking areas shown on the Drawings. Parking area and entrance road are to be surfaced with an aggregate base course.
- B. This work shall be scheduled near the end of the project to minimize construction traffic on finished surface.

1.2 RELATED WORK SPECIFIED ELSEWHERE

- A. Site Clearing: Section 02102
- B. Earthwork: Section 02300

1.3 APPLICABLE STANDARDS

- A. All references in this section to the Standard Specifications shall refer to the most recent edition of Standard Specifications for Road and Bridge Construction with all amendments and supplements thereto as published by the Department of Transportation, Bureau of Highways.

1.4 DEFINITIONS

- A. Unimproved surfaces shall mean grass, other vegetative cover and non-traffic areas.
- B. Improved surfaces shall mean existing gravel or dirt travel ways (existing access road adjacent to site).

PART 2 - PRODUCTS

2.1 MATERIALS

- A. All materials required for work in this section shall be as specified in the Standard Specifications.

- B. Aggregate base course for the access road and parking area shall consist of Type "O", Size No. 53 aggregate. Compacted thickness shall be nine (9) inches over unimproved areas and six (6) inches over improved areas.
- C. Perforated Polyethylene Drain Pipe shall be as specified in Section 810 of the Standard Specifications.
- D. Coarse aggregate for drains shall be as specified in Section 805 of the Standard Specifications.
- E. Geotextile Fabric shall be as specified in Section 845 of the Standard Specifications.

PART 3 - EXECUTION

3.1 SUBGRADE

- A. On the unimproved areas, the ground surface shall be stripped of all vegetative cover, and the top 6" layer of soil shall be scarified and compacted in place.
- B. On the improved areas, the existing gravel surface shall be leveled and prepared to receive aggregate base.
- C. The preparation of the subgrade shall be in accordance with Section 208 of the Standard Specifications and compacted to 95% standard proctor density.
- D. The subgrade shall be prepared to the full width of the base course plus one foot of additional width beyond each edge, except where limited by structures.
- E. The subgrade shall be shaped by mechanical means until a uniform line and grade are established.
- F. Subgrade for the aggregate surface access road shall be shaped to a crown with slopes 1/2" to 3/4" per foot.

3.2 PIPE UNDERDRAINS

- A. Pipe underdrains shall be placed in a trench to the required lines and grades, backfilled with coarse aggregate and wrapped in geotextile fabric.
- B. Installation shall be in accordance with Section 705 of the Standard Specifications.

3.3 AGGREGATE COURSE

- A. Aggregate base course for the access road and parking area shall consist of Type "O", Size No. 53 aggregate. Compacted thickness shall be nine (9) inches over unimproved areas and six (6) inches over improved areas.
- B. Thickness on the access road shall be uniform over the shaped subgrade to maintain the crown.
- C. Aggregate shall be machine compacted to the density established as satisfactory by the Engineer.
- D. The mixture shall be placed, spread to a string-line, and shaped without segregation by the use of power equipment operated so as to produce the desired compacted depth to the line, grade and cross section required.

++ END OF SECTION ++

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SECTION 02775

SIDEWALKS

PART 1 - GENERAL

1.1 SCOPE OF WORK

- A. Furnish all labor, materials, equipment and services required for constructing concrete sidewalks where shown on the Drawings and as specified herein.

1.2 RELATED WORK SPECIFIED ELSEWHERE

- A. Earthwork:Section 02300
- B. Concrete: Section 03300

PART 2- PRODUCTS

2.1 CRUSHED STONE

- A. Stone for sidewalk base shall be No. 57 aggregate, or equal.

2.2 CONCRETE

- A. Concrete for sidewalks shall be 3000 psi concrete.

2.3 REINFORCEMENT

- A. The minimum yield strength of the reinforcement shall be 60,000 pounds per square inch. Bar reinforcement shall conform to the requirements of ASTM A615. All bar reinforcement shall be deformed.
- B. Wire-mesh reinforcement shall be continuous between expansion joints. Laps shall be at least one full mesh plus 2", staggered to avoid continuous lap in either direction, and securely wired or clipped with standard clips.

2.4 PREMOLDED EXPANSION JOINT FILLER

- A. Premolded expansion joint filler shall be closed cell polyethylene foam type, Sonneborn Sonoflex F, Williams Products Expand-O-Foam, or equal. Seal joint with one-part self. leveling polyurethane sealant, Sonneborn Sonolastic SL 1, or equal, maximum 3/8" deep. Prepare and prime joints per manufacturer's instructions.

PART 3- EXECUTION

3.1 BASE

- A. Following finished grading, a base course of crushed stone shall be placed to a compacted thickness of four (4) inches. Immediately prior to placing concrete, crushed stone base shall be thoroughly wetted, or the concrete placed on a layer of heavy building paper.

3.2 SURFACE

- A. Concrete paving shall consist of 4 or 6 inches (as noted) of 3,000 psi reinforced concrete, struck off to accurately placed screens and worked with a float until mortar appears on the top. After surface has been thoroughly floated, it shall be brushed to leave markings of a uniform type, providing non-slip finish. No dusting or plastering will be allowed.

3.3 FINISHING

- A. All joints and edges shall be finished with an edging tool. Dummy joints shall be formed about five (5) feet apart to form rectangular blocks. Expansion joints of 1/2 inch premolded expansion joint material shall be provided at the intersection of all vertical surfaces with the sidewalks slabs and at approximately 20-foot intervals along the walks.

3.4 QUALITY CONTROL

- A. The allowable variation shall be 1/8 inch to 10 feet transversely and longitudinally.

++ END OF SECTION ++

SECTION 02820

CHAIN LINK SECURITY FENCES AND GATES

PART 1 - GENERAL

1.1 SCOPE OF WORK

- A. Furnish all labor, materials, equipment, and service required to furnish and install chain link fencing and gates according to the layout shown on the Contract Drawings. Height of the fencing fabric shall be seven (7) feet.

1.2 RELATED WORK SPECIFIED ELSEWHERE

- A. Finish Grading: Section 02300
- B. Concrete: Section 03300

1.3 SUBMITTALS

- A. Comply with provisions of Section 01340. At the time of submission, the Contractor shall in writing, call the Engineer's attention to any deviations that the submittals may have from the requirements of the Engineer's Contract Drawings and Specifications.
- B. Shop Drawings:
 - 1. Indicate details of fabrication and installation, including but not limited to fence height, post spacing, dimensions, unit weights and footing details.
- C. Manufacturer's Literature:
 - 1. Descriptive data of installation methods and procedures;
 - 2. Standard drawings of fence and gate installation.

1.4 PRODUCT DELIVERY, HANDLING AND STORAGE

- A. Deliver materials with manufacturer's tags and labels.
- B. Handle and store material as to avoid damage.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Framework shall conform to one of the following:
1. Steel pipe with 1.8 ounces of zinc coating per square foot of surface area conforming to ASTM F1043 - Group IA; external coatings per F1043 paragraph 7.1.1 and internal coatings per F1043 paragraph 7.2.1.
 2. High strength steel pipe triple coated per ASTM F1043 - Group IC; external coatings per F1043 paragraph 7.1.2, and internal coatings per F1043 paragraph 7.2.4.
 3. All coatings to be applied after welding.

Pipe shall be straight, true to section and shall conform to the following weights:

Pipe Size Outside Diameter	Group 1A Weight (Lbs per Ft.)	Group 1C Weight (Lbs per Ft.)
1-5/8"	2.27	1.84
2"	2.72	2.28
2-1/2"	3.65	3.12
3"	5.79	4.64
3-1/2"	7.58	5.71
4"	9.11	6.56

- B. Fabric: Fabric shall be aluminized fabric manufactured in accordance with ASTM A-491 and coated before weaving with a minimum of 0.4 ounces of aluminum per square foot of surface area. The steel wire and coating shall conform to ASTM A-817. Fabric shall be 9 gauge, woven in a 2" diamond mesh. Top selvage to be twisted and barbed. Bottom selvage to be knuckled.
- C. The aluminum coated wire shall have a tensile strength of at least 80,000 pounds per square inch.

2.2 COMPONENTS

Components of the fencing system shall be in accordance with the following requirements:

- A. Fence Posts:

	Group IA or Group IC	
Fabric Height	Line Post O.D.	Terminal Post O.D.
Under 6"	2"	2-1/2"
6' to 9'	2-1/2"	3"
9' to 12'	3"	4"

B. Gate Posts:

Single Gate Width	Double Gate Width	Group IA or Group IC Post O.D.
Up to 6'	Up to 12'	3"
7' to 12'	13' to 25'	4"

C. Rails and Braces: 1-5/8" O.D.

D. Fittings:

1. Post Caps: Pressed steel, cast iron or cast aluminum alloy designed to fit snugly over posts to exclude moisture. Supply cone type caps for terminal posts and loop type for line posts. All fittings to conform to ASTM F-626.
2. Rail and Brace Ends: Pressed steel, cast iron or cast aluminum alloy, cup-shaped to receive rail and brace ends.
3. Top Rail Sleeves: Tubular steel, 0.051 thickness x 7" long, expansion type.
4. Tension Bars: Steel strip, 5/8" wide x 3/16" thick.
5. Tension Bands: Pressed steel, 14 gauge thickness x 3/4" wide.
6. Brace Bands: Pressed steel, 12 gauge thickness x 3/4" wide.
7. Truss rods: Steel rod, 3/8" diameter merchant quality with turnbuckle.
8. Barbed Wire Arms: Pressed steel, cast iron or cast aluminum alloy fitted with clips or slots for attaching three strands of barbed wire. Arms shall be set outward on a 45 degree angle and be capable of supporting a 250 pound load at outer barbed wire connecting point without causing permanent deflection.

E. Tension Wire: Marcellled 7 gauge steel wire with minimum coating of 0.80 ounces of zinc or 0.40 ounces of aluminum per square foot of wire surface and conforming to ASTM A-824.

F. Tie Wires: Aluminum, 9 gauge, alloy 1100-H4 or equal.

G. Hog rings: Steel wire, 11 gauge, with a minimum zinc coating of 0.80 ounces per square foot of wire surface.

H. Barbed Wire: Commercial quality steel, 12-1/2 gauge, two strand twisted line wire with 4 point barbs at 5-inch spacing. Coating shall consist of a minimum of 0.80 ounces of zinc per square foot of wire surface conforming to ASTM A-121 or a minimum of 0.30 ounces of aluminum per square foot of wire surface conforming to ASTM A-585.

2.3 CONCRETE MIX

- A. Concrete for footings shall be ASTM C-94 Portland Cement concrete with maximum 3/4" aggregate having a minimum compressive strength of 3,000 PSI at 28 days.

2.4 GATES

- A. Gates shall be of the types and sizes shown on the Drawings. Gate filler fabric shall be of the same as that used in fence.
- B. Frames:
 - 1. Swing gate frames shall be of 2" outside diameter galvanized Group IA or Group IC, having corners fitted with rigid watertight heavy malleable castings or electrically welded joints. Internal bracing shall be of 1-5/8" outside diameter galvanized steel pipe, Group IA or Group IC.
- C. Hinges:
 - 1. Gate hinges shall be double clamping offset type allowing gates to swing back parallel with line of fence. They shall be malleable iron and forged steel heavily galvanized.
- D. Latches and Keepers:
 - 1. Gate latch shall be of eccentric double locking type which engage strike securely bolted to either gate frame or gate post at both top and bottom. Latches shall be readily locked with padlock.
 - 2. Gatekeeper shall be furnished with each gate frame to automatically engage gate frame when swung to open position.
- E. Gate manufacturer and supplier shall be responsible for all hardware associated with attaching gates and removable panels.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. General: Installation to conform to ASTM F-567.
- B. Post Spacing: Space line posts at intervals not exceeding ten feet.
- C. Post Setting: Set terminal, gate and line posts plumb in concrete footings of the dimensions shown on the Details. Top of footing to be 2" above grade and sloped to direct water away from posts.
- D. Bracing: Brace gate and terminal posts back to adjacent line posts with horizontal brace rails and diagonal truss rods.

- E. Top Rail: Install through line post loop caps connecting sections with sleeves to form a continuous rail between terminal posts.
- F. Top Tension Wire: If top rail is not required, stretch tension wire through loop caps and fasten to terminal posts.
- G. Bottom Tension Wire: Stretch between terminal posts 6" above grade and fasten to outside of line posts with tie wires.
- H. Fabric: Pull fabric taut with bottom selvage 2" above grade. Fasten to terminal posts with tension bars threaded through mesh and secured with tension bands at maximum 15" intervals. Tie to line posts and top rails with tie wires spaced at maximum 12" on posts and 24" on rails. Attach to bottom tension wire with top rings at maximum 24" intervals.
- I. Barbed Wired: Anchor to terminal extension arms, pull taut and firmly install in slots of line post extension arms.
- J. Gates: Install gates plumb, level and secure for full opening without interference. Anchor center stops and keepers in concrete.
- K. Fasteners: Install nuts for fittings, bands, and hardware bolts on inside of fence.

3.2 COMPLETION

- A. Adjust brace rails and tension rods for rigid installation.
- B. Tighten hardware, fasteners, and accessories.
- C. The area of installation shall be left free of debris caused by the installation of the fence.

++ END OF SECTION ++

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SECTION 02821

STEEL ORNAMENTAL FENCE AND GATE SYSTEM

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:

1. The contractor shall provide all labor, materials and appurtenances necessary for installation of the welded ornamental steel fence system and appurtenances defined herein at Taylor Mill Water Treatment Plant.
2. The manufacturer shall supply a total fence system of Ornamental Steel design. The system shall include all components (i.e., panels, posts, gates, operators, and hardware) required.

B. Coordination:

1. Review installation procedures under other sections and coordinate the installation of items that must be installed with or before, the Steel Ornamental Fence and Gate System are installed.

C. Related Sections:

1. Section 02300, Earthwork
2. Section 03300, Concrete

1.2 REFERENCES

A. See recommendations below:

1. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy Coated (Galvannealed) by the Hot-Dip Process.
2. ASTM B117 - Practice for Operating Salt-Spray (Fog) Apparatus.
3. ASTM D523 - Test Method for Specular Gloss.
4. ASTM D714 - Test Method for Evaluating Degree of Blistering in Paint.
5. ASTM D822 - Practice for Conducting Tests on Paint and Related Coatings and Materials using Filtered Open-Flame Carbon-Arc Light and Water Exposure Apparatus.
6. ASTM D1654 - Test Method for Evaluation of Painted or Coated Specimens Subjected to Corrosive Environments.
7. ASTM D2244 - Test Method for Calculation of Color Differences from Instrumentally Measured Color Coordinates.
8. ASTM D2794 - Test Method for Resistance of Organic Coatings to the Effects of Rapid Deformation (Impact).
9. ASTM D3359 - Test Method for Measuring Adhesion by Tape Test.

10. ASTM F2408 – Ornamental Fences Employing Galvanized Steel Tubular Pickets.

1.3 QUALITY ASSURANCE

- A. The contractor shall provide laborers and supervisors who are thoroughly familiar with the type of construction involved and materials and techniques specified.
- B. A company specializing in the manufacture of hydraulic gate operators of the type specified, with a minimum of ten years experience.

1.4 SUBMITTAL

- A. Installation instructions: Submit two copies of manufacturer's installation instructions for this specific project.
- B. Test Reports:
 1. Submit affidavits from the manufacturer demonstrating that the gate mechanism has been tested to 200,000 cycles without breakdown.
 2. Each operator shall bear a label indicating that the operator mechanism has been tested for full power and pressure of all hydraulic components, full stress tests of all mechanical components and electrical tests of all overload devices.
- C. At the time of submission, the contractor shall in writing, call the Engineer's attention to any deviations that the Drawings may vary from the requirements of the Engineer's Specifications. Comply with the requirements of Section 01330.

1.5 PRODUCT HANDLING AND STORAGE

- A. Upon receipt at the job site, all materials shall be checked to ensure that no damage occurred during shipping or handling. Materials shall be stored in such a manner to ensure proper ventilation and drainage, and to protect against damage, weather, vandalism and theft.

1.6 WARRANTY

- A. General Warranty:
 1. The guaranty period shall be set forth in Specifications Section 00710, "General Conditions." In the event that the manufacturer's guarantee period exceeds that as stated in the General Conditions, the manufacturer's guarantee period will stay in effect and shall not be replaced by the previously stated.

PART 2 – PRODUCTS

2.1 SERVICE CONDITIONS

A. Fence and Gate Criteria:

1. Fence and gate shall comply with the following conditions:

Table 1 – Minimum Sizes for Montage Industrial Posts		
Fence Posts	Panel Height	
2-1/2” x 12 Ga.	Over 6’ Up to & Including 8’ Height	
Gate Leaf	Over 6’ Up to & Including 8’	
Up to 4’	3” x 12 Ga.	
4’-1” to 6’	4” x 11 Ga.	
6’-1” to 8’	6” x 3/16”	
8’-1” to 10’	6” x 3/16”	
10’-1” to 12’	6” x 3/16”	
12’-1” to 14’	6” x 3/16”	
14’-1” to 16’	6” x 3/16”	
Table 2 – Coating Performance Requirements		
<u>Quality Characteristics</u>	<u>ASTM Test Method</u>	<u>Performance Requirements</u>
Adhesion	D3359 – Method B	Adhesion (Retention of Coating) over 90% of test area (Tape and knife test).
Corrosion Resistance	B117, D714 & D1654	Corrosion Resistance over 1,500 hours (Scribed per D1654; failure mode is accumulation of 1/8” coating loss from scribe or medium #8 blisters).
Impact Resistance	D2794	Impact Resistance over 60 inch lb. (Forward impact using 0.625” ball).
Weathering Resistance	D822 D2244, D523 (60° Method)	Weathering Resistance over 1,000 hours (Failure mode is 60% loss of gloss or color variance of more than 3 delta-E color units).

Table 3 – Montage Industrial – Post Spacing By Bracket Type		
Span	For Invincible 8' Nominal (91-1/4" Rail)	
Post Size	2 – 1/2"	3"
Bracket Type	Industrial Flat Mount (BB301)	
Post Settings ± 1/2" O.C.	94 – 1/2"	95"
* Note: When using BB304 swivel brackets on either or both ends of a panel installation, care must be taken to ensure the spacing between post and adjoining pickets meets applicable codes. This will require trimming one or both ends of the panel.		

B. Gate Operators

1. HySecurity gate operators model SlideDriver 50VF2 (222 X2 ST) with Smart Touch Controller, or other comparable operator, as approved equal.

2.2 MANUFACTURER

A. Fence System

1. The fence system shall conform to Montage Industrial® *Welded and Rackable* (ATF – All Terrain Flexibility) Ornamental Steel, Invincible design, extended picket bottom rail treatment, 4-Rail style manufactured by Ameristar Fence Products, Inc., in Tulsa, Oklahoma.
2. Approved Equal.

B. Gates

1. All industrial ornamental aluminum cantilever gates shall conform to the Ameristar® TransPort II gate system, Invincible style, manufactured by Ameristar Fence Products, Inc., in Tulsa, Oklahoma.
2. Approved Equal.

C. Gate Operators

1. HySecurity gate operators model SlideDriver 50VF2 (222 X2 ST).
2. Approved Equal.

2.3 MATERIAL

A. Fence

1. Steel material for fence panels and posts shall conform to the requirements of ASTM A653/A653M, with a minimum yield strength of 45,000 psi (344 MPa) and a minimum zinc (hot-dip galvanized) coating weight of 0.60 oz/ft² (184 g/m²), Coating Designation G-60. A minimum of 62% of the steel material shall be derived from recycled scrap metal.
2. Material for pickets shall be 1" square x 16 Ga. tubing. The rails shall be steel channel, 1.75" x 1.75" x .105". Picket holes in the rail shall be spaced 4.715" o.c. For fence systems up to and including 6 feet tall, posts shall be a minimum of 2-1/2" square x 14 Ga. For fence systems 7 feet tall and 8' tall, posts shall be a minimum of 2-1/2" square x 12 Ga. Gate posts shall meet the minimum requirements of Table 1.

B. Gates

1. The materials used for cantilever gate framing (i.e., uprights, diagonal braces and pickets or pales) shall be manufactured from ASTM B221 aluminum (designation 6063-T-6) with a yield strength of 25,000 PSI and a standard mill finish.
2. Material for diagonal bracing and uprights shall be 2" sq. x 1/4" aluminum. The design of the top and bottom enclosed track shall conform to the manufacturers 5" x 2" Fast-Trak system. Material for pickets shall be 1" x 8" wall aluminum.
3. Internal roller truck assembly shall be self-aligning swivel ball-and-socket type running on four bearing wheels. Internal roller truck assembly shall be affixed to the hanger bracket by means of a 5/8" diameter industrial-grade rod end/center bolt, with a minimum static load rating of 10,000 pounds. Attachment of the center bolt to the truck body shall be by means of a swivel joint to ensure equivalent and consistent loading on all bearing wheels and internal track surfaces throughout the travel of the gate.

2.4 DETAILS OF CONSTRUCTION – FENCE SYSTEM

- A. Pickets, rails and posts shall be pre-cut to specified lengths. Rails shall be pre-punched to accept pickets.
- B. Pickets shall be inserted into the pre-punched holes in the rails and shall be aligned to standard spacing using a specially calibrated alignment fixture. The aligned pickets and rails shall be joined at each picket-to-rail intersection by Ameristar's proprietary fusion welding process, thus completing the rigid panel assembly (Note: The process produces a virtually seamless, spatter-free good-neighbor appearance, equally attractive from either side of the panel).
- C. The manufactured panels and posts shall be subjected to an inline electrodeposition coating (E-Coat) process consisting of a multi-stage pretreatment/wash (with zinc phosphate), followed by a duplex application of an epoxy primer and an acrylic topcoat. The minimum cumulative coating thickness of epoxy and acrylic shall be 2 mils (0.058 mm). The color shall be Black. The coated panels and posts shall be

capable of meeting the performance requirements for each quality characteristic shown in Table 2 (Note: The requirements in Table 2 meet or exceed the coating performance criteria of ASTM F2408).

- D The manufactured fence system shall be capable of meeting the vertical load, horizontal load, and infill performance requirements for Industrial weight fences under ASTM F2408.

2.5 DETAILS OF CONSTRUCTION – GATES

- A. Pickets, enclosed track, uprights and diagonal bracing shall be pre-drilled and labeled for easy assembly. All components shall be precut to specified lengths.
- B. Top and bottom rail extrusions shall be mechanically fastened to vertical uprights and reinforced with diagonal braces, as required by drawing.
- C. The manufactured components shall be subjected to the Ameristar thermal stratification coating process (high-temperature, in-line, multi-stage, and multi-layer) including, as a minimum, a six-stage pretreatment/wash and an electrostatic spray application of a polyester finish. The topcoat shall be a “no-mar” TGIC polyester powder coat finish with a minimum thickness of 2 mils (.0508 mm). The color shall be Black. The stratification-coated framework shall be capable of meeting the performance requirements for each quality characteristic shown in Table 2.

2.6 DETAILS OF CONSTRUCTION – GATE OPERATORS

- A. Operation shall be by means of a metal rail passing between a pair of solid metal wheels with polyurethane treads. Operator motors shall be hydraulic, geroller type, and system shall not include belts, gears, pulleys, roller chains or sprockets to transfer power from operator to gate panel. The operator shall generate a minimum horizontal pull of 300 pounds. The operator shall be speed controlled by an electronic Variable Frequency Drive (VFD) which will accelerate and decelerate the gate gradually to prevent shock loads to the gate and operator assembly. The maximum gate velocity of the Model SlideDriver 50VF2 (222 X2 ST) shall not be less than 26” per second. Upon starting, the VFD will gradually accelerate the gate to its maximum speed and when stopping, gradually reduce gate velocity to less than 1 foot per second, where upon a limit switch will stop the electric motor. Two adjustable hydraulic brake valves (one for each direction) assist in slowing the gate to a precise stop.
- B. Standard mechanical components shall include as a minimum:
 - 1. Supporting arms: Cast aluminum channel. Arms shall incorporate a fully bushed, 1-1/2" (38 mm) bronze bearing surface, acting on arm pivot pins. (item 2 below)
 - 2. Arm pivot pins: 3/4" (19 mm) diameter, stainless steel, with integral tabs

- for ease of removal.
3. Tension spring: 2-1/2" (63.5 mm) heavy duty, 800 pound (363 kg) capacity.
 4. Tension adjustment: Finger tightened nut, not requiring the use of tools.
 5. Drive release: Must instantly release tension on both drive wheels, and disengage them from contact with drive rail in a single motion, for manual operation.
 6. Limit switches: Fully adjustable, toggle types, with plug connection to control panel.
 7. Electrical enclosure: Oversized, metal, with hinged lid gasketed for protection from intrusion of foreign objects, and providing ample space for the addition of accessories.
 8. Chassis: 1/4" (6.35 mm) steel base plate and 12 Ga. (2.66 mm) sides and back welded and ground smooth.
 9. Cover: 16 Ga. (1.52 mm) galvanized sheet metal with a textured paint finish. All joints welded.
 10. Finish: Prime painted, with a textured finish coat, proven to withstand 1000-hour salt spray test.
 11. Drive wheels: Two 8" (203 mm) Dia. metal hub with polyurethane tread.
 12. Drive rail: Shall be extruded 6061 T6, not less than 1/8" (3.175 mm) thick. Drive rail shall incorporate alignment pins for ease of replacement or splicing. Pins shall enable a perfect butt splice.
 13. Hydraulic hose: Shall be 1/4" (6.35 mm) synthetic, rated to 2750 PSI (19 MPa).
 14. Hydraulic valves: Shall be individually replaceable cartridge type, in an integrated hydraulic manifold.
 15. Hose fittings: At manifold shall be quick-disconnect type, others shall be swivel type.
 16. Hydraulic fluid: High performance type with viscosity index greater than 375 and temperature range -40F to 167F degrees (-40C to 75C).
 17. A zero to 2000 PSI (13.79 MPa) pressure gauge, mounted on the manifold for diagnostics, shall be a standard component.
 18. The hydraulic fluid reservoir shall be formed from a single piece of metal, non-welded, and shall be powder painted on the inside and the outside, to prevent fluid contamination.

C. Minimum standard electrical components:

1. Pump motor: Shall be a 2 HP, 56C, TEFC, three phase, continuous duty motor, with a service factor of 1.15, or greater. (Note, the VFD converts single phase to drive a three phase motor)
2. All components shall have overload protection.
3. Controls: Smart Touch Controller Board with 256K of program memory containing:
 - a. inherent entrapment sensor;
 - b. built in "warn before operate" system;
 - c. built in timer to close;

- d. liquid crystal display for system configuration and reporting of control status
- e. 26 programmable user relay output options;
- f. anti-tailgate mode;
- g. built-in power surge/lightning strike protection;
- h. menu configuration, event logging and system diagnostics easily accessible with a PC and HySecurity's free START software
- i. RS232 port for connection to laptop or other computer peripheral and RS485 for connection of Master/Slave systems or network interface.
 - 1) Transformer: 75 VA, non-jumpered taps, for all common voltages.
 - 2) Control circuit: 24VDC.

D. Required external sensors

- 1. Through Beam Photo Eyes in both open and close direction.
- 2. Gate edge and transmitter radio reversing device.

E. Other Options:

- 1. Lock for operator cover.
- 2. Heater with thermostat control for cold or damp climates.
- 3. Through Beam photo eyes, open and close direction.
- 4. Gate edge and transmitter radio reversing device.
- 5. HY=5A plug in loop detectors.
- 6. Key operated cable manual release (secure side of gate).
- 7. HySecurity factory drive rail.
- 8. Provide 460 VAC three phase 60 HZ.

PART 3 – EXECUTION

3.1 INSPECTION

- A. All new installation shall be laid out by the contractor in accordance with the construction plans.

3.2 INSTALLATION

A. Fence:

- 1. Fence post shall be spaced according to Table 3, plus or minus ½". For installations that must be raked to follow sloping grades, the post spacing dimension must be measured along the grade. Fence panels shall be attached to posts with brackets supplied by the manufacturer. Posts shall be set in concrete footers having a minimum depth of 36" The "Earthwork", Section 02300 and "Concrete", Section 03300 sections of this specification shall

govern material requirements for the concrete footer. Posts setting by other methods such as plated posts or grouted core-drilled footers are permissible only if shown by engineering analysis to be sufficient in strength for the intended application.

2. When cutting/drilling rails or posts adhere to the following steps to seal the exposed steel surfaces; 1) remove all metal shavings from cut area. 2) Apply zinc-rich primer to thoroughly cover cut edge and/or drilled hole; let dry. 3) Apply 2 coats of custom finish paint matching fence color. Failure to seal exposed surfaces per steps 1-3 above will negate warranty. Ameristar spray cans or paint pens shall be used to prime and finish exposed surfaces; it is recommended that paint pens be used to prevent overspray. Use of non-Ameristar parts or components will negate the manufactures' warranty.

B. Gate:

1. All new gate installations shall be laid out by the contractor in accordance with the construction plans.
2. All hardware shall be installed in accordance with the Transport installation instructions. Transport cantilever gates shall be installed so they comply with current ASTM F2200 & UL325 standards.
3. Gate stops shall be installed on each track in a way that conforms to current ASTM F2200 standards.
4. Gate post shall be spaced according to specified gate elevation.
5. Posts shall be set in concrete footers having a minimum depth of 48" with a minimum diameter of 12". The "Earthwork", Section 02300 and "Concrete", Section 03300 sections of this specification shall govern material requirements for the concrete footer. Posts setting by other methods such as plated posts or grouted core-drilled footers are permissible only if shown by engineering analysis to be sufficient in strength for the intended application.

C. Gate Operators:

1. Locate concrete mounting pad in accordance with approved shop drawings.
2. Make sure that gate is operating smoothly under manual conditions before installation of gate operators. Do not proceed until gate panel is aligned and operates without binding.
3. Install gate operator in accordance with the manufacturer's printed instructions, current at the time of installation. Coordinate locations of operators with contract drawings, other trades and shop drawings.
4. Installer shall insure that the electric service to the operator is at least 20 AMPS. Operator wattage is 2400.
5. Test gate operator through ten full cycles and adjust for operation without binding, scraping or uneven motion. Test limit switches for proper "at rest" gate position.
6. All anchor bolts shall be fully concealed in the finished installation.

++ END OF SECTION++

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SECTION 02920

LAWNS AND GRASSES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Seeding.
 - 2. Hydro-seeding.
 - 3. Sodding.
 - 4. Turf renovation.
 - 5. Erosion-control material(s).

1.3 DEFINITIONS

- A. Duff Layer: The surface layer of native topsoil that is composed of mostly decayed leaves, twigs, and detritus.
- B. Finish Grade: Elevation of finished surface of planting soil.
- C. Manufactured Topsoil: Soil produced off-site by homogeneously blending mineral soils or sand with stabilized organic soil amendments to produce topsoil or planting soil.
- D. Pesticide: A substance or mixture intended for preventing, destroying, repelling, or mitigating a pest. This includes insecticides, miticides, herbicides, fungicides, rodenticides, and molluscicides. It also includes substances or mixtures intended for use as a plant regulator, defoliant, or desiccant.
- E. Pests: Living organisms that occur where they are not desired or that cause damage to plants, animals, or people. These include insects, mites, grubs, mollusks (snails and slugs), rodents (gophers, moles, and mice), unwanted plants (weeds), fungi, bacteria, and viruses.
- F. Planting Soil: Standardized topsoil; existing, native surface topsoil; existing, in-place surface soil; imported topsoil; or manufactured topsoil that is modified with

soil amendments and perhaps fertilizers to produce a soil mixture best for plant growth.

- G. Subgrade: Surface or elevation of subsoil remaining after excavation is complete, or top surface of a fill or backfill before planting soil is placed.
- H. Subsoil: All soil beneath the topsoil layer of the soil profile, and typified by the lack of organic matter and soil organisms.
- I. Surface Soil: Soil that is present at the top layer of the existing soil profile at the Project site. In undisturbed areas, the surface soil is typically topsoil, but in disturbed areas such as urban environments, the surface soil can be subsoil.
- J. Planting Completion: The date of completion of all work related to a specific project including installation of plants, lawns and grasses, etc.

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated.
 - 1. Pesticides and Herbicides: Include product label and manufacturer's application instructions specific to this Project.
- B. Certification of Grass Seed: From seed vendor for each grass-seed monostand or mixture stating the botanical and common name, percentage by weight of each species and variety, and percentage of purity, germination, and weed seed. Include the year of production and date of packaging.
 - 1. Certification of each seed mixture for turfgrass sod. Include identification of source and name and telephone number of supplier.
- C. Qualification Data: For qualified landscape Installer.
- D. Product Certificates: For soil amendments and fertilizers, from manufacturer.
- E. Material Test Reports: For standardized ASTM D 5268 topsoil.
- F. Maintenance Instructions: Recommended procedures to be established by Owner for maintenance of turf during a calendar year. Submit before expiration of required initial maintenance periods.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified landscape Installer whose work has resulted in successful turf establishment.
 - 1. Professional Membership: Installer shall be a member in good standing of either the Professional Landcare Network or the American Nursery and Landscape Association.

2. Experience: Five years' experience in turf installation in addition to requirements in Division 1 Section "Quality Requirements."
 3. Installer's Field Supervision: Require Installer to maintain an experienced full-time supervisor on Project site when work is in progress.
 4. Personnel Certifications: Installer's personnel assigned to the work shall have certification in one of the following categories from the Professional Landcare Network:
 - a. Certified Landscape Technician - Exterior, with installation or maintenance specialty area(s), designated CLT-Exterior.
 - b. Certified Turfgrass Professional, designated CTP.
 - c. Certified Turfgrass Professional of Cool Season Lawns, designated CTP-CSL.
 5. Maintenance Proximity: Not more than two hours' normal travel time from Installer's place of business to Project site.
 6. Pesticide Applicator: State licensed, commercial.
- B. Soil-Testing Laboratory Qualifications: An independent laboratory or university laboratory, recognized by the State Department of Agriculture, with the experience and capability to conduct the testing indicated and that specializes in types of tests to be performed.
- C. Soil Analysis: For each unamended soil type, furnish soil analysis and a written report by a qualified soil-testing laboratory stating percentages of organic matter; gradation of sand, silt, and clay content; cation exchange capacity; deleterious material; pH; and mineral and plant-nutrient content of the soil.
1. Testing methods and written recommendations shall comply with USDA's Handbook No. 60.
 2. The soil-testing laboratory shall oversee soil sampling, with depth, location, and number of samples to be taken per instructions from Architect. A minimum of three representative samples shall be taken from varied locations for each soil to be used or amended for planting purposes.
 3. Report suitability of tested soil for turf growth.
 - a. Based on the test results, state recommendations for soil treatments and soil amendments to be incorporated. State recommendations in weight per 1000 sq. ft. (92.9 sq. m) or volume per cu. yd. (0.76 cu. m) for nitrogen, phosphorus, and potash nutrients and soil amendments to be added to produce satisfactory planting soil suitable for healthy, viable plants.
 - b. Report presence of problem salts, minerals, or heavy metals, including aluminum, arsenic, barium, cadmium, chromium, cobalt, lead, lithium, and vanadium. If such problem materials are present, provide additional recommendations for corrective action.
- D. Pre-installation Conference: Conduct conference at Project site.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Seed and Other Packaged Materials: Deliver packaged materials in original, unopened containers showing weight, certified analysis, name and address of manufacturer, and indication of conformance with state and federal laws, as applicable.
- B. Sod: Harvest, deliver, store, and handle sod according to requirements in "Specifications for Turfgrass Sod Materials" and "Specifications for Turfgrass Sod Transplanting and Installation" in TPI's "Guideline Specifications to Turfgrass Sodding." Deliver sod in time for planting within 24 hours of harvesting. Protect sod from breakage and drying.
- C. Bulk Materials:
 - 1. Do not dump or store bulk materials near structures, utilities, walkways and pavements, or on existing turf areas or plants.
 - 2. Provide erosion-control measures to prevent erosion or displacement of bulk materials, discharge of soil-bearing water runoff, and airborne dust reaching adjacent properties, water conveyance systems, or walkways.
 - 3. Accompany each delivery of bulk fertilizers, lime, and soil amendments with appropriate certificates.

1.7 PROJECT CONDITIONS

- A. Planting Restrictions: Plant during one of the following periods, unless otherwise authorized by the Owner/Landscape Architect. Coordinate planting periods with initial maintenance periods to provide required maintenance from date of planting completion.
 - 1. Spring Planting: March 1st to May 15th.
 - 2. Fall Planting: September 15th to October 30th.
- B. Weather Limitations: Proceed with planting only when existing and forecasted weather conditions permit planting to be performed when beneficial and optimum results may be obtained. Apply products during favorable weather conditions according to manufacturer's written instructions.

1.8 MAINTENANCE SERVICE

- A. Initial Turf Maintenance Service: Provide full maintenance by skilled employees of landscape Installer. Maintain as required in Part 3. Begin maintenance immediately after each area is planted and continue until acceptable turf is established but for not less than the following periods:
 - 1. Seeded Turf: 60 days from date of planting completion.
 - a. When initial maintenance period has not elapsed before end of planting season, or if turf is not fully established, continue maintenance during next planting season.

2. Sodded Turf: 60 days from date of planting completion.
- B. Initial Meadow Maintenance Service: Provide full maintenance by skilled employees of landscape Installer. Maintain as required in Part 3. Begin maintenance immediately after each area is planted and continue until acceptable meadow is established, but for not less than [60] days from date of planting completion.
 - C. Continuing Maintenance Proposal: From Installer to Owner, in the form of a standard yearly (or other period) maintenance agreement, starting on date initial maintenance service is concluded. State services, obligations, conditions, and terms for agreement period and for future renewal options.

PART 2 - PRODUCTS

2.1 TURF GRASS

- A. Turf Grass Seed: Fresh, clean, dry, new-crop seed complying with AOSA's "Journal of Seed Technology; Rules for Testing Seeds" for purity and germination tolerances.
- B. Seed Species: Seed of grass species as follows, with not less than 95 percent germination, not less than 85 percent pure seed, and not more than .5 percent weed seed:
 1. Full Sun: Proportioned by weight as follows
 - a. 80 percent turf type tall fescue blend containing a minimum of three cultivars acceptable to the Owner/Landscape Architect.
 - b. 20 percent Kentucky bluegrass (*Poa pratensis*).
 2. Full Sun: Kentucky bluegrass (*Poa pratensis*), a minimum of three cultivars.
 3. Sun and Partial Shade: Proportioned by weight as follows:
 - a. 50 percent Kentucky bluegrass (*Poa pratensis*).
 - b. 30 percent chewings red fescue (*Festuca rubra* variety).
 - c. 10 percent perennial ryegrass (*Lolium perenne*).
 - d. 10 percent redtop (*Agrostis alba*).
 4. Shade: Proportioned by weight as follows:
 - a. 50 percent chewings red fescue (*Festuca rubra* variety).
 - b. 35 percent rough bluegrass (*Poa trivialis*).
 - c. 15 percent redtop (*Agrostis alba*).

2.2 TURFGRASS SOD

- A. Turfgrass Sod: Sod, complying with "Specifications for Turfgrass Sod Materials" in TPI's "Guideline Specifications to Turfgrass Sodding." Furnish viable sod of uniform density, color, and texture, strongly rooted, and capable of vigorous

growth and development when planted. No mesh of any kind shall be permitted within sod.

- B. Turfgrass Species: Sod of grass species as follows, with not less than 95 percent germination, not less than 85 percent pure seed, and not more than 0.5 percent weed seed:
 - 1. Full Sun: Proportioned by weight as follows
 - a. 80 percent turf type tall fescue blend containing a minimum of three cultivars acceptable to the Owner/Landscape Architect.
 - b. 20 percent Kentucky Bluegrass (*Poa pratensis*).
 - 2. Full Sun: Kentucky bluegrass (*Poa pratensis*), a minimum of three cultivars.
 - 3. Sun and Partial Shade: Proportioned by weight as follows:
 - a. 50 percent Kentucky bluegrass (*Poa pratensis*).
 - b. 30 percent chewings red fescue (*Festuca rubra* variety).
 - c. 10 percent perennial ryegrass (*Lolium perenne*).
 - d. 10 percent redtop (*Agrostis alba*).
 - 4. Shade: Proportioned by weight as follows:
 - a. 50 percent chewings red fescue (*Festuca rubra* variety).
 - b. 35 percent rough bluegrass (*Poa trivialis*).
 - c. 15 percent redtop (*Agrostis alba*).

2.3 INORGANIC SOIL AMENDMENTS

- A. Lime: ASTM C 602, agricultural liming material containing a minimum of 80 percent calcium carbonate equivalent and as follows:
 - 1. Class: T, with a minimum of 99 percent passing through No. 8 sieve and a minimum of 75 percent passing through No. 60 sieve.
 - 2. Class: O, with a minimum of 95 percent passing through No. 8 sieve and a minimum of 55 percent passing through No. 60 sieve.
 - 3. Provide lime in form of ground dolomitic limestone.
- B. Sulfur: Granular, biodegradable, containing a minimum of 90 percent sulfur, and with a minimum of 99 percent passing through No. 6 sieve and a maximum of 10 percent passing through No. 40 sieve.
- C. Iron Sulfate: Granulated ferrous sulfate containing a minimum of 20 percent iron and 10 percent sulfur.
- D. Aluminum Sulfate: Commercial grade, unadulterated.
- E. Perlite: Horticultural perlite, soil amendment grade.
- F. Agricultural Gypsum: Minimum 90 percent calcium sulfate, finely ground with 90 percent passing through No. 50 sieve.
- G. Sand: Clean, washed, natural or manufactured, and free of toxic materials.

2.4 ORGANIC SOIL AMENDMENTS

- A. Compost: Well-composted, stable, and weed-free organic matter, pH range of 5.5 to 8; moisture content 35 to 55 percent by weight; 100 percent passing through 3/4-inch sieve; soluble salt content of 5 to 10 decisiemens/m; not exceeding 0.5 percent inert contaminants and free of substances toxic to plantings; and as follows:
 - 1. Organic Matter Content: 50 to 60 percent of dry weight.
 - 2. Feedstock: Agricultural, food, or industrial residuals; biosolids; yard trimmings; or source-separated or compostable mixed solid waste.
- B. Sphagnum Peat: Partially decomposed sphagnum peat moss, finely divided or of granular texture, with a pH range of 3.4 to 4.8.
- C. Muck Peat: Partially decomposed moss peat, native peat, or reed-sedge peat, finely divided or of granular texture, with a pH range of 6 to 7.5, and having a water-absorbing capacity of 1100 to 2000 percent.
- D. Wood Derivatives: Decomposed, nitrogen-treated sawdust, ground bark, or wood waste; of uniform texture and free of chips, stones, sticks, soil, or toxic materials.
 - 1. In lieu of decomposed wood derivatives, mix partially decomposed wood derivatives with ammonium nitrate at a minimum rate of 0.15 lb/cu. ft. of loose sawdust or ground bark, or with ammonium sulfate at a minimum rate of 0.25 lb/cu. ft. of loose sawdust or ground bark.
- E. Manure: Well-rotted, unleached, stable or cattle manure containing not more than 25 percent by volume of straw, sawdust, or other bedding materials; free of toxic substances, stones, sticks, soil, weed seed, and material harmful to plant growth.

2.5 FERTILIZERS

- A. Superphosphate: Commercial, phosphate mixture, soluble; a minimum of 20 percent available phosphoric acid.
- B. Commercial Fertilizer: Commercial-grade complete fertilizer of neutral character, consisting of fast- and slow-release nitrogen, 50 percent derived from natural and/or synthetic organic sources of urea formaldehyde, phosphorous, and potassium in the following composition:
 - 1. Composition: 1 lb/1000 sq. ft. of actual nitrogen, 4 percent phosphorous, and 2 percent potassium, by weight.
 - 2. Composition: Nitrogen, phosphorous, and potassium in amounts recommended in soil reports from a qualified soil-testing laboratory.

2.6 PLANTING SOILS

- A. Planting Soil for trees and shrubs: Existing, in-place surface soil. Verify suitability of existing surface soil to produce viable planting soil. Remove stones, roots, plants, sod, clods, clay lumps, pockets of coarse sand, concrete slurry, concrete layers or chunks, cement, plaster, building debris, and other extraneous materials harmful to plant growth. Mix surface soil with the following soil amendments and fertilizers in the following quantities to produce planting soil:
 - 1. Ratio of Loose Compost to Surface Soil by Volume: 1:4.
 - 2. Weight of Lime per 1000 Sq. Ft.: 150 lbs.
 - 3. Volume of Sand (Plus 10 Percent Diatomaceous Earth) per 10CY:1CY (10% total volume)
 - 4. Weight of Commercial Fertilizer per 1000 Sq. Ft.: 28 lbs.

2.7 MULCHES

- A. Straw Mulch: Provide air-dry, clean, mildew- and seed-free, or threshed straw of wheat, rye, oats, or barley.
- B. Fiber Mulch: Biodegradable, dyed-wood, cellulose-fiber mulch; nontoxic and free of plant-growth or germination inhibitors; with a maximum moisture content of 15 percent and a pH range of 4.5 to 6.5.
- C. Nonasphaltic Tackifier: Colloidal tackifier recommended by fiber-mulch manufacturer for slurry application; nontoxic and free of plant-growth or germination inhibitors.
- D. Asphalt Emulsion: ASTM D 977, Grade SS-1; nontoxic and free of plant-growth or germination inhibitors.

2.8 PESTICIDES

- A. General: Pesticide, registered and approved by EPA, acceptable to authorities having jurisdiction, and of type recommended by manufacturer for each specific problem and as required for Project conditions and application. Do not use restricted pesticides unless authorized in writing by authorities having jurisdiction.
- B. Pre-Emergent Herbicide (Selective and Non-Selective): Effective for controlling the germination or growth of weeds within planted areas at the soil level directly below the mulch layer.
- C. Post-Emergent Herbicide (Selective and Non-Selective): Effective for controlling weed growth that has already germinated.

2.9 EROSION-CONTROL MATERIALS

- A. Erosion-Control Blankets: Biodegradable wood excelsior, straw, or coconut-fiber mat enclosed in a degradable mesh. Include manufacturer's recommended steel wire staples, 6 inches long.
- B. Erosion-Control Fiber Mesh: Biodegradable burlap or spun-coir mesh, a minimum of 0.92 lb/sq. yd., with 50 to 65 percent open area. Include manufacturer's recommended steel wire staples, 6 inches long.
- C. Erosion-Control Mats: Cellular, non-biodegradable slope-stabilization mats designed to isolate and contain small areas of soil over steeply sloped surface, of 3-inch nominal mat thickness. Include manufacturer's recommended anchorage system for slope conditions.
- D. Products: Subject to compliance with requirements available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Invisible Structures, Inc.; Slopetame 2.
 - b. Presto Products Company, a business of Alcoa; Geoweb.
 - c. Tenax Corporation - USA; Tenweb.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas to be planted for compliance with requirements and other conditions affecting performance.
 - 1. Verify that no foreign or deleterious material or liquid such as paint, paint washout, concrete slurry, concrete layers or chunks, cement, plaster, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, or acid has been deposited in soil within a planting area.
 - 2. Do not mix or place soils and soil amendments in frozen, wet, or muddy conditions.
 - 3. Suspend soil spreading, grading, and tilling operations during periods of excessive soil moisture until the moisture content reaches acceptable levels to attain the required results.
 - 4. Uniformly moisten excessively dry soil that is not workable and which is too dusty.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.
- C. If contamination by foreign or deleterious material or liquid is present in soil within a planting area, remove the soil and contamination as directed by Architect and replace with new planting soil.

3.2 PREPARATION

- A. Protect structures, utilities, sidewalks, pavements, and other facilities, trees, shrubs, and plantings from damage caused by planting operations.
 - 1. Protect adjacent and adjoining areas from hydroseeding and hydromulching overspray.
 - 2. Protect grade stakes set by others until directed to remove them.
- B. Install erosion-control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.

3.3 TURF AREA PREPARATION

- A. Limit turf subgrade preparation to areas to be planted.
- B. Newly Graded Subgrades: Loosen subgrade to a minimum depth of 6 inches. Remove stones larger than 1 inch in any dimension and sticks, roots, rubbish, and other extraneous matter and legally dispose of them off Owner's property.
 - 1. Apply superphosphate fertilizer directly to subgrade before loosening.
 - 2. Spread topsoil, apply soil amendments and fertilizer on surface, and thoroughly blend planting soil.
 - a. Delay mixing fertilizer with planting soil if planting will not proceed within a few days.
 - b. Mix lime with dry soil before mixing fertilizer.
 - 3. Spread planting soil to a depth of 6 inches but not less than required to meet finish grades after light rolling and natural settlement. Do not spread if planting soil or subgrade is frozen, muddy, or excessively wet.
 - a. Spread approximately 1/2 the thickness of planting soil over loosened subgrade. Mix thoroughly into top 2 inches of subgrade. Spread remainder of planting soil.
 - b. Reduce elevation of planting soil to allow for soil thickness of sod.
- C. Unchanged Subgrades: If turf is to be planted in areas unaltered or undisturbed by excavating, grading, or surface-soil stripping operations, prepare surface soil as follows:
 - 1. Remove existing grass, vegetation, and turf. Do not mix into surface soil.
 - 2. Loosen surface soil to a depth of at least 6 inches. Apply soil amendments and fertilizers according to planting soil mix proportions and mix thoroughly into top 4 inches of soil. Till soil to a homogeneous mixture of fine texture.
 - a. Apply superphosphate fertilizer directly to surface soil before loosening.
 - 3. Remove stones larger than 1 inch in any dimension and sticks, roots, trash, and other extraneous matter.
 - 4. Legally dispose of waste material, including grass, vegetation, and turf, off Owner's property.

- D. Finish Grading: Grade planting areas to a smooth, uniform surface plane with loose, uniformly fine granular texture. Grade to within plus or minus 1/2 inch of finish elevation. Roll and rake, remove ridges, and fill depressions to meet finish grades. Limit finish grading to areas that can be planted in the immediate future.
- E. Moisten prepared area before planting if soil is dry. Water thoroughly and allow surface to dry before planting. Do not create muddy soil.
- F. Before planting, obtain Architect's acceptance of finish grading; restore planting areas if eroded or otherwise disturbed after finish grading.

3.4 PREPARATION FOR EROSION-CONTROL MATERIALS

- A. Prepare area as specified in "Turf Area Preparation" Article.
- B. For erosion-control mats, install planting soil in two lifts, with second lift equal to thickness of erosion-control mats. Install erosion-control mat and fasten as recommended by material manufacturer.
- C. Fill cells of erosion-control mat with planting soil and compact before planting.
- D. For erosion-control blanket or mesh, install from top of slope, working downward, and as recommended by material manufacturer for site conditions. Fasten as recommended by material manufacturer.
- E. Moisten prepared area before planting if surface is dry. Water thoroughly and allow surface to dry before planting. Do not create muddy soil.

3.5 SEEDING

- A. Sow seed with spreader or seeding machine. Do not broadcast or drop seed when wind velocity exceeds 5 mph. Evenly distribute seed by sowing equal quantities in two directions at right angles to each other.
 - 1. Do not use wet seed or seed that is moldy or otherwise damaged.
 - 2. Do not seed against existing trees. Limit extent of seed to outside edge of planting saucer.
- B. Sow seed at a total rate of 5 to 8 lb/1000 sq. ft.
- C. Rake seed lightly into top 1/8 inch of soil, roll lightly, and water with fine spray.
- D. Protect seeded areas with slopes exceeding 1:4 with erosion-control blankets and 1:6 with erosion-control fiber mesh installed and stapled according to manufacturer's written instructions.

- E. Protect seeded areas with erosion-control mats where shown on Drawings; install and anchor according to manufacturer's written instructions.
- F. Protect seeded areas with slopes not exceeding 1:6 by spreading straw mulch. Spread uniformly at a minimum rate of 2 tons/acre to form a continuous blanket 1-1/2 inches in loose thickness over seeded areas. Spread by hand, blower, or other suitable equipment.
 - 1. Anchor straw mulch by crimping into soil with suitable mechanical equipment.
- G. Protect seeded areas from hot, dry weather or drying winds by applying compost mulch or planting soil within 24 hours after completing seeding operations. Soak areas, scatter mulch uniformly to a thickness of 3/16 inch, and roll surface smooth.

3.6 HYDROSEEDING

- A. Hydroseeding: Mix specified seed, fertilizer, and fiber mulch in water, using equipment specifically designed for hydroseed application. Continue mixing until uniformly blended into homogeneous slurry suitable for hydraulic application.
 - 1. Mix slurry with fiber-mulch manufacturer's recommended tackifier. Slurry to be nonasphaltic.
 - 2. Apply slurry uniformly to all areas to be seeded in a one-step process. Apply slurry at a rate so that mulch component is deposited at not less than 1500-lb/acre dry weight, and seed component is deposited at not less than the specified seed-sowing rate.
 - 3. Apply slurry uniformly to all areas to be seeded in a two-step process. Apply first slurry coat at a rate so that mulch component is deposited at not less than 500-lb/acre dry weight, and seed component is deposited at not less than the specified seed-sowing rate. Apply slurry cover coat of fiber mulch (hydromulching) at a rate of 1000 lb/acre.

3.7 SODDING

- A. Lay sod within 24 hours of harvesting. Do not lay sod if dormant, if ground is frozen or muddy, or if temperatures exceed 85 degrees Fahrenheit.
- B. Lay sod to form a solid mass with tightly fitted joints. Butt ends and sides of sod; do not stretch or overlap. Stagger sod strips or pads to offset joints in adjacent courses. Avoid damage to subgrade or sod during installation. Tamp and roll lightly to ensure contact with subgrade, eliminate air pockets, and form a smooth surface. Work sifted soil or fine sand into minor cracks between pieces of sod; remove excess to avoid smothering sod and adjacent grass.
 - 1. Lay sod across angle of slopes exceeding 1:3.

2. Anchor sod on slopes exceeding 1:6 with wood pegs spaced as recommended by sod manufacturer but not less than 2 anchors per sod strip to prevent slippage.
- C. Saturate sod with fine water spray within two hours of planting. During first week after planting, water daily or more frequently as necessary to maintain moist soil to a minimum depth of 1-1/2 inches below sod.

3.8 TURF RENOVATION

- A. Renovate existing turf.
- B. Renovate existing turf damaged by Contractor's operations, such as storage of materials or equipment and movement of vehicles.
1. Reestablish turf where settlement or washouts occur or where minor regrading is required.
 2. Install new planting soil as required.
- C. Remove sod and vegetation from diseased or unsatisfactory turf areas; do not bury in soil.
- D. Remove topsoil containing foreign materials such as oil drippings, fuel spills, stones, gravel, and other construction materials resulting from Contractor's operations, and replace with new planting soil.
- E. Mow, loosen surface, dethatch, core aerate, and rake existing turf.
- F. Remove weeds before seeding. Where weeds are extensive, apply selective herbicides as required. Do not use pre-emergence herbicides.
- G. Remove waste and foreign materials, including weeds, soil cores, grass, vegetation, and turf, and legally dispose of them off Owner's property.
- H. Till stripped, bare, and compacted areas thoroughly to a soil depth of 4-6" inches.
- I. Apply soil amendments and initial fertilizers required for establishing new turf and mix thoroughly into top 4 inches of existing soil. Install new planting soil to fill low spots and meet finish grades.
- J. Apply seed and protect with straw mulch as required for new turf.
- K. Water newly planted areas and keep moist until new turf is established.

3.9 TURF MAINTENANCE

- A. Maintain and establish turf by watering, fertilizing, weeding, mowing, trimming, replanting, and performing other operations as required to establish healthy, viable turf. Roll, regrade, and replant bare or eroded areas and remulch to produce a uniformly smooth turf. Provide materials and installation the same as those used in the original installation.
 - 1. Fill in as necessary soil subsidence that may occur because of settling or other processes. Replace materials and turf damaged or lost in areas of subsidence.
 - 2. In areas where mulch has been disturbed by wind or maintenance operations, add new mulch and anchor as required to prevent displacement.
 - 3. Apply treatments as required to keep turf and soil free of pests and pathogens or disease. Use integrated pest management practices whenever possible to minimize the use of pesticides and reduce hazards.

- B. Watering: Install and maintain temporary piping, hoses, and turf-watering equipment to convey water from sources and to keep turf uniformly moist to a depth of 4 inches.
 - 1. Schedule watering to prevent wilting, puddling, erosion, and displacement of seed or mulch. Lay out temporary watering system to avoid walking over muddy or newly planted areas.
 - 2. Water turf with fine spray at a minimum rate of 1 inch per week unless rainfall precipitation is adequate.

- C. Mow turf as soon as top growth is tall enough to cut. Repeat mowing to maintain specified height without cutting more than 1/3 of grass height. Remove no more than 1/3 of grass-leaf growth in initial or subsequent mowings. Do not delay mowing until grass blades bend over and become matted. Do not mow when grass is wet. Schedule initial and subsequent mowings to maintain the following grass height:
 - 1. Mow turf-type tall fescue to a height of 2 to 3 inches.

- D. Turf Postfertilization: Apply fertilizer after initial mowing and when grass is dry.
 - 1. Use fertilizer that will provide actual nitrogen of at least 1 lb/1000 sq. ft. to turf area.

3.10 SATISFACTORY TURF

- A. Turf installations shall meet the following criteria as determined by Architect:
 - 1. Satisfactory Seeded Turf: At end of maintenance period, a healthy, uniform, close stand of grass has been established, free of weeds and surface irregularities, with coverage exceeding 90 percent over any 10 sq. ft. and bare spots not exceeding 5 by 5 inches.
 - 2. Satisfactory Sodded Turf: At end of maintenance period, a healthy, well-rooted, even-colored, viable turf has been established, free of weeds, open joints, bare areas, and surface irregularities.

3. Satisfactory Plugged Turf: At end of maintenance period, the required number of plugs has been established as well-rooted, viable patches of grass, and areas between plugs are free of weeds and other undesirable vegetation.
 4. Satisfactory Sprigged Turf: At end of maintenance period, the required number of sprigs has been established as well-rooted, viable plants, and areas between sprigs are free of weeds and other undesirable vegetation.
- B. Use specified materials to reestablish turf that does not comply with requirements and continue maintenance until turf is satisfactory.

3.11 PESTICIDE APPLICATION

- A. Apply pesticides and other chemical products and biological control agents in accordance with requirements of authorities having jurisdiction and manufacturer's written recommendations. Coordinate applications with Owner's operations and others in proximity to the Work. Notify Owner before each application is performed.
- B. Post-Emergent Herbicides (Selective and Non-Selective): Apply only as necessary to treat already-germinated weeds and in accordance with manufacturer's written recommendations.

3.12 CLEANUP AND PROTECTION

- A. Promptly remove soil and debris created by turf work from paved areas. Clean wheels of vehicles before leaving site to avoid tracking soil onto roads, walks, or other paved areas.
- B. Erect temporary fencing or barricades and warning signs as required to protect newly planted areas from traffic. Maintain fencing and barricades throughout initial maintenance period and remove after plantings are established.
- C. Remove non-degradable erosion-control measures after grass establishment period.

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SECTION 02930

PLANTINGS

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

- A. Provide all labor, materials, equipment, and services required for installation and maintenance of planting beds, plants, tree anchoring, landscape edging material and accessories as shown on the Drawings and required by the Specifications.

1.2 RELATED WORK SPECIFIED ELSEWHERE

- A. Drawings and General Provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to Work of this Section.
- B. Earthwork: Section 02300
- C. Erosion and Sedimentation Control: Section 02370

1.3 DEFINITIONS

- A. Backfill: The earth used to replace or the act of replacing earth in an excavation.
- B. Balled and Burlapped Stock: Plants dug with firm, natural balls of earth in which they were grown, with ball size not less than sizes indicated; wrapped with natural or untreated burlap, tied, rigidly supported, and drum laced with natural biodegradable twin, jute and or wire basket with the root flare visible at the surface of the ball as recommended by ANSI Z60.1.
- C. Balled and Potted Stock: Plants dug with firm, natural balls of earth in which they are grown and placed, unbroken, in a container. Ball size is not less than sizes indicated.
- D. Bare-Root Stock: Plants with a well-branched, fibrous-root system developed by transplanting or root pruning, with soil or growing medium removed, and with not less than minimum root spread according to ANSI Z60.1 for type and size of plant required.
- E. Container-Grown Stock: Healthy, vigorous, well-rooted plants grown in a container, with a well-established root system reaching sides of container and maintaining a firm ball when removed from container. Container shall be rigid

enough to hold ball shape and protect root mass during shipping and be sized according to ANSI Z60.1 for type and size of plant required.

- F. Duff Layer: The surface layer of native topsoil that is composed of mostly decayed leaves, twigs, and detritus.
- G. Fabric Bag-Grown Stock: Healthy, vigorous, well-rooted plants established and grown in-ground in a porous fabric bag with well-established root system reaching sides of fabric bag. Fabric bag size is not less than diameter, depth, and volume required by ANSI Z60.1 for type and size of plant.
- H. Finish Grade: Elevation of finished surface of planting soil.
- I. Manufactured Topsoil: Soil produced off-site by homogeneously blending mineral soils or sand with stabilized organic soil amendments to produce topsoil or planting soil.
- J. Pesticide: A substance or mixture intended for preventing, destroying, repelling, or mitigating a pest. This includes insecticides, miticides, herbicides, fungicides, rodenticides, and molluscicides. It also includes substances or mixtures intended for use as a plant regulator, defoliant, or desiccant.
- K. Pests: Living organisms that occur where they are not desired, or that cause damage to plants, animals, or people. These include insects, mites, grubs, mollusks (snails and slugs), rodents (gophers, moles, and mice), unwanted plants (weeds), fungi, bacteria, and viruses.
- L. Planting Area: Areas to be planted.
- M. Planting Soil: Standardized topsoil; existing, native surface topsoil; existing, in-place surface soil; imported topsoil; or manufactured topsoil that is modified with soil amendments and perhaps fertilizers to produce a soil mixture best for plant growth.
- N. Plant; Plants; Plant Material: These terms refer to vegetation in general, including trees, shrubs, vines, ground covers, ornamental grasses, bulbs, corms, tubers, or herbaceous vegetation.
- O. Root Flare: Also called "trunk flare." The area at the base of the plant's stem or trunk where the stem or trunk broadens to form roots; the area of transition between the root system and the stem or trunk.
- P. Stem Girdling Roots: Roots that encircle the stems (trunks) of trees below the soil surface.
- Q. Subgrade: Surface or elevation of subsoil remaining after excavation is complete, or the top surface of a fill or backfill before planting soil is placed.

- R. Subsoil: All soil beneath the topsoil layer of the soil profile, and typified by the lack of organic matter and soil organisms.
- S. Surface Soil: Soil that is present at the top layer of the existing soil profile at the Project site. In undisturbed areas, the surface soil is typically topsoil; but in disturbed areas such as urban environments, the surface soil can be subsoil.
- T. Planting Completion: The date of completion of all work related to a specific project including installation of plants, lawns and grasses, etc.

1.3 INSPECTION FOR ACCEPTANCE

- A. The Inspection of the Work:
 - 1. The inspection of the work of plantings to determine the completion of contract work exclusive of the possible replacement of plants, will be made by the Architect/Engineer upon written notice requesting such inspection submitted by the Contractor at least ten (10) days prior to the anticipated date.
- B. Acceptance:
 - 1. After inspection, the Contractor will be notified in writing by the Owner of acceptance of all work of this Section, exclusive of the possible replacement of plants subject to guaranty, or if there are any deficiencies of the requirements of completion of the Work.

1.4 WARRANTY

- A. Special Warranty: Installer agrees to repair or replace plantings and accessories that fail in materials, workmanship, or growth within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Death and unsatisfactory growth, except for defects resulting from abuse, lack of adequate maintenance, or neglect by Owner, or incidents that are beyond Contractor's control.
 - b. Structural failures including plantings falling or blowing over.
 - c. Faulty performance of tree stabilization.
 - d. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
 - 2. Warranty Periods from Date of Planting Completion:
 - a. Trees, Shrubs, Vines, and Ornamental Grasses: 24 months.
 - b. Ground Covers, Biennials, Perennials, and Other Plants: 24 months.
 - c. Annuals: Three months.

3. Include the following remedial actions as a minimum:
 - a. Immediately remove dead plants and replace unless required to plant in the succeeding planting season.
 - b. Replace plants that are more than 10-15% percent dead or in an unhealthy condition at end of warranty period.
 - c. A limit of one replacement of each plant will be required except for losses or replacements due to failure to comply with requirements.
 - d. Provide extended warranty for period equal to original warranty period, for replaced plant material.

PART 2 - SUBMITTALS

- A. Product Data: For each type of product indicated, including soils.
 1. Plant Materials: Include quantities, sizes, quality, and sources for plant materials.
 2. Pesticides and Herbicides: Include product label and manufacturer's application instructions specific to the Project.
 3. Plant Photographs: Include color photographs in digital format of each required species and size of plant material as it will be furnished to the Project. Take photographs from an angle depicting true size and condition of the typical plant to be furnished. Include a scale rod or other measuring device in each photograph. For species where more than 20 plants are required, include a minimum of three photographs showing the average plant, the best quality plant, and the worst quality plant to be furnished. Identify each photograph with the full scientific name of the plant, plant size, and name of the growing nursery.
- B. Samples for Verification: For each of the following:
 1. Trees and Shrubs: Three samples of each variety and size delivered to the site for review. Maintain approved samples on-site as a standard for comparison.
 2. Organic Mulch: 1-pint volume of each organic mulch required; in sealed plastic bags labeled with composition of materials by percentage of weight and source of mulch. Each Sample shall be typical of the lot of material to be furnished; provide an accurate representation of color, texture, and organic makeup.
- C. Qualification Data: For qualified landscape Installer. Include list of similar projects completed by Installer demonstrating Installer's capabilities and experience. Include project names, addresses, and year completed, and include names and addresses of owners' contact persons.

- D. Product Certificates: For each type of manufactured product, from manufacturer, and complying with the following:
 - 1. Manufacturer's certified analysis of standard products.
 - 2. Analysis of other materials by a recognized laboratory made according to methods established by the Association of Official Analytical Chemists, where applicable.
- E. Material Test Reports: For imported topsoil.
- F. Maintenance Instructions: Recommended procedures including watering, fertilizer, pruning, disease control, etc. to be established by Owner for maintenance of plants during a calendar year. Submit before start of required maintenance periods.

PART 3 – QUALITY ASSURANCE

3.1 QUALIFICATIONS

- A. Installer Qualifications: A qualified landscape Installer whose work has resulted in successful establishment of plants.
 - 1. Professional Membership: Installer shall be a member in good standing of either the Professional Landcare Network or the American Nursery and Landscape Association.
 - 2. Experience: Five years' experience in landscape installation similar in scale and scope to the requirements of this Project
 - 3. Installer's Field Supervision: Require Installer to maintain an experienced full-time supervisor on Project site when work is in progress.
 - 4. Personnel Certifications: Installer's field supervisor shall have certification in one of the following categories from the Professional Landcare Network:
 - a. Certified Landscape Technician - Exterior, with installation and maintenance, specialty area(s), designated CLT-Exterior.
 - b. Certified Ornamental Landscape Professional, designated COLP.
 - c. Certified ISA Arborist
 - 5. Pesticide Applicator: State licensed, commercial.
 - 6. Maintenance Proximity: Not more than two hours' normal travel time from Installer's place of business to Project site.
- B. Soil-Testing Laboratory Qualifications: An independent or university laboratory, recognized by the State Department of Agriculture, with the experience and capability to conduct the testing indicated and that specializes in types of tests to be performed.

- C. Soil Analysis: For each unamended soil type, furnish soil analysis and a written report by a qualified soil-testing laboratory stating percentages of organic matter; gradation of sand, silt, and clay content; cation exchange capacity; deleterious material; pH; and mineral and plant-nutrient content of the soil.
1. Testing methods and written recommendations shall comply with USDA's Handbook No. 60.
 2. The soil-testing laboratory shall oversee soil sampling; with depth, location, and number of samples to be taken per instructions from Landscape Architect. A minimum of five representative samples shall be taken from varied locations for each soil to be used or amended for planting purposes.
 3. Report suitability of tested soil for plant growth.
 - a. Based upon the test results, state recommendations for soil treatments and soil amendments to be incorporated. State recommendations in weight per 1000 sq. ft. or volume per cu. yd. for nitrogen, phosphorus, and potash nutrients and soil amendments to be added to produce satisfactory planting soil suitable for healthy, viable plants.
 - b. Report presence of problem salts, minerals, or heavy metals, including aluminum, arsenic, barium, cadmium, chromium, cobalt, lead, lithium, and vanadium. If such problem materials are present, provide additional recommendations for corrective action.

3.2 DELIVERY, STORAGE, AND HANDLING

- A. Packaged Materials: Deliver packaged materials in original, unopened containers showing weight, certified analysis, name and address of manufacturer, and indication of conformance with state and federal laws if applicable.
- B. Bulk Materials:
1. Do not dump or store bulk materials near structures, utilities, walkways and pavements, or on existing turf areas or plants.
 2. Provide erosion-control measures to prevent erosion or displacement of bulk materials, discharge of soil-bearing water runoff, and airborne dust reaching adjacent properties, water conveyance systems, or walkways.
 3. Accompany each delivery of bulk fertilizers, lime, and soil amendments with appropriate certificates.
- C. Do not prune trees and shrubs before delivery. Protect bark, branches, and root systems from sun scald, drying, wind burn, sweating, whipping, and other handling and tying damage. Do not bend or bind-tie trees or shrubs in such a

manner as to destroy their natural shape. Provide protective covering of plants during shipping and delivery. Do not drop plants during delivery and handling.

- D. Handle planting stock by root ball.
- E. Store bulbs, corms, and tubers in a dry place at 60 to 65 deg F until planting.
- F. Deliver plants after preparations for planting have been completed, and install immediately. If planting is delayed more than six hours after delivery, set plants and trees in their appropriate aspect (sun, filtered sun, or shade), protect from weather and mechanical damage, and keep roots moist.
 - 1. Heel-in bare-root stock. Soak roots that are in dry condition in water for two hours. Reject dried-out plants.
 - 2. Set balled stock on ground and cover ball with soil, peat moss, sawdust, or other acceptable material.
 - 3. Do not remove container-grown stock from containers before time of planting.
 - 4. Water root systems of plants stored on-site deeply and thoroughly with a fine-mist spray. Water as often as necessary to maintain root systems in a moist, but not overly-wet condition.

3.3 PROJECT CONDITIONS

- A. Field Measurements: Verify actual grade elevations, service and utility locations, irrigation system components, and dimensions of plantings and construction contiguous with new plantings by field measurements before proceeding with planting work.
- B. Interruption of Existing Services or Utilities: Do not interrupt services or utilities to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary services or utilities according to requirements indicated:
 - 1. Notify Owner no fewer than two days in advance of proposed interruption of each service or utility.
 - 2. Do not proceed with interruption of services or utilities without Owner's written permission.
- C. Planting Restrictions: Plant during one of the following periods unless otherwise authorized by Owner/Landscape Architect. Coordinate planting periods with maintenance periods to provide required maintenance from date of Substantial Completion.
 - 1. Spring Planting: March 1st to May 15th.
 - 2. Fall Planting: October 15th to December 1st.

- D. Weather Limitations: Proceed with planting only when existing and forecasted weather conditions permit planting to be performed when beneficial and optimum results may be obtained. Apply products during favorable weather conditions according to manufacturer's written instructions and warranty requirements.
- E. Coordination with Turf Areas (Lawns): Plant trees, shrubs, and other plants after finish grades are established and before planting turf areas unless otherwise indicated.
 - 1. When planting trees, shrubs, and other plants after planting turf areas, protect turf areas, and promptly repair damage caused by planting operations.

PART 4 – PRODUCTS

4.1 WATER

- A. Water used in this work shall be suitable for irrigation and free from ingredients harmful to plant life.
- B. Hose and other watering equipment required for the Work shall be furnished by the Contractor.

4.2 TOPSOIL

- A. The Contractor shall furnish and place sufficient topsoil for the installation of trees, shrubs, and other plants.
 - 1. Topsoil Source: Reuse surface soil stockpiled on-site. Verify suitability of stockpiled surface soil to produce topsoil. Clean surface soil of roots, plants, sod, stones, clay lumps, and other extraneous materials harmful to plant growth.
 - a. Supplement with imported or manufactured topsoil from off-site sources when quantities are insufficient. Obtain topsoil displaced from naturally well-drained sites where topsoil occurs at least 4 inches deep

4.3 PLANT MATERIAL

- A. General: Furnish nursery-grown plants true to genus, species, variety, cultivar, stem form, shearing, and other features indicated in Plant Schedule or Plant Legend shown on Drawings and complying with ANSI Z60.1; and with healthy

root systems developed by transplanting or root pruning. Provide well-shaped, fully branched, healthy, vigorous stock, densely foliated when in leaf and free of disease, pests, eggs, larvae, and defects such as knots, sun scald, injuries, abrasions, and disfigurement.

1. Trees with damaged, crooked, or multiple leaders; tight vertical branches where bark is squeezed between two branches or between branch and trunk ("included bark"); crossing trunks; cut-off limbs more than 3/4 inch in diameter; or with stem girdling roots will be rejected.
 2. Collected Stock: Do not use plants harvested from the wild, from native stands, from an established landscape planting, or not grown in a nursery unless otherwise indicated.
 3. All plant material shall be grown in zone 5 or zone 6.
- B. Provide plants of sizes, grades, and ball or container sizes complying with ANSI Z60.1 for types and form of plants required. Plants of a larger size may be used if acceptable to Architect, with a proportionate increase in size of roots or balls.
- C. Root-Ball Depth: Furnish trees and shrubs with root balls measured from top of root ball, which shall begin at root flare according to ANSI Z60.1. Root flare shall be visible before planting.
- D. Labeling: Label each plant of each variety, size, and caliper with a securely attached, waterproof tag bearing legible designation of common name and full scientific name, including genus and species. Include nomenclature for hybrid, variety, or cultivar, if applicable for the plant as shown on Drawings.
- E. If formal arrangements or consecutive order of plants is shown on Drawings, select stock for uniform height and spread, and number the labels to assure symmetry in planting.

4.4 INORGANIC SOIL AMENDMENTS

- A. Lime: ASTM C 602, agricultural liming material containing a minimum of 80 percent calcium carbonate equivalent and as follows:
1. Class: T, with a minimum of 99 percent passing through No. 8 sieve and a minimum of 75 percent passing through No. 60 sieve.
 2. Class: O, with a minimum of 95 percent passing through No. 8 sieve and a minimum of 55 percent passing through No. 60 sieve.
 3. Provide lime in form of ground dolomitic limestone.
- B. Sulfur: Granular, biodegradable, and containing a minimum of 90 percent sulfur, with a minimum of 99 percent passing through No. 6 sieve and a maximum of 10 percent passing through No. 40 sieve.

- C. Iron Sulfate: Granulated ferrous sulfate containing a minimum of 20 percent iron and 10 percent sulfur.
- D. Aluminum Sulfate: Commercial grade, unadulterated.
- E. Perlite: Horticultural perlite, soil amendment grade.
- F. Agricultural Gypsum: Minimum 90 percent calcium sulfate, finely ground with 90 percent passing through No. 50 sieve.
- G. Sand: Clean, washed, natural or manufactured, and free of toxic materials.
- H. Diatomaceous Earth: Calcined, 90 percent silica, with approximately 140 percent water absorption capacity by weight.
- I. Zeolites: Mineral clinoptilolite with at least 60 percent water absorption by weight.

4.5 ORGANIC SOIL AMENDMENTS

- A. Compost: Well-composted, stable, and weed-free organic matter, pH range of 5.5 to 8; moisture content 35 to 55 percent by weight; 100 percent passing through 3/4-inch sieve; soluble salt content of 5 to 10 decisiemens/m; not exceeding 0.5 percent inert contaminants and free of substances toxic to plantings; and as follows:
 - 1. Organic Matter Content: 50 to 60 percent of dry weight.
 - 2. Feedstock: Agricultural, food, or industrial residuals; biosolids; yard trimmings; or source-separated or compostable mixed solid waste.
- B. Sphagnum Peat: Partially decomposed sphagnum peat moss, finely divided or granular texture, with a pH range of 3.4 to 4.8.
- C. Manure: Well-rotted, unleached, stable or cattle manure containing not more than 25 percent by volume of straw, sawdust, or other bedding materials; free of toxic substances, stones, sticks, soil, weed seed, debris, and material harmful to plant growth.
- D. Mycorrhizal Fungi: Dry, granular inoculant containing at least 5300 spores per lb of vesicular-arbuscular mycorrhizal fungi and 95 million spores per lb of ectomycorrhizal fungi, 33 percent hydrogel, and a maximum of 5.5 percent inert material.

4.6 FERTILIZERS

- A. Bonemeal: Commercial, raw or steamed, finely ground; a minimum of 1 percent nitrogen and 10 percent phosphoric acid.
- B. Slow-Release Fertilizer: Granular or pelleted fertilizer consisting of 50 percent water-insoluble nitrogen, phosphorus, and potassium in the following composition:
 - 1. Composition: 20 percent nitrogen, 10 percent phosphorous, and 10 percent potassium, by weight.
 - 2. Composition: Nitrogen, phosphorous, and potassium in amounts recommended in soil reports from a qualified soil-testing laboratory.

4.7 PLANTING SOILS

- A. Planting Soil: Imported topsoil complying with ASTM D5268, a pH range of 5.5 to 7, a minimum of 4 percent organic content and from off-site sources. Obtain topsoil displaced from naturally well-drained construction or mining sites where topsoil occurs at least 4 inches deep; do not obtain from agricultural land, bogs, or marshes.
 - 1. Additional Properties of Imported Topsoil: Screened and free of stones 1 inch or larger in any dimension; free of roots, plants, sod, clods, clay lumps, pockets of coarse sand, paint, paint washout, concrete slurry, concrete layers or chunks, cement, plaster, building debris, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, acid, and other extraneous materials harmful to plant growth; free of obnoxious weeds and invasive plants including quackgrass, Johnsongrass, poison ivy, nutsedge, nimblewill, Canada thistle, bindweed, bentgrass, wild garlic, ground ivy, perennial sorrel, and bromegrass; not infested with nematodes; grubs; or other pests, pest eggs, or other undesirable organisms and disease-causing plant pathogens; friable and with sufficient structure to give good tilth and aeration. Continuous, air-filled pore space content on a volume/volume basis shall be at least 15 percent when moisture is present at field capacity. Soil shall have a field capacity of at least 15 percent on a dry weight basis.
 - 2. Stones may comprise no more than 10 percent of the total soil volume.
 - 3. Mix imported topsoil with the following soil amendments [and fertilizers] in the following quantities to produce planting soil:
 - a. Ratio of Loose Compost to Topsoil by Volume: 1:3.
 - b. Weight of Lime per 1000 Sq. Ft 40lbs.

- c. Volume of Washed Natural Course Sand per 1000 Sq. Ft.: 10 percent
 - 1) Mortar sand will not be permitted
 - d. Mycorrhizal fungi
4. Contractor may be permitted to amend imported topsoil in different proportions to produce satisfactory planting soil, depending on tests of imported or manufactured soils.

4.8 MULCHES

- A. Organic Mulch: Free from deleterious materials and suitable as a top dressing of trees and shrubs, consisting of one of the following:
 - 1. Type: Shredded hardwood bark.
 - 2. Size Range: 2 inches maximum, 1/2 inch minimum.
 - 3. Color: Natural.

4.9 PESTICIDES

- A. General: Pesticide registered and approved by EPA, acceptable to authorities having jurisdiction, and of type recommended by manufacturer for each specific problem and as required for Project conditions and application. Do not use restricted pesticides unless authorized in writing by authorities having jurisdiction.
- B. Pre-Emergent Herbicide (Selective and Non-Selective): Effective for controlling the germination or growth of weeds within planted areas at the soil level directly below the mulch layer.
- C. Post-Emergent Herbicide (Selective and Non-Selective): Effective for controlling weed growth that has already germinated.

4.10 LANDSCAPE EDGINGS

- A. General: Wood or plastic edging material is not permitted. Only steel or aluminum edging materials will be incorporated into the work.
- B. Steel Edging: Standard commercial-steel edging, rolled edge, fabricated in sections of standard lengths, with loops stamped from or welded to face of sections to receive stakes.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Border Concepts, Inc.
 - b. Collier Metal Specialties, Inc.
 - c. Russell, J. D. Company (The).
 - d. Sure-Loc Edging Corporation.
 2. Edging Size: 1/4 inch wide by 5 inches deep.
 3. Stakes: Tapered steel, a minimum of 12 inches long.
 4. Accessories: Standard tapered ends, corners, and splicers.
 5. Finish: Standard paint.
 6. Paint Color: Black.
- C. Aluminum Edging: Standard-profile extruded-aluminum edging, ASTM B 221, Alloy 6063-T6, fabricated in standard lengths with interlocking sections with loops stamped from face of sections to receive stakes.
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Curv-Rite, Inc.
 - b. Permaloc Corporation.
 - c. Russell, J. D. Company (The).
 - d. Sure-Loc Edging Corporation.
 2. Edging Size: 3/16 inch wide by 5-1/2 inches deep.
 3. Stakes: Aluminum, ASTM B 221, Alloy 6061-T6, approximately 1-1/2 inches wide by 12 inches long.
 4. Finish: Manufacturer's standard paint.
 5. Paint Color: Black.

4.11 TREE STABILIZATION MATERIALS

A. Stakes and Guys:

1. Upright and Guy Stakes: Rough-sawn, sound, new hardwood, free of knots, holes, cross grain, and other defects, 2-by-2-inch nominal by length indicated, pointed at one end.
2. Flexible Ties: Wide rubber or elastic bands or straps of length required to reach stakes or turnbuckles.
3. Tree-Tie Webbing: UV-resistant polypropylene.
4. Retain first subparagraph below for tall and large-caliper trees.

5. Proprietary Staking-and-Guying Devices: Proprietary stake and adjustable tie systems to secure each new planting by plant stem; sized as indicated and per manufacturer's written recommendations.
 - a. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - 1) Arborbrace; ArborBrace Tree Guying System.
 - 2) Decorations for Generations, Inc.; Reddy Stake or Mega Stake System.

PART 5 - EXECUTION

5.1 EXAMINATION

- A. Examine areas to receive plants for compliance with requirements and conditions affecting installation and performance.
 1. Verify that no foreign or deleterious material or liquid such as paint, paint washout, concrete slurry, concrete layers or chunks, cement, plaster, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, or acid has been deposited in soil within a planting area.
 2. Do not mix or place soils and soil amendments in frozen, wet, or muddy conditions.
 3. Suspend soil spreading, grading, and tilling operations during periods of excessive soil moisture until the moisture content reaches acceptable levels to attain the required results.
 4. Uniformly moisten excessively dry soil that is not workable and which is too dusty.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.
- C. If contamination by foreign or deleterious material or liquid is present in soil within a planting area, remove the soil and contamination as directed by Architect and replace with new planting soil.

5.2 PREPARATION

- A. Lay out individual tree and shrub locations and areas for multiple plantings. Stake locations, outline areas, adjust locations when requested, and obtain Architect's acceptance of layout before excavating or planting. Make minor adjustments as required.

- B. Apply anti-desiccant to trees and shrubs using power spray to provide an adequate film over trunks (before wrapping), branches, stems, twigs, and foliage to protect during digging, handling, and transportation.
 - 1. If deciduous trees or shrubs are moved in full leaf, spray with anti-desiccant at nursery before moving and again two weeks after planting.
- C. Wrap trees and shrubs with burlap fabric over trunks, branches, stems, twigs, and foliage to protect from wind and other damage during digging, handling, and transportation.

5.3 PLANTING AREA ESTABLISHMENT

- A. Loosen sub-grade of planting areas to a minimum depth of 6 inches. Remove stones larger than 1 inch in any dimension and sticks, roots, rubbish, and other extraneous matter and legally dispose of them off Owner's property.
 - 1. Spread topsoil, apply soil amendments, fertilizer, and mycorrhizal fungi on surface, and thoroughly blend planting soil.
 - a. Delay mixing fertilizer with planting soil if planting will not proceed within a few days.
 - b. Mix lime with dry soil before mixing fertilizer.
 - 2. Spread planting soil to a depth of 12 inches but not less than required to meet finish grades after natural settlement. Do not spread if planting soil or subgrade is frozen, muddy, or excessively wet.
 - a. Spread approximately one-half the thickness of planting soil over loosened subgrade. Mix thoroughly into top 2 inches of subgrade. Spread remainder of planting soil.
- B. Finish Grading: Grade planting areas to a smooth, uniform surface plane with loose, uniformly fine texture. Roll and rake, remove ridges, and fill depressions to meet finish grades.
- C. Before planting, obtain Architect's acceptance of finish grading; restore planting areas if eroded or otherwise disturbed after finish grading.
- D. Application of mycorrhizal fungi: broadcast dry product uniformly over prepared soil at application rate indicated per product supplier.

5.4 EXCAVATION FOR TREES AND SHRUBS

- A. Planting Pits and Trenches: Excavate circular planting pits with sides sloping inward at a 30-45 degree angle. Excavations with vertical sides are not

acceptable. Trim perimeter of bottom leaving center area of bottom raised slightly to support root ball and assist in drainage away from center. Do not further disturb base. Ensure that root ball will sit on undisturbed base soil to prevent settling. Scarify sides of planting pit smeared or smoothed during excavation.

1. Excavate approximately three times as wide as ball diameter for balled and burlapped, balled and potted or container-grown stock.
 2. Excavate at least 12 inches wider than root spread and deep enough to accommodate vertical roots for bare-root stock.
 3. Do not excavate deeper than depth of the root ball, measured from the root flare to the bottom of the root ball.
 4. If area under the plant was initially dug too deep, add soil to raise it to the correct level and thoroughly tamp the added soil to prevent settling.
 5. Maintain required angles of repose of adjacent materials as shown on the Drawings. Do not excavate subgrades of adjacent paving, structures, hardscapes, or other new or existing improvements.
 6. Maintain supervision and protection of excavations at all times during the project.
 7. Keep excavations covered or otherwise protected when unattended by Installer's personnel.
 8. If drain tile is shown on Drawings or required under planting areas, excavate to top of porous backfill over tile.
- B. Subject to the acceptance of the Landscape Architect or Owner, subsoil and topsoil removed from excavations may be used as planting soil.
- C. Obstructions: Notify Landscape Architect if unexpected rock or obstructions detrimental to trees or shrubs are encountered in excavations.
1. Hardpan Layer: Drill 6-inch- diameter holes, 24 inches apart, into free-draining strata or to a depth of 10 feet, whichever is less, and backfill with free-draining material.
- D. Fill excavations with water and allow to percolate away before positioning trees and shrubs.
- E. Drainage: Notify Architect if subsoil conditions evidence unexpected water seepage or retention in tree or shrub planting pits.

5.5 TREE, SHRUB, AND VINE PLANTING

- A. Before planting, verify that root flare is visible at top of root ball according to ANSI Z60.1. If root flare is not visible, remove soil in a level manner from the root ball to where the top-most root emerges from the trunk. After soil removal to expose the root flare, verify that root ball still meets size requirements.

- B. Remove stem girdling roots and kinked roots on bare rooted plant material. Remove injured roots by cutting cleanly; do not break.
- C. Set balled and burlapped stock plumb and in center of planting pit or trench with root flare 1 inch above adjacent finish grades.
 - 1. Use planting soil for backfill.
 - 2. After placing some backfill around root ball to stabilize plant, carefully cut and remove burlap, rope, and wire baskets from tops of root balls and from sides, but do not remove from under root balls. Remove pallets, if any, before setting. Do not use planting stock if root ball is cracked or broken before or during planting operation.
 - 3. Backfill around root ball in layers, tamping to settle soil and eliminate voids and air pockets. When planting pit is approximately one-half filled, water thoroughly before placing remainder of backfill. Repeat watering until no more water is absorbed.
 - 4. Place planting tablets in each planting pit when pit is approximately one-half filled; in amounts specified in soil reports from soil-testing laboratory. Place tablets beside the root ball about 1 inch from root tips; do not place tablets in bottom of the hole.
 - 5. Continue backfilling process. Water again after placing and tamping final layer of soil.
- D. Set balled and potted or container-grown stock plumb and in center of planting pit or trench with root flare 1 inch above adjacent finish grades.
 - 1. Use planting soil for backfill.
 - 2. Carefully remove root ball from container without damaging root ball or plant.
 - 3. Backfill around root ball in layers, tamping to settle soil and eliminate voids and air pockets. When planting pit is approximately one-half filled, water thoroughly before placing remainder of backfill. Repeat watering until no more water is absorbed.
 - 4. Place planting tablets in each planting pit when pit is approximately one-half filled; in amounts recommended in soil reports from soil-testing laboratory. Place tablets beside the root ball about 1 inch from root tips; do not place tablets in bottom of the hole.
 - 5. Continue backfilling process. Water again after placing and tamping final layer of soil.
- E. Set fabric bag-grown stock plumb and in center of planting pit or trench with root flare 1 inch above adjacent finish grades.
 - 1. Use planting soil for backfill.
 - 2. Carefully remove root ball from fabric bag without damaging root ball or plant. Do not use planting stock if root ball is cracked or broken before or during planting operation.

3. Backfill around root ball in layers, tamping to settle soil and eliminate voids and air pockets. When planting pit is approximately one-half filled, water thoroughly before placing remainder of backfill. Repeat watering until no more water is absorbed.
 4. Place planting tablets in each planting pit when pit is approximately one-half filled; in amounts recommended in soil reports from soil-testing laboratory. Place tablets beside the root ball about 1 inch from root tips; do not place tablets in bottom of the hole.
 5. Continue backfilling process. Water again after placing and tamping final layer of soil.
- F. Set and support bare-root stock in center of planting pit or trench with root flare 1 inch above adjacent finish grade.
1. Use planting soil for backfill.
 2. Spread roots without tangling or turning toward surface, and carefully work backfill around roots by hand. Puddle with water until backfill layers are completely saturated. Plumb before backfilling, and maintain plumb while working backfill around roots and placing layers above roots.
 3. Place planting tablets in each planting pit when pit is approximately one-half filled; in amounts recommended in soil reports from soil-testing laboratory. Place tablets beside soil-covered roots about 1 inch from root tips; do not place tablets in bottom of the hole or touching the roots.
 4. Continue backfilling process. Water again after placing and tamping final layer of soil.
- G. When planting on slopes, set the plant so the root flare on the uphill side is flush with the surrounding soil on the slope; the edge of the root ball on the downhill side will be above the surrounding soil. Apply enough soil to cover the downhill side of the root ball.

5.6 MECHANIZED TREE SPADE PLANTING

- A. Trees may be planted with an approved mechanized tree spade at the designated locations. Do not use tree spade to move trees larger than the maximum size allowed for a similar field-grown, balled-and-burlapped root-ball diameter according to ANSI Z60.1, or larger than the manufacturer's maximum size recommendation for the tree spade being used, whichever is smaller.
- B. When extracting the tree, center the trunk within the tree spade and move tree with a solid ball of earth.
- C. Cut exposed roots cleanly during transplanting operations.
- D. Use the same tree spade to excavate the planting hole as was used to extract and transport the tree.

- E. Plant trees as shown on Drawings, following procedures in "Tree, Shrub, and Vine Planting" Article.
- F. Where possible, orient the tree in the same direction as in its original location.

5.7 TREE AND SHRUB PRUNING

- A. Remove only dead, dying, or broken branches. Do not prune for shape.
- B. Prune, thin, and shape trees, shrubs, and vines as directed by Landscape Architect.
- C. Prune, thin, and shape trees, shrubs, and vines according to professional horticultural and arboricultural practices. Unless otherwise indicated by Landscape Architect, do not cut tree leaders; remove only injured, dying, or dead branches from trees and shrubs; and prune to retain natural character.
- D. Do not apply pruning paint to wounds unless authorized by Owner/Landscape Architect.

5.8 TREE STABILIZATION

- A. Install trunk stabilization as follows unless otherwise indicated:
 - 1. Upright Staking and Tying: Stake trees of 2- through 5-inch caliper. Stake trees of less than 2-inch caliper only as required to prevent wind tip out. Use a minimum of two stakes of length required to penetrate at least 18 inches below bottom of backfilled excavation and to extend to the dimension shown on Drawings above grade. Set stakes and space to avoid penetrating root balls or root masses.
 - 2. Use two stakes for trees up to 12 feet high and 2-1/2 inches or less in caliper; three stakes for trees less than 14 feet high and up to 4 inches in caliper. Space stakes equally around trees.
 - 3. Support trees with bands of flexible ties at contact points with tree trunk. Allow enough slack to avoid rigid restraint of tree.
- B. Staking and Guying: Stake and guy trees more than 14 feet in height and more than 3 inches in caliper unless otherwise indicated. Securely attach no fewer than three guys to stakes 30 inches long, driven to grade.
 - 1. Site-Fabricated Staking-and-Guying Method:
 - a. For trees more than 6 inches in caliper, anchor guys to wood deadmen buried at least 36 inches below grade. Provide turnbuckle or compression spring for each guy wire and tighten securely.

- b. Support trees with bands of flexible ties at contact points with tree trunk and reaching to turnbuckle or compression spring. Allow enough slack to avoid rigid restraint of tree.
 - c. Support trees with strands of cable or multiple strands of tie wire, connected to the brass grommets of tree-tie webbing at contact points with tree trunk and reaching to turnbuckle or compression spring. Allow enough slack to avoid rigid restraint of tree.
 - d. Attach flags to each guy wire, 30 inches above finish grade.
 - e. Paint turnbuckles or compression springs with luminescent white paint.
2. Proprietary Staking and Guying Device: Install staking and guying system sized and positioned as recommended by manufacturer unless otherwise indicated and according to manufacturer's written instructions.

5.9 EDGING INSTALLATION

- A. Steel Edging: Install steel edging where indicated according to manufacturer's written instructions. Anchor with steel stakes spaced approximately 30 inches apart (or per manufacturer's instruction), driven below top elevation of edging.
- B. Aluminum Edging: Install aluminum edging where indicated according to manufacturer's written instructions. Anchor with aluminum stakes spaced approximately 48 inches apart (or per manufacturer's instruction), driven below top elevation of edging.
- C. Shovel-Cut Edging: Separate mulched areas from turf areas, curbs, and paving with a 45-degree, 4- to 6-inch- deep, shovel-cut edge.

5.10 PLANTING AREA MULCHING

- A. Mulch backfilled surfaces of planting areas and other areas indicated.
 - 1. Trees in Turf Areas: Apply organic mulch ring of 3-inch average thickness, with 12-inch radius around trunks or stems. Do not place mulch within 3 inches of trunks or stems.

5.11 PLANT MAINTENANCE

- A. Maintain plantings by pruning, cultivating, watering, weeding, fertilizing, mulching, restoring planting saucers, adjusting and repairing tree-stabilization devices, resetting to proper grades or vertical position, and performing other operations as required to establish healthy, viable plantings. Spray or treat as required to keep trees and shrubs free of insects and disease.

- B. Fill in as necessary soil subsidence that may occur because of settling or other processes. Replace mulch materials damaged or lost in areas of subsidence.
- C. Apply treatments as required to keep plant materials, planted areas, and soils free of pests and pathogens or disease. Use integrated pest management practices whenever possible to minimize the use of pesticides and reduce hazards. Treatments include physical controls such as hosing off foliage, mechanical controls such as traps, and biological control agents.
- D. Remove tree stabilization devices after 1 year from date of installation.
- E. Water trees as required to provide 1" of water per week on average.

5.12 CHEMICAL APPLICATION

- A. Apply pesticides and other chemical products and biological control agents in accordance with authorities having jurisdiction and manufacturer's written recommendations. Coordinate applications with Owner's operations and others in proximity to the Work. Notify Owner before each application is performed.
- B. Pre-Emergent Herbicides (Selective and Non-Selective): Apply to tree, shrub, and ground-cover areas in accordance with manufacturer's written recommendations. Do not apply to seeded areas.
- C. Post-Emergent Herbicides (Selective and Non-Selective): Apply only as necessary to treat already-germinated weeds and in accordance with manufacturer's written recommendations.

5.13 CLEANUP AND PROTECTION

- A. During planting, keep adjacent paving and construction clean and work area in an orderly condition.
- B. Protect plants from damage due to landscape operations and operations of other contractors and trades. Maintain protection during installation and maintenance periods. Treat, repair, or replace damaged plantings.
- C. After installation and before the final inspection for completion, remove nursery tags, nursery stakes, tie tape, labels, wire, burlap, and other debris from plant material, planting areas, and Project site.

5.14 DISPOSAL

- A. Remove surplus soil and waste material including excess subsoil, unsuitable soil, trash, and debris and legally dispose of them off Owner's property.

5.15 TIME OF PLANTING

- A. The Contractor shall be notified in writing by the Owner when other divisions of the Work have progressed sufficiently to commence work of planting. Thereafter, planting operations shall be conducted under favorable weather conditions during the next season or seasons which are normal for such work as determined by accepted practice in the locality of the project. At the option and on full responsibility of the Contractor, planting operations may be conducted under unseasonable conditions without additional compensation.

5.16 PLANTING BEDS

- A. Planting beds shall be treated with the following improvements:
 - 1. Peat: Peat shall be a natural product of peat humus mixed at a ratio of 1/3 peat to 2/3 topsoil.
 - 2. Fertilizer: Fertilizer shall be applied at the rate of 20 pounds per 1,000 square feet to the lawn area being prepared for planting and mixed lightly into the top few inches of topsoil.
 - 3. Mulch: Mulch shall be applied at the rate of 3" to 4" of uniform thickness.
- B. Plants shall be installed as recommended by the American Association of Nurserymen, and at the locations and spacings indicated on the Drawings.

5.17 MAINTENANCE

- A. Maintenance shall begin immediately following the last operation of installation and shall continue in accordance with the requirements herein.
- B. Planting Beds shall be maintained by watering and weeding for a period of forty-five (45) days. At the end of this period an inspection will be made and any deficiencies, which may be attributable to the Contractor, will be noted in writing. At this time, the Owner will assume the maintenance. Another inspection will be made at the beginning of the next planting season, and any of the previously noted deficiencies still existing shall be repaired by the Contractor.

5.18 CLEAN UP

- A. All soil, peat or similar material which has been brought over paved areas by hauling operations or otherwise, shall be removed promptly, keeping these areas clean at all times. Upon completion of the planting all excess soil, stone and debris which have not previously been cleaned up shall be removed from the site or disposed of as directed by the Owner. All areas shall be prepared for final inspection.

5.19 OTHER WORK

- A. The Contractor also shall be responsible for the repair of any damage caused by his activities or those of his subcontractors, such as the storage of topsoil or other materials, operations or equipment, or other usages to all on-site areas outside the contract limits. Such repair operations shall include any regrading, seeding or other work necessary to restore such areas to an acceptable condition.

++ END OF SECTION ++

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SECTION 02940

VEGETATED ROOF ASSEMBLIES

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Continuous vegetated roof assemblies.
 - 2. Walkway pavers.
 - 3. Geofoam fill.
- B. Overall Roof Assembly:
 - 1. Vegetated roof assemblies specified in this specification division are part of the overall roof assembly. See additional roof warranty requirements in Division 07 specifications.
- C. Related Sections:
 - 1. Division 7 Section 5 for roofing, roof insulation, and roofing warranty.

1.3 DEFINITIONS

- A. Captured Water: Water that is retained in the drainage layer of a vegetated roof assembly after new water additions have ceased and that cannot escape the roof except through evaporation or plant transpiration.
- B. Finish Elevation: Elevation of finished growing-media surface of planting area.
- C. Planting Area: Areas to be planted.
- D. Plant, Plants, Plant Material: Vegetation in general, including trees, shrubs, vines, ground covers, ornamental grasses, bulbs, corms, tubers, or herbaceous vegetation. Growing Medium: Manufactured, lightweight soil mixture that promotes good growing conditions for specific varieties of plants.

1.4 ACTION SUBMITTALS

- A. Product Data: For each vegetated roof assembly and each component, including each growing medium.

- B. LEED Submittals:
 - 1. Project will not be certified however shall meet the intent.
 - 2. Product Data for Credit MR 4: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.
- C. Shop Drawings: For vegetated roof assembly. Include roof plans, slopes, and drain locations; details of vegetated roof assembly, walkway pavers, geofoam fill and accessories; depth of growing media; and attachments to other work.
- D. Samples for Verification: For each of the following components of vegetated roof assembly:
 - 1. Preplanted Vegetative Mat: 12 by 12 inches (300 by 300 mm).
 - 2. Growing Media: 1-pint (0.5-liter) volume of each growing medium, in sealed plastic bags labeled with content and source. Each Sample shall be typical of the lots of growing media to be furnished. Provide an accurate representation of texture and composition.
 - 3. Moisture-Retention Mat: 12 by 12 inches (300 by 300 mm).
 - 4. Molded-Sheet Drainage Panels: 12 by 12 inches (300 by 300 mm).
 - 5. Protection Fabric: 12 by 12 inches (300 by 300 mm).
 - 6. Drainage Gravel: 1-pint (0.5-liter) volume in sealed plastic bags labeled with content and source.
 - 7. Root Barrier: 12 by 12 inches (300 by 300 mm).
 - 8. Walkway paver, full size, in each color and texture required; include installation accessories to illustrate assembly.
 - 9. Geofoam Fill: 12 by 12 inches (300 by 300 mm).
 - 10. Separation Geotextile: 12 by 12 inches (300 by 300 mm).
 - 11. Access Boxes: One in each size and color required.
 - 12. Soil Retainer: Manufacturer's standard size to verify configuration and color selected.
 - 13. Roof drainage collection.

1.5 SUBMITTALS

- A. Vegetated roof Assembly submittals of this section and underlying roof water proofing specified in Division 07 shall be submitted simultaneously.
- B. Qualification Data: For qualified Installer.
- C. Product Certificates: For each type of manufactured product, from manufacturer, and complying with the following:
 - 1. Manufacturer's certified analysis of standard products.
 - 2. Analysis of other materials by a recognized laboratory, according to methods established by the Association of Official Analytical Chemists, where applicable.

- D. Product Test Reports: For each growing medium, including complete analysis demonstrating compliance with specified requirements.
- E. Field quality-control reports.
- F. Warranty: Sample of each special warranty.
- G. Preliminary Design
 - 1. Provide 2 plant layout designs in electronic AutoCAD format indicating the specific locations of plant species.
 - 2. Layout shall plant species as to provide color variation from March through November in the form of blooms.
 - 3. No irrigation shall be required.
 - 4. Layouts shall be designed by a Landscape Architect licensed in the State of Kentucky. Drawings shall be stamped and signed.
 - 5. Plaza Deck paver samples of each manufacture color for initial selection and a full size paver for final selection. Plaza deck and curb mounting details of 2 to 3 colors and overall layout drawing.

1.6 CLOSEOUT SUBMITTALS

- A. Maintenance Data: Recommended maintenance plan including procedures for inspection and care of vegetated roof assembly and plants during a calendar year. Submit before start of required warranty and maintenance periods.

1.7 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified vegetated roof assembly Installer, approved, authorized, or licensed by roofing manufacturer, whose work has resulted in successful establishment of vegetated roofs.
 - 1. Field Supervision: Require Installer to maintain an experienced full-time supervisor on Project site when work is in progress.
 - 2. Professional Membership: Installer shall be a member in good standing of either the Professional Landcare Network or the American Nursery and Landscape Association.
 - 3. Personnel Certifications: Installer's field supervisor shall have certification in the following categories from the Professional Landcare Network:
 - a. Certified Ornamental Landscape Professional designated "COLP."
- B. Source Limitations: Obtain vegetated roof assembly components, growing medium, walkway pavers and setting bed or supports, geofoam fill and separation geotextile, and accessories from single source from single manufacturer.
- C. Preinstallation Conference: Conduct conference at Project site.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Packaged Materials: Deliver packaged materials in original, unopened containers showing weight, certified analysis, name and address of manufacturer, and indication of conformance with state and federal laws if applicable.
- B. Bulk Materials:
 - 1. Do not dump or store bulk materials on or near structures, utilities, walkways and pavements, or existing roof areas or plants.
 - 2. Provide erosion-control measures to prevent erosion or displacement of bulk materials, discharge of debris-bearing water runoff, and airborne dust reaching adjacent properties, water conveyance systems, or walkways.
 - 3. Accompany each delivery of bulk materials with product certificates.

1.9 PROJECT CONDITIONS

- A. Weather Limitations: Proceed with planting only when existing and forecasted weather conditions permit planting to be performed when optimum results may be obtained. Apply products during favorable weather conditions according to manufacturer's written instructions and warranty requirements.

1.10 WARRANTIES

- A. The Warranty for the vegetated roof assembly and underlying roof water proofing specified in Division 07 shall have a single source (one manufacturer) of responsibility.
- B. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of vegetated roof assembly that fail in material or workmanship within specified warranty period.
 - 1. Warranty Period for vegetated roof assembly: Manufacturer's standard, but not less the (20) year(s) from date of Substantial Completion.
 - 2. Failure includes, but is not limited to, ponding water or prolonged wetness of growing medium caused as a result of failure of the assembly to properly drain.
- C. Special Warranty for Plant Growth and Root Maintenance: Installer agrees to repair or replace plantings and accessories that fail in materials, workmanship, or growth within specified warranty period.
 - 1. Foliage Cover: Planted materials shall grow to achieve and maintain at least 95 percent foliage cover over planting area commencing 1 month after planting, through the duration of this warranty.
 - 2. Failures include, but are not limited to, death and unsatisfactory growth except for defects resulting from abuse, lack of adequate maintenance, neglect by Owner, or incidents that are beyond Contractor's control.

3. Warranty Periods from Date of Substantial Completion:
 - a. Ground Covers, Perennials, Vines, and Ornamental Grasses: 20 years.
4. Include the following remedial actions as a minimum:
 - a. Immediately remove dead plants and replace unless required to plant in the succeeding planting season.
 - b. Replace plants that are more than 25 percent dead or in an unhealthy condition at end of warranty period.
 - c. A limit of one replacement of each plant will be required except for losses or replacements due to failure to comply with requirements.
5. Provide extended warranty for period equal to original warranty period, for replaced plant material.
6. Removal and replacement as required to locate and correct roof leaks.

1.11 MAINTENANCE SERVICE

- A. Initial Maintenance Service: Provide maintenance by skilled employees of vegetated roof assembly Installer approved by roofing manufacturer. Maintain as required in Part 3. Begin maintenance immediately after plants are installed and continue until plantings are acceptably healthy and well established but for not less than the following maintenance period:
 1. Maintenance Period: 24 months from date of Substantial Completion.
- B. Continuing Maintenance Proposal: From vegetated roof assembly Installer approved by roofing manufacturer to Owner, in the form of a standard yearly (or other period) maintenance agreement, starting on date initial maintenance service is concluded. State services, obligations, conditions, and terms for agreement period and for future renewal options.

PART 2 - PRODUCTS

2.1 VEGETATED ROOF ASSEMBLY COMPONENTS

- A. Moisture-Retention and Drainage Products:
 1. Moisture-Retention Mat: Manufacturer's standard water-retaining fabric manufactured from recycled synthetic fibers.
 2. Molded-Sheet Drainage Panels: Manufacturer's standard drainage board formed from geotextile-faced, molded-plastic sheet with a geotextile face and "cups" of the molded sheet facing upward like small reservoirs to retain water while allowing excess water to drain away below the board. Volume requirements as recommended by the vegetated roof assembly manufacturers Landscape Architect.
- B. Aggregate-Type Moisture-Retention and Drainage Products:
 1. Protection Fabric: Manufacturer's standard protection fabric.
 2. Drainage Gravel: Washed, sound crushed stone or gravel complying with ASTM D 448 for Size No. 8.

- C. Root Barrier: Manufacturer's standard black plastic sheet manufactured from recycled polyethylene or polypropylene plastic; formulated to resist root growth and bacteria.
- D. Erosion-Control Fabric: Manufacturer's standard erosion-control fabric.
- E. Anti-Slip Devices: Manufacturer's standard anti-slip devices.
- F. Recycled Content: Provide moisture-retention mat and root barrier material with recycled content so postconsumer recycled content plus one-half of preconsumer recycled content not less than ten percent by weight.
- G. Roof Drainage Collection: As indicated in the construction documents and recommended by the vegetated roof assembly and roof water proofing manufacturer.

2.2 VEGETATED ROOF ASSEMBLIES

- A. Continuous Vegetated Roof Assembly: Continuous-coverage assembly consisting of manufacturer's standard vegetated roof assembly components for installation over membrane roofing.
 - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. American Hydrotech, Inc.; Extensive Garden Roof.
 - b. Sika Sarnafil Extensive.
 - c. Tremco Extensive.
 - d. Equivalent by other manufacturers.
 - 2. Assembly Depth, Nominal: minimum 4 inches (100 mm); maximum 8 inches (200 mm). Manufacturer's standard for required plantings including growing medium.
 - 3. Assembly Weight: Maximum 28 lb/sq. ft. (137 kg/sq. m), including growing medium and plants and saturated with captured water, but not including weight of roofing system.
 - 4. Plantings: Preplanted vegetative mat.

2.3 SOIL AMENDMENTS

- A. Provide soil amendments as designed by the vegetative roof systems manufacturer's Landscape Architect which may include the following:
 - 1. Lime: ASTM C 602, Class T or Class O agricultural liming material containing a minimum of 80 percent calcium carbonate equivalent. Provide lime in the form of ground dolomitic limestone, calcitic limestone, and mollusk shells.
 - 2. Sulfur: Granular, biodegradable, and containing a minimum of 90 percent sulfur, with a minimum of 99 percent passing through No. 6 (3.35-mm)

sieve and a maximum of 10 percent passing through No. 40 (0.425-mm) sieve.

3. Iron Sulfate: Granulated ferrous sulfate containing a minimum of 20 percent iron and 10 percent sulfur.
4. Aluminum Sulfate: Commercial grade, unadulterated.
5. Perlite: Horticultural perlite, soil amendment grade.
6. Agricultural Gypsum: Minimum 90 percent calcium sulfate, finely ground with 90 percent passing through No. 50 (0.30-mm) sieve.
7. Diatomaceous Earth: Calcined, 90 percent silica, with approximately 140 percent water absorption capacity by weight.
8. Zeolites: Mineral clinoptilolite with at least 60 percent water absorption by weight.
9. Bonemeal: Commercial, raw or steamed, finely ground.
10. Superphosphate: Commercial, phosphate mixture, soluble; minimum 20 percent available phosphoric acid.
11. Commercial Fertilizer: Commercial-grade complete fertilizer of neutral character.
12. Slow-Release Fertilizer: Granular or pelleted fertilizer consisting of 20 percent nitrogen (50 percent of that water-insoluble), 10 percent phosphorus, and 10 percent potassium, by weight.

2.4 MANUFACTURED GROWING MEDIA

- A. Growing Medium : Vegetated roof assembly manufacturer's lightweight, manufactured soil mixture designed for the area of Project location.
 1. General Condition at Time of Planting: Free of stones 1/2 inch (13 mm) or larger in any dimension; free of roots, plants, sod, clods, clay lumps, pockets of coarse sand, paint, paint washout, concrete slurry, concrete layers or chunks, cement, plaster, building debris, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, acid, and other extraneous materials harmful to plant growth; free of weeds and other botanical pests; not infested with nematodes, grubs, or other pests or pest eggs; free of disease-causing plant pathogens and other undesirable organisms; friable and with sufficient structure to give good tilth and aeration.
 2. Maximum Media Density: ASTM E 2399, weight as designed by manufacturer, lb/cu. ft. (kg/cu. m) for basic growing-medium mixture.
 3. Maximum Media Water-Retention: ASTM E 2399, percentage as designed by manufacturer, percent by volume for basic growing-medium mixture at maximum media density.
 4. Water Permeability: ASTM E 2399, permeability as designed by manufacturer in/min. (cm/s) for basic growing-medium mixture at maximum media density.
 5. Organic Material Content: ASTM F 1647, Method A, organic material as measured using the loss-on-ignition procedure.
 - a. Minimum: percentage as designed by manufacturer.
 - b. Maximum: percentage as designed by manufacturer.
 6. Chemical Properties: as designed by manufacturer.

- a. Growing-Medium pH (Reaction):
 - b. Cation Exchange Capacity:
 - c. Nitrogen:
 - d. Phosphorous:
 - e. Potassium:
 - f. Sodium Absorption Ratio:
- B. Custom Growing Medium: Manufacture designed soil mixture for the area of the Project and that complies with the following:
- 1. Basic Growing-Medium Mixture: as designed by manufacturer.
 - 2. General Condition at Time of Planting: Free of stones 1/2 inch (13 mm) or larger in any dimension; free of roots, plants, sod, clods, clay lumps, pockets of coarse sand, paint, paint washout, concrete slurry, concrete layers or chunks, cement, plaster, building debris, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, acid, and other extraneous materials harmful to plant growth; free of weeds and other botanical pests; not infested with nematodes, grubs, or other pests or pest eggs; free of disease-causing plant pathogens and other undesirable organisms; friable and with sufficient structure to give good tilth and aeration.

2.5 WALKWAY PAVERS

- A. Plaza Deck Pavers: Heavyweight, hydraulically pressed, concrete units, square edged with top edges beveled 3/16 inch (5 mm), manufactured for use as plaza deck pavers; minimum compressive strength 6500 psi (45 MPa), ASTM C 140; absorption not greater than 5 percent, ASTM C 140; no breakage and maximum 1 percent mass loss when tested for freeze-thaw resistance according to ASTM C 67.
- 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. [Hanover Architectural Products](#), Basis of Design 'Prest Standard colors with Tudor Finish' Curbs 'Rock Curb'.
 - b. [Hastings Pavement Company, LLC](#).
 - c. [Roofblok Limited](#).
 - d. [Sunny Brook Pressed Concrete](#).
 - e. [Wausau Tile, Inc.; Terra-Paving Division](#).
 - f. [Westile Roofing Products](#).
 - g. Equivalent by other manufacturers.
 - 2. Thickness: 2 inches (51 mm).
 - 3. Face Size: 24 inches (610 mm) square
 - 4. Color: As selected by Architect from manufacturer's full range.
- D. Setting Bed: Provide aggregate, mortar, or bituminous setting-bed materials as required by waterproofing manufacturer.

- E. Paver Supports: Paver manufacturer's standard SBR rubber, high-density polyethylene, or polyurethane paver support assembly, including adjustable or stackable pedestals, shims, and spacer tabs for joint spacing of 1/8 to 3/16 inch (3 to 5 mm).
 - 1. Concrete Fill: ACI 301, compressive strength of 5000 psi (34 MPa) at 28 days, and air content of 6 percent.

2.6 PLAZA DECK PAVERS AND CURBS

- A. Plaza Deck Pavers: Heavyweight, hydraulically pressed, concrete units, square edged with top edges beveled 3/16 inch (5 mm), manufactured for use as plaza deck pavers; minimum compressive strength 6500 psi (45 MPa), ASTM C 140; absorption not greater than 5 percent, ASTM C 140; no breakage and maximum 1 percent mass loss when tested for freeze-thaw resistance according to ASTM C 67.
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. [Hanover Architectural Products](#), basis of design 'Prest Standard colors with Tudor Finish' curbs 'Rock Curb'
 - b. [Hastings Pavement Company, LLC](#).
 - c. [Roofblok Limited](#).
 - d. [Sunny Brook Pressed Concrete](#).
 - e. [Wausau Tile, Inc.; Terra-Paving Division](#).
 - f. [Westile Roofing Products](#).
 - g. Equivalent by other manufacturers.
 - 2. Thickness: 2 inches (51 mm).
 - 3. Face Size: 24 inches (610 mm) square.
 - 4. Color: As selected by Architect from manufacturer's full range.
- B. Setting Bed: Provide aggregate, mortar, or bituminous setting-bed materials as required by waterproofing manufacturer.
- C. Paver Supports: Paver manufacturer's standard SBR rubber, high-density polyethylene, or polyurethane paver support assembly, including adjustable or stackable pedestals, shims, and spacer tabs for joint spacing of 1/8 to 3/16 inch (3 to 5 mm).
 - 1. Concrete Fill: ACI 301, compressive strength of 5000 psi (34 MPa) at 28 days, and air content of 6 percent.

2.7 ACCESSORIES

- A. Protection Board: ASTM D 6506, semirigid sheets of fiberglass or mineral-reinforced-asphaltic core, pressure laminated between two asphalt-saturated fibrous liners; 1/4-inch (6-mm) nominal thickness as recommended by membrane roofing manufacturer.

- B. Access Boxes: If required, manufacturer's standard aluminum boxes with removable, rigid covers for accessing drains, valves, and switches beneath the finish elevation of growing medium; secure each cover with four noncorrosive screws.
 - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. JDR Enterprises, Inc.; Access Box.
 - b. ZinCo USA, Inc.; Inspection Chamber.
 - c. Equivalent by other manufacturers.
 - 2. Size: 12 inches (305 mm) square by depth of vegetated roof assembly at each location.

- C. Soil Retainer and Soil Retainer / Gutter: Assembly manufacturer's extruded-aluminum edging with drainage openings.
 - 1. Configuration: L-shaped, T-shaped, Flat-top curb. As required for specific condition.
 - 2. Color: Mill-finish metal.
 - 3. Gauge: Vegetative Roof Manufacturer's recommended gauge
 - 4. Method of Attachment: Manufacturer's standard adhesive compatible with the membrane roofing.

PART 3 – EXECUTION

3.1 EXAMINATION

- A. Examine each area to receive vegetated roof assembly for compliance with requirements for installation tolerances and other conditions affecting performance.
 - 1. Verify that roof insulation over membrane roofing is in place, secure, and flush along all seams.
 - 2. Verify that perimeter and other flashings are in place and secure along entire lengths where they will be covered by vegetated roof assembly.

- B. Flood Testing: Flood test each deck area for leaks.
 - 1. Flood each area for 24 hours.

- C. Proceed with installation only after unsatisfactory conditions have been corrected.

- D. Inspect growing medium. If growing medium is contaminated by foreign or deleterious material or liquid, remove growing medium and contamination and replace with new growing medium.

3.2 PREPARATION

- A. General: Protect structures, utilities, sidewalks, pavements, and other facilities and areas from damage caused by installation.

- B. Protection Course: Cover membrane roofing with protection board with butted and fully taped joints before membrane roofing is subject to vegetated roof assembly installation work.

3.3 INSTALLATION, GENERAL

- A. Install vegetated roof assembly according to manufacturer's written instructions.
- B. Sloped Roofs: Install erosion-control fabric and anti-slip devices for slopes steeper than 1/2 inch per 12 inches (1:24) according to manufacturer's written instructions.
- C. Small Plant Stabilization: Install erosion-control fabric over planting area to secure small plants according to manufacturer's written instructions.
- D. Geofoam Fill: Install geofoam-fill blocks in as few layers as possible with abutting edges and ends and with the long dimension of each block placed at right angles to blocks in each subsequent layer. Offset joints of blocks in successive layers.
 - 1. Install geofoam connectors at each layer, without damaging membrane roofing, to resist horizontal displacement of geofoam and according to geofoam-fill manufacturer's written instructions.
 - 2. Cover geofoam fill with separation geotextile before placing overlying growing medium.
- E. Access Boxes: Install access box at each drain, valve, and switch beneath the finish elevation of growing medium.

3.4 PLANTING

- A. Verify that no foreign or deleterious material or liquid such as paint, paint washout, concrete slurry, concrete layers or chunks, cement, plaster, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, or acid has been deposited in growing medium within a planting area.
- B. Do not mix or place growing medium during frozen, wet, or muddy conditions.
- C. Suspend spreading, grading, and planting operations during periods of excessive moisture until the moisture content in growing medium reaches acceptable levels to attain the required results.
- D. Uniformly moisten an excessively dry growing medium that is too dusty or not workable.
- E. Preplanted Vegetative Mat: Install in full contact with growing medium and secure in position.

3.5 PLAZA DECK PAVER INSTALLATION

- A. Install concrete pavers in locations indicated according to manufacturer's written instructions.
- B. Accurately install adjustable-height paver pedestals and accessories in locations and to elevations required. Adjust for final level and slope with shims.
 - 1. Fill paver pedestal with concrete mix, strike smooth with top of pedestal, and cure according to ACI 301.
- C. Loosely lay pavers on pedestals, maintaining a uniform open joint width. Tightly seat pavers against spacers to eliminate lateral movement or drift of paving assembly. Align joint patterns parallel in each direction.
 - 1. Lay out pavers to avoid less-than-half-width pavers at perimeter or other terminations.
- D. Install pavers to not vary more than 1/16 inch (1.6 mm) in elevation between adjacent pavers or more than 1/16 inch (1.6 mm) from surface plane elevation of individual paver.
- E. Maintain tolerances of paving installation within 1/4 inch in 10 feet (1:48) of surface plane in any direction.

3.6 SOIL-RETAINER INSTALLATION

- A. Install soil retainer where indicated according to manufacturer's written instructions.

3.7 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: Engage Division 7 membrane roofing manufacturer's authorized service representative to provide full-time inspection of vegetated roof assembly installation and prepare inspection reports.
- B. Correct deficiencies in work that do not comply with requirements.

3.8 PLANT MAINTENANCE

- A. General: During maintenance period, maintain plantings by pruning, cultivating, watering, weeding, fertilizing, mulching, restoring planting saucers, adjusting and repairing devices, resetting plants to proper elevations or vertical position, and performing other operations as required to establish healthy, viable plantings. Spray or treat as required to keep trees and shrubs free of insects and disease.
- B. Replace growing medium that becomes displaced or eroded because of settling or other processes.

- C. Apply treatments as required to keep plant materials, planted areas, and growing medium free of pests and pathogens or disease. Use integrated pest management practices whenever possible to minimize the use of pesticides and reduce hazards. Treatments include physical controls such as hosing off foliage, mechanical controls such as traps, and biological control agents.
- D. Use only products and methods acceptable to membrane roofing manufacturer.

3.9 CLEANING AND PROTECTION

- A. During planting and maintenance, keep adjacent areas and construction clean and maintain work area in an orderly condition.
- B. Protect vegetated roof assemblies from damage due to planting operations and operations of other contractors and trades. Repair or replace damaged vegetated roof assemblies.

++ END OF SECTION ++

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SECTION 03300

CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 SCOPE OF WORK

- A. Provide all labor, materials, equipment and services required to furnish and install all cast-in-place concrete as indicated on the Drawings and specified herein.
- B. All concrete construction shall conform to all applicable requirements of ACI 301 (latest revision), Specifications for Structural Concrete for Buildings, except as modified by the supplemental requirements specified herein.

1.2 RELATED WORK SPECIFIED ELSEWHERE

- A. Earthwork:Section 02300

1.3 SUBMITTALS

The Contractor shall submit the following data for the Engineer's review in accordance with Section 01340.

- A. Concrete mixture proportions, test results and curves plotted to establish water-cementitious materials ratio if ACI 301 (latest revision) Section 4.2.3.4.b is followed.
- B. Proposed mix designs and all necessary substantiating data used to establish the proposed mix designs if ACI 301 (latest revision) Section 4.2.3.1 is followed.
- C. Mix designs shall be submitted for all mixes proposed or required to be used, including all mixes containing admixtures.
- D. A certified copy of the control records of the proposed production facility establishing the standard deviation as defined in Paragraph 4.2.3.2. of ACI 301.
- E. Submit shop drawings as specified in ACI 301. Submit shop drawing showing the location of proposed construction and control joints separate from the steel reinforcement shop drawings.
 - 1. Construction Joints
 - 2. Control Joints
 - 3. Steel Reinforcement
 - 4. Curing Procedures

1.4 QUALITY ASSURANCE

A. The Contractor shall obtain two (2) copies of each of the following references and have one copy of each available in the field office at all times and provide the CCA with the other copy of each:

1. ACI 301 Specifications for Structural Concrete for Buildings ACI 301 (latest Revision).
2. SP-15 (05) Field Reference Manual: Specifications for Structural Concrete for Buildings with selected ACI references.

Available from:
The American Concrete Institute
Publications Department
P.O. Box 9094
Farmington Hills, Michigan 48333-9094

3. Manual of Standard Practice - CRSI. (Latest Edition).
4. Placing Reinforcing Bars - CRSI (Latest Edition).

Available from:

Concrete Reinforcing Steel Institute
933 North Plum Grove Road
Schaumburg, Illinois 60173-4758

5. ACI 318-05 Building Code Requirements for Structural Concrete and Commentary.
6. ACI 347 Guide to Form Work for Concrete.
7. ACI 336.1 Standard Specification for the Construction of End Bearing Drilled Piers.

B. Qualifications:

1. Mix Designer: Licensed professional engineer registered in the State of Kentucky.
2. Batch Plant: Currently certified by the National Ready Mixed Concrete Association.

C. Reporting

1. The Batch Plant shall provide one copy to the Owner of each batch report that corresponds to the delivery ticket for each load of concrete delivered to the site.
2. A delivery ticket shall be prepared for each load of ready-mixed concrete and a copy of the ticket shall be handed to the CCA by the truck operator at the time of delivery. Tickets shall indicate the contractor's name, project name, mixture identification, quantity delivered, quantity of each material in the batch, outdoor temperature, time at which cement added, and numerical sequence of delivery. The truck operator shall note on the ticket the name

and amount of any materials, including water, added to the concrete after it leaves the batch plant.

D. Preinstallation Conference

1. Required Meeting Attendees
 - a. Contractor, including pumping, placing and finishing, and curing subcontractors.
 - b. Ready-mix producer.
 - c. Admixture representative.
 - d. Testing and sampling personnel.
 - e. Engineer.
 - f. Owner.
 - g. Owner's testing agency representative.
2. Schedule and conduct prior to placement of any concrete.
3. Agenda shall include:
 - a. Admixture types, dosage, performance and redosing at site.
 - b. Mix designs, test of mixes and Submittals.
 - c. Placement methods, techniques, equipment, consolidation and form pressures.
 - d. Slump and placement time to maintain slump.
 - e. Finish, curing and water retention.
 - f. Protection procedures for weather conditions.
 - g. Other specified requirements requiring coordination.

PART 2 - PRODUCTS

2.1 CLASSES OF CONCRETE AND USAGE

- A. Structural concrete of the various classes required shall be proportioned by either Method 1 or Method 2 of ACI 301 to produce the following 28-day compressive strengths:
1. Selection of Proportions for Class A Concrete:
 - a. 4,000 psi compressive for strength at 28 days.
 - b. Type I/II cement plus supplementary cementitious materials.
 - c. Max. water-cementitious materials ratio = 0.45.
 - d. Min. cement content = 564 lbs. (6.0 bags)/cu. yd. concrete.
 - e. Nominal max. size coarse aggregate = No. 67 (3/4" max.) or No. 57 (1.5" max.) or No. 467 for pours thicker than 12". Walls with architectural treatment shall use No. 67 (3/4" max.).
 - f. Air content = 6% plus or minus 1% by volume.
 - g. Slump = 3" - 4" when tested in accordance with ASTM C 143/C 143M. Slump shall not exceed 8 inches when high-range water-reducers are used.
 - h. Fly Ash (15% maximum): ASTM C 618, Class C or F, with maximum loss on ignition of 6%.

2. Selection of Proportions for Class B Concrete:
 - a. 3,000 psi compressive strength at 28 days.
 - b. Type I cement plus supplementary cementitious materials.
 - c. Max. water-cementitious materials ratio = 0.45.
 - d. Min. cement content = 470 lbs. (5.0 bags)/cu. yd. concrete.
 - e. Nominal max. size coarse aggregate = No. 67 (3/4" max.) or No. 57 (1.5" max) or No. 467 for pours thicker than 12". Walls with architectural treatment shall use No. 67 (3/4" max.).
 - f. Air content = 6% plus or minus 1% by volume.
 - g. Slump = 3" - 4" when tested in accordance with ASTM C 143/C 143M. Slump shall not exceed 8 inches when high-range water-reducers are used.

- B. Concrete shall be used as follows:
 1. Class A concrete for all concrete work except as noted below.
 2. Class B concrete for fill concrete, thrust blocks and topping over hollow-core slabs, and where indicated on the Drawings.

- C. Type I/II cement conforming to ASTM C 150 shall be used in all structural concrete. The alkali content shall not exceed 0.6% calculated as sodium oxide. Cement for exposed to view concrete shall have a uniform color classification.

- D. Coarse aggregate for concrete shall be size No. 57 or No. 467 for pours thicker than 12", as specified in ASTM C 33 unless a smaller size aggregate is required to conform to provisions of Section 4.2.2.3 of ACI 301. Coarse aggregate shall conform to all requirements of ASTM C 33.

- E. Manufactured sand shall not be used as fine aggregate in concrete.

2.2 ADMIXTURES

- A. An air entraining admixture shall be used on all concrete exposed to freezing and thawing cycles. Product shall be MB-AE 90, MB-VR or Micro Air by BASF Construction Chemicals or approved equal. Certification attesting to the percent of effective solids and compliance of the material with ASTM C 260 shall be furnished, if requested.

- B. Water-Reducing Admixture shall conform to ASTM C 494/C 494M Type A. Product shall be "Pozzolith" Series or "PolyHeed" Series by BASF Construction Chemicals or approved equal.

- C. High-Range Water-Reducing Admixture shall conform to ASTM C 494/C 494M Type F. Product shall be Rheobuild 1000, "Glenium" Series or PS 1466 by BASF Construction Chemicals or approved equal.

- D. Accelerating Admixture shall conform to ASTM C 494/C 494M Type C or E.

Products shall be Pozzolith NC 534 or Pozzutec 20+ by BASF Construction Chemicals or approved equal.

- E. Retarding Admixture shall conform to ASTM C 494/C 494M Type B or D. Product shall be “Pozzolith” Series or “DELVO” Series by BASF Construction Chemicals.
- F. A water-reducing, set controlling admixture (nonlignin type) shall be used in all concrete. The admixture shall be a combination of polyhydroxylated polymers including catalysts and components to produce the required setting time based on job site conditions, specified early strength development, finishing characteristics required, and surface texture, as determined by the CCA.
- G. Certification shall be furnished attesting that the admixture exceeds the physical requirements of ASTM C 494, Type A, water-reducing and normal setting admixture, and when required, for ASTM C 494, Type D, water-reducing and retarding admixture when used with local materials with which the subject concrete is composed.
- H. The admixture manufacturer, when requested, shall provide a qualified concrete technician employed by the manufacturer to assist in proportioning concrete for optimum use. He shall also be available when requested to advise on proper addition of the admixture to the concrete and on adjustment of the concrete mix proportions to meet changing job conditions.
- I. The use of admixtures to retard setting of the concrete during hot weather, to accelerate setting during cold weather, and to reduce water content without impairing workability will be permitted if the following conditions are met:
- J. The admixture shall conform to ASTM C494, except that the durability factor for concrete containing the admixture shall be at least 100 percent of control, the water content a maximum of 90 percent of control and length change shall not be greater than control, as defined in ASTM C 494.
- K. Where the Contractor finds it impractical to employ fully the recommended procedures for hot weather concreting, the CCA may at his discretion, require the use of a set retarding admixture for mass concrete 2.5 feet or more thick for all concrete whenever the temperature at the time concrete is cast exceeds 80°F. The admixture shall be selected by the Contractor subject to the review of the CCA. The admixture and concrete containing the admixture shall meet all the requirements of these Specifications. Preliminary tests of this concrete shall be required at the Contractor's expense.
- L. When more than one (1) admixture is used, all admixtures shall be compatible. They shall be by the same manufacturer.

M. Calcium chloride will not be permitted as an admixture in any concrete.

2.3 REINFORCEMENT

- A. The minimum yield strength of the reinforcement shall be 60,000 pounds per square inch. Bar reinforcement shall conform to the requirements of ASTM A 615/A 615M. All bar reinforcement shall be deformed.
- B. Wire-mesh reinforcement shall be continuous between expansion joints. Laps shall be at least one full mesh plus 2 inches, staggered to avoid continuous lap in either direction, and securely wired or clipped with standard clips.
- C. Smooth dowels shall be plain steel bars conforming to ASTM A 615/A615M, Grade 60, or steel pipe conforming to ASTM A 120, Schedule 80. Pipe, if used, shall be closed flush at each end with mortar or metal or plastic cap. Dowels shall be installed at right angles to construction joints and expansion joints. Dowels shall be accurately aligned parallel to the finished surface, and shall be rigidly held in place and supported during placing of the concrete. One end of dowels shall be oiled or greased or dowels shall be coated with high density polyethylene with a minimum thickness of 14 mils.
- D. Reinforcement supports and other accessories in contact with the forms for members which will be exposed to view in the finished work shall be of stainless steel or shall have approved high-density polyethylene tips so that the metal portion shall be at least one-quarter of an inch from the form or surface. Supports for reinforcement, when in contact with the ground or stone fill, shall be precast stone concrete blocks. Particular attention is directed to the requirement of Paragraph 3.3.2.4 of ACI Standard 301. These requirements apply to all reinforcement, whether in walls or other vertical elements, inclined elements or flatwork.
- E. Particular care shall be taken to bend tie wire ends away from exposed faces of beams, slabs and columns. In no case shall ends of tie wires project toward or touch formwork.

2.4 OTHER MATERIALS

- A. Anchorage items shall be of standard manufacture and of type required to engage with the anchors to be installed therein under other sections of the Specifications and shall be subject to approval by the CCA.
 - 1. Slots shall be galvanized dovetail-type as specified in Section "Masonry Work".
 - 2. Inserts shall be malleable iron or steel, and of sturdy design adequate strength for the load to be carried. All inserts shall be galvanized. Adjustable wedge inserts shall have an integral loop or strap at the back, or shall be slotted to

receive a special-headed bolt not smaller than 5/8-inch in diameter and of the required length and fitted with hexagonal nut. Other inserts shall be either threaded or slotted as required by their usage. Threaded inserts shall have integral lugs to prevent running.

3. Concrete anchors shall be an approved expansion type conforming to Federal Specification FF-S-325, Groups I, II, III, or VIII and shall be installed in strict accordance with the manufacturer's recommendations. Material for anchors shall be as specified in Section 05500 "Miscellaneous Metals". Anchors shall develop ultimate shear and pull out loads of not less than the following values in Class A concrete:

Bolt Diameter (Inches)	Min. Shear (Pounds)	Min. Pull-Out Load (Pounds)
1/2	4,500	4,600
5/8	6,900	7,700
3/4	10,500	9,900

4. Chemical Adhesive Anchors shall be Epoxy ICC-ES-ESR-1772 or Acrylic ICC-ES-ESR-5791.

B. Epoxy bonding adhesive used to bond fresh plastic concrete to sound, hardened concrete shall meet the following Specification. Contractor shall furnish a notarized certification by the manufacturer that the proposed material meets the Specification.

1. Material: The epoxy material shall consist of a 2-component system whose components conform to the following requirements:
 - a. Component A - Component A shall be a modified epoxy resin of the epichlorohydrin bisphenol A condensation type, containing suitable viscosity control agents and having an epoxide equivalent of 180-200.
 - b. Component B - The B component shall be primarily a reaction product of one mole of an aliphatic polyamine and two moles of mono-functional epoxide containing compounds modified with 2, 4, 6 tri (dimethylaminomethyl) phenol.
 - c. The component ratio of B to A by volume shall be as specified by the manufacturer.
2. Properties of Mixed Components:
 - a. Solids Content 100% by weight
 - b. Pot Life 25-35 min. @ 73°F.
 - c. Tack-Free Time 4-5-1/2 hrs @ (Thin Film) 73°F.
 - d. Final Cure ASTM D 695 (75% ultimate strength) 3 days at 73°F.
 - e. Initial Viscosity (A+B) 2,000 cps. min at 73°F.
 - f. Color Mixed Straw
3. Properties of Cured Material (Neat Material):

- | | | |
|----|------------------------------------|--|
| a. | Tensile Strength
ASTM D 638 | 3,000 psi min. @
14 days 73°F. cure |
| b. | Tensile Elongation
ASTM D 638 | 2 - 2% at 14
modified days 73°F. cure |
| c. | Compressive Strength
ASTM D 695 | 12,500 psi min. at
73°F. cure |
| d. | Compressive Modules
ASTM D 695 | 470,000 psi min. @
28 days, 73°F cure |
| e. | Compressive Strength
ASTM D 695 | 5,500 psi min. @
24 days 73°F cure |
| f. | Water Pick-up
ASTM D 570 | 1.5 max. |

- C. Flashing reglets shall be as specified in Section 07530. Reglets shall be correctly placed into forms prior to placing concrete in formwork.
- D. Premolded expansion-joint filler strips shall conform to ASTM D 1752 and shall be 3/8-inch thick unless otherwise shown.
- E. Joint sealants shall conform to ANSI A 116.1. The following joint sealants are acceptable:
1. Colma by Sika Chemical Corporation
 2. Hornflex by A.C. Horn, Inc.
 3. Sonolastic by BASF Construction Chemicals.
- F. Nonshrink grout shall be Embecco 885 grout by BASF Construction Chemicals, Euco Firmix grout by the Euclid Chemical Company, or approved equal. The approved product shall be delivered to the site of the Work in the original sealed containers, each bearing the trade name of the material and the name of the manufacturer.
- G. Hardeners and dustproofers shall be colorless, aqueous solution of zinc or magnesium fluosilicate. Each gallon of solution used for the first application shall contain not less than one pound of crystals. Each gallon of solution used for subsequent application shall contain not less than two pounds of crystals. Materials shall be reviewed by the CCA. Product shall be Lapidolith by BASF Construction Chemicals or approved equal.
- H. Porous fill shall be crushed rock or gravel of such size that all will pass a 1-1/2 inch screen and not more than 5 percent will pass a No. 4 screen, free from earth clay or other foreign substances.
- I. Waterstops: Waterstops shall be polyvinyl chloride, flat dumbbell shape (no center bulb), of size shown on Drawings, complete with fittings as required such as unions, vertical tees, vertical ells, flat crosses, flat ells, flat tees, etc. Waterstops shall be securely wired into place to maintain proper position during

placement of fresh concrete, as shown on the Drawings. Care shall be taken in the installation of the waterstop and the placing of the concrete to avoid "folding" while concrete is being placed, and to prevent voids in the concrete surrounding the waterstop.

- J. Form Liners: Form liners for construction of fluted wall treatment shall be prefabricated plastic liners as manufactured by Greenstreak Plastic Products, Interform Company, or Symons Corporation.
1. Liners shall be fiberglass or ABS (acrylonitrile - butadiene - styrene) of such configuration as to obtain the fluted pattern shown or indicated on the Drawings.
 2. For purposes of designating type and quality of material required, form liners shall be pattern 361 trapezoidal liners as manufactured by Greenstreak Plastic Products.
 3. Preparation of forming materials, sealing of joints to prevent grout leakage and form release treatment (if required) shall be in strict compliance with the manufacturer's printed instructions and recommendations.

PART 3 - EXECUTION

3.1 FINISHES

A. Exposed to Public View Concrete Surfaces:

1. All concrete exposed to view in the completed structure shall be produced using materials and workmanship to such quality that only nominal finishing will be required. The provisions of paragraphs 6.2.2.1 and 6.3.6 of ACI 301 shall apply to all exterior exposed to public view concrete surfaces, including the outside surfaces of tanks.
2. Forms for exposed concrete surfaces shall be exterior grade, high-density overlay plywood, steel, or wood forms with smooth tempered hard-board form-liners.
3. Forms shall be coated with an approved release agent before initial pour and between subsequent pours, in accordance with the manufacturer's printed instructions. Form boards shall not be wet prior to placing concrete.
4. Recessed joints in concrete shall be formed using lacquer-coated wood battens or forms, milled to indicated profiles. Battens and corner strips shall be carefully inspected before concrete is placed and damaged pieces replaced.
5. Chamfer strips shall be one (1) inch radius with leg, polyvinyl chloride strips by Gateway Building Products, Saf-T-Grip Specialties Corp., Vinylex Corp., or equal.
6. Form panels shall be provided in the maximum sized practicable in order to minimize form joints. Wherever practicable, form joints shall occur at

recessed joints. All form joints in exterior exposed to view surfaces shall be carefully caulked with an approved nonstaining caulking compound. Joints shall not be taped. Form oil or other material which will impart a stain to the concrete shall not be allowed to contact concrete surfaces.

7. Care shall be taken to prevent chipping of corners or other damage to concrete when forms are removed. Exposed corners and other surfaces which may be damaged by ensuing operations shall be protected from damage by boxing, corner boards or other approved means until construction is completed.
 8. Form ties shall remain in the walls and shall be equipped with a waterseal to prevent passage of water through the walls. Minimum set back of form ties shall be 1-1/2 inches from faces of wall. The hole left by removal of tie ends shall be sealed and grouted in accordance with the procedure described hereinafter in Par. 3.01.F. Form ties will be permitted to fall within as-cast areas of architecturally treated wall surfaces; this does not apply to walls receiving decorative waterproof masonry coating.
 9. All formed exposed to view concrete surfaces shall have a "smooth rubbed finish". Exterior vertical surfaces shall be rubbed to one foot below grade. Interior exposed to public view vertical surfaces of liquid containers shall be rubbed to one (1) foot below the minimum liquid level that will occur during normal operations.
- B. All vertical surfaces in liquid containing structures shall have a "smooth form" finish.
1. All "smooth form" concrete vertical surfaces shall be a true plane within 1/4 inch in ten (10) feet as determined by a ten (10) foot straightedge placed anywhere on the surface in any direction. Abrupt irregularities shall not exceed 1/8 inch.
- C. Basin, flume, conduit and tank floors shall have a "troweled" finish unless shown otherwise on Drawings.
- D. Weirs and overflow surfaces shall be given a "troweled" finish.
- E. Exterior platforms, steps and landings, shall be given a "broom" finish. "Broom" finish shall be applied to surfaces which have been steel-troweled to an even, smooth finish. The troweled surface shall then be broomed with a fiber-bristle brush in the direction transverse to that of the main traffic.
- F. Patching of holes due to removal of tie ends and other repairable defective areas, shall be as follows: Entire contact area of hole shall be coated with two-part moisture insensitive epoxy bonding compound as specified in Par. 2.04.B. in accordance with manufacturer's specifications, and prior to placing of freshly mixed patching mortar. Patching mortar shall be mixed and placed in general accordance with ACI 301, Par. 5.3.7.5, floor finish – "smooth trowel" – 1/8" in

10'-0" or $F_F = 25$ and $F_L = 20$. F_F and F_L numbers applicable to horizontal surfaces only.

- G. For floors and slabs in which drains occur, special care shall be exercised to slope the floors uniformly to the drains. All floors with drains shall be sloped not less than 1/8 inch per foot unless otherwise shown. In all areas where quarry tile or other materials requiring more than 1/4 inch drop are to be overlaid, the concrete base slab shall be depressed to provide a finished floor at the same elevation as surrounding areas.

3.2 TESTING

- A. All testing shall be in accordance with provisions of ACI 301. Testing services listed in ACI Sections 1.6.4 shall be performed by the Owner's Testing Agency.
- B. The testing services of ACI sections 1.6.4.2 and 1.6.4.3 shall be performed at the Owner's expense. The Owner shall be responsible for making concrete test cylinders, storing and protecting concrete cylinders and delivering cylinders to the Owner-approved testing laboratory.
- C. Testing services of ACI Section 1.6.4.4 shall be paid for by the Owner. Test shall be made for each 50 cubic yards of concrete and/or each day concrete is placed. Each concrete test cylinder shall be 6" x 12".
- D. Testing samples shall be taken immediately before placement of concrete. If concrete is pumped, samples shall be taken from the discharge end of the hose.
- E. If Contractor chooses to perform any testing, testing services shall be performed by a separate Testing Agency from the Owner's selected Testing Agency and at the Contractor's expense.

3.3 ADDITIONAL REQUIREMENTS

- A. Unless otherwise directed by the CCA, the vertical surfaces of footings shall be formed. Excavations and reinforcement for all footings shall have been inspected by the CCA before any concrete is placed.
- B. The installation of underground and embedded items shall be inspected before slabs are placed. Pipes and conduits shall be installed below the concrete unless otherwise indicated. Fill required to raise the subgrade shall be placed as specified in Section 02300 "Earthwork". Porous fill not less than 6 inches in compacted thickness shall be installed under all slabs, tank bottoms, and foundations. The fill shall be leveled and uniformly compacted to a reasonably true and even surface. The surfaces shall be clean, free from frost, ice, mud and water. Waterproof paper, polyethylene sheeting of nominal 4-mil minimum

thickness, or polyethylene-coated burlap shall be laid over all surfaces receiving concrete.

- C. Concrete shall be placed in layers not over 18 inches deep and each layer shall be compacted by mechanical internal-vibrating equipment supplemented by hand spading, rodding and tamping as directed. Vibrators shall not be inserted into lower courses that have begun to set. Use chutes or tremies for placing concrete where a drop of more than 8' is required.
- D. Concrete that is truck mixed or transported in truck mixers or truck agitators shall be delivered to the site of the work and discharged completed in the forms within the time specified in Paragraph 12.7 of ASTM C 94/C 94M except that when the concrete temperature exceeds 85°F., the time shall be reduced to 45 minutes. Transit-mixed concrete that is completely mixed at the site of concrete placement or batched cement and aggregates transported to mixers shall be placed in the forms within 1-1/2 hours after cement has been added. Concrete shall be placed in the forms within 15 minutes after discharge from the mixer at the job site.
- E. If concrete is placed by pumping, no aluminum shall be used in any parts of the pumping system which contact or might contaminate the concrete. Aluminum chutes and conveyors shall not be used.
- F. All concrete surfaces not in contact with forms shall be moist cured by the application of absorptive mats or double thicknesses of fabric kept continuously wet. Forms shall be kept continuously wet. Use of other curing methods will not be permitted unless written authorization is received from the CCA.
- G. The unit of operation shall not exceed 30 feet for tank walls and walls exposed to weather, and 45 feet for other work in any horizontal direction and not less than 48 hours shall elapse between casting of adjoining units unless these requirements are waived by the CCA. Provision shall be made for jointing successive units as indicated or required to be made at spacing of approximately 25 feet. Additional construction joints required to satisfy the 25 foot spacing shall be located by the Contractor subject to the review of the CCA. The Contractor shall submit for review drawings separate from the steel reinforcing drawings, showing the location of all proposed construction joints. All construction joints shall be prepared for bonding by roughening the surface of the concrete in an acceptable manner which will expose the aggregate uniformly and will not leave laitance, loosened particles of aggregate or damaged concrete at the surface. Joints in walls and columns shall be maintained level. Concrete shall be placed in layers not over 18 inches deep and each layer shall be compacted by mechanical internal-vibrating equipment supplemented by hand spading, rodding and tamping as directed. Vibrators shall not be inserted into lower courses that have begun to set.
- H. Formwork for beam soffits and slabs and other parts that support the weight of

concrete, shall remain in place until the concrete has reached its specified 28-day strength, unless otherwise specified or permitted.

I. Concrete Walks and Curbs:

1. Subgrade shall be true and well compacted at the required grades. Spongy and otherwise unsuitable material shall have been removed and replaced with approved material. Concrete walks shall be placed upon porous fill covered with waterproof paper, polyethylene sheeting of nominal 4-mil minimum thickness or polyethylene-coated burlap.
2. Concrete walks shall be not less than 4 inches in thickness. Walks shall have contraction joints every 5 linear feet in each groove in the top surface of the slab to a depth of at least one-fourth the slab thickness with a jointing tool. Transverse expansion joints shall be installed at all returns, driveways, and opposite expansion joints in adjacent curbs. Where curbs are not adjacent, transverse expansion joints shall be installed at intervals of approximately forty (40) feet. Sidewalks shall receive a "broomed" finish. Scoring shall be in a transverse direction. Edges of the sidewalks and joints shall be edged with a tool having a radius not greater than 1/6 inch. Sidewalks adjacent to curbs shall have a slope of 1/4 inch per foot toward the curb. Sidewalks not adjacent to curbs shall have a slope of 1/4 inch per foot. The surface of the concrete shall show no variation in cross section in excess of 1/4 inch in 5 feet. Concrete walks shall be reinforced with 6 x 6-W1.4xW1.4 welded wire reinforcement.
3. Concrete curbs shall be constructed to the section indicated on the Standard Detail, and all horizontal and vertical curves shall be incorporated as indicated or required. Forms shall be steel as approved by the CCA. At the option of the Contractor, the curbs may be precast or cast-in-place. Cast-in-place curbs shall be divided into sections 8 to 10 feet in length using steel divider plates. The divider plates shall extend completely through the concrete and shall be removed. Precast curbs shall be cast in lengths of 4 to 5 feet. All exposed surfaces of concrete shall be finished smooth. All sharp edges and the edges of joints and divisions shall be tooled to 1/4 inch radius. Steel reinforcement shall be installed where the curb crosses pipe trenches or other insecure foundations. Such reinforcement shall consist of two (2) No. 4 deformed bars near the bottom of the curb and shall extend at least 24 inches beyond the insecure area. Transverse expansion joints shall be installed at all curb returns and at intervals of approximately 40 feet.

- J. Column base plates, bearing plates for beams and similar structural members, machinery and equipment bases shall, after being plumbed and properly positioned, be provided with full bearing with nonshrink grout. Concrete surfaces shall be rough, clean, free of oil, grease, and laitance and shall be moistened thoroughly immediately before grout is placed. Metal surfaces shall be clean and free of oil, grease and rust. Mixing and placing shall be in conformance with the material manufacturer's printed instructions. After the grout has set, exposed

surfaces shall be cut back one (1) inch and covered with a parge coat of mortar consisting of one (1) part Portland cement, two (2) parts sand and sufficient water to make the mixture placeable. Parge coat shall have a smooth dense finish. Exposed surfaces of grout and parge coat shall be water cured with wet burlap for seven (7) days.

- K. Grout fill which is formed in place by using rotating equipment as a screen, such as clarifiers and similar types of equipment, shall be mixed in proportions and consistencies as required by the manufacturer or supplier of the equipment.
- L. Watertightness:
1. The structures which are intended to contain liquids and/or will be subjected to exterior hydrostatic pressures shall be so constructed that, when completed and tested, there shall be no loss of water and no wet spots shall show.
 2. As soon as practicable, after the completion of the structures, the Contractor shall fill them with water and if leakages develop or wet spots show, the Contractor shall empty such structures and correct the leakage in an approved manner. Any cracks which appear in the concrete shall be dug out and suitably repaired. Temporary bulkheads over pipe openings in walls shall be provided as required for the testing.
 3. After repairs, if any are required, the structures shall be tested again and further repaired if necessary until satisfactory results are obtained. All work in connection with these tests and repairs shall be at the expense of the Contractor.
 4. Waterstops shall be placed in other locations as indicated on the Drawings and as may be required to assure the watertightness of all containers of liquids. Special shop fabricated ells, tees and crosses shall be provided at junctions. Waterstops shall be extended at least 6 inches beyond end of placement in order to provide splice length for subsequent placement. In slabs and tank bottoms, water stops shall be turned up to be made continuous with waterstops at bottom of walls or in walls.
 5. Joints between pipe (except cast iron wall pipe) and cast-in-place concrete walls shall be sealed by means of a groove cast completely around the pipe; the groove shall be filled with a quick setting hydraulic compound similar and equal to Waterplug as made by BASF Construction Chemicals mixed and applied in accordance with the manufacturer's instructions.
- M. Unless otherwise shown or directed, all pumps, other equipment, and items such as lockers, motor control centers and the like, shall be installed on concrete bases. The bases shall be constructed to the dimensions shown on the plans or as required to meet plan elevations. Where no specific plan elevations are required, the bases shall be 6 inches thick and shall extend 3 inches outside the metal equipment base. In general, the concrete bases shall be placed up to 2 inches

below the metal base. The equipment shall then be properly shimmed to grade and the 2- inch void filled with nonshrink grout.

- N. Concrete which, in the opinion of the CCA, has excessive honeycomb, aggregate pockets or depressions will be rejected and the Contractor shall, at his own expense, remove the entire section containing such defects and replace it with acceptable concrete.
- O. Manhole or access steps shall be plastic, constructed of copolymer polypropylene meeting the requirements of ASTM D 2146 for Type II, Grade 16906 material. Step shall be reinforced with ASTM A 615, Grade 60, #4 deformed steel reinforcing bar, be 9" deep, 14" wide, provided with notched tread ridge, foot retainer lugs on each side of tread and penetration stops for press fit installation. Plastic steps shall be PS2-PF as manufactured by M.A. industries, Inc., Peachtree City, Georgia. Steps shall be installed by drilling 1" diameter holes, minimum 3-3/4 inches deep into the wall, and then driving steps into hole to the penetration stop, resulting in a press fit condition.
- P. Tank pressure relief valves shall be 6" diameter Neenah Foundry Company R-5001-1, American Valve & Hydrant B315.1, or equal, floor type, with outside hooks or inside self-contained lock; quantity and spacing as shown on structural drawings. No part of pressure relief valves shall project above the neat line of the tank floor to prevent fouling of scraper mechanisms where used.
- Q. All existing contact surfaces with new patch shall be coated with moisture insensitive epoxy bonding adhesive, Sikadur Hi-Mod, Concessive LPL Liquid by BASF Construction Chemicals, or approved equal. Patch shall consist of base pour of 4,000 psi structural concrete, then a topping of non-shrink natural aggregate grout, Masterflow 713, SonogROUT by BASF Construction Chemicals, or approved equal, mixed and placed in accordance with manufacturer's instructions, to the thicknesses shown on Drawings. Coat base pour with epoxy bonding adhesive prior to placing grout course.
- R. All reinforcing steel, formwork, bulkheads shall be in place for section of concrete being poured prior to beginning placement of concrete.

++ END OF SECTION ++

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SECTION 03395

CURING, SEALING, AND HARDENING CONCRETE FLOORS

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Single application cure-seal-hardener for new concrete floors.
- B. Precautions for avoiding staining concrete before and after application.

1.2 RELATED SECTIONS

- A. Section 03300 - Cast-In-Place Concrete: Concrete slabs.

1.3 SUBMITTALS

- A. Submit under provisions of Section 01300.
- B. Material requirements for concrete to which cure-seal-hardener is to be applied, including cement type, water-cement ratio, type of trowel finish, limitations on admixtures, pigments, bonding agents, and bond breakers, etc.
- C. Product Data: Manufacturer's data sheets, including product specifications, curing procedures, test data, preparation instructions and recommendations, storage and handling requirements and recommendations, and installation methods.
- D. Maintenance instructions, including precautions for avoiding staining after application.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: Applicator experienced with installation of product and certified by manufacturer, or applicator experienced with similar products and providing manufacturer's field technician on site to advise on application procedures; and providing adequate number of skilled workers trained and familiar with application requirements.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver product in factory numbered and sealed drums, with numbers recorded for Owner's records.

- B. Store products in manufacturer's unopened drums until ready for installation.

1.6 PROJECT CONDITIONS

- A. No satisfactory procedures are available to remove petroleum or rust stains from concrete. Prevention is therefore essential. Take precautions to prevent staining of concrete prior to application of cure-seal-hardener and for minimum of three months after application:
 - 1. Prohibit parking of vehicles on concrete slab.
 - 2. If vehicles must be temporarily parked on slab, place drop cloths under vehicles during entire time parked.
 - 3. If construction equipment must be used for application, diaper all components that might drip oil, hydraulic fluid, or other liquids.
 - 4. Prohibit pipe cutting using pipe cutting machinery on concrete slab.
 - 5. Prohibit temporary placement and storage of steel members on concrete slab.
- B. Do not install products under environmental conditions outside manufacturer's absolute limits.
- C. Do not use frozen material; thaw and agitate prior to use.

1.7 WARRANTY

- A. Provide manufacturer's warranty that a structurally sound concrete surface prepared and treated according to the manufacturer's directions will remain permanently dustproof, hardened and water repellent. If after the specified sealing period the treated surface does not remain dustproof, hardened and water repellent, provide, at manufacturer's expense, sufficient material to reseal defective areas.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Acceptable Manufacturer: Curecrete Distribution, Inc; 1203 West Spring Creek Place, Springville, UT 84663. ASD. Tel: (800) 998-5664. Fax: (801) 489-3307. Email: techsupport@ashfordformula.com. www.ashfordformula.com

2.2 MATERIALS

- A. Cure-Seal-Hardener: Ashford Formula; water-based chemically-reactive penetrating sealer and hardener, that seals by densifying concrete so that water molecules cannot pass through but air and water vapor can, while allowing concrete to achieve full compressive strength, minimizing surface crazing, and eliminating dusting.
 - 1. Colorless, transparent, odorless, non-toxic, non-flammable.

2. Containing no solvents or volatile organic compounds.
3. USDA approved for food handling facilities.
4. Allowing traffic on floors within 2 to 3 hours, with chemical process complete within 3 months.
5. No change to surface appearance except a sheen developed due to traffic and cleaning.

B. Water: Clean, potable.

PART 3 -EXECUTION

3.1 EXAMINATION

- A. Do not begin installation until substrates have been properly prepared and are suitable for application of product.
- B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 PREPARATION

- A. Clean surfaces thoroughly prior to installation.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.3 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. If this is the applicator's first project using this product, provide the manufacturer's technical representative on-site to familiarize installers with proper procedures.
- C. Prevent damage to and soiling of adjacent work.
- D. New Concrete: Apply cure-seal-hardener to new concrete as soon as the concrete is firm enough to work on after troweling, except on colored concrete wait minimum of 30 days.
 1. Spray on at rate of 200 square feet per gallon (4.8 sq m/L).
 2. Keep surfaces wet with cure-seal-hardener for minimum soak-in period of 30 minutes, without allowing drying out or becoming slippery. In hot weather slipperiness may appear before the 30 minute time period has elapsed. If that occurs, apply more cure-seal-hardener as required to keep entire surface in a non-slippery state for the first 15 minutes. For the remaining 15 minutes,

mist the surface as needed with water to keep the material in a non-slippery state.

3. After this period, when treated surface becomes slippery lightly mist with water until slipperiness disappears.
4. Wait for surface to become slippery again and then flush entire surface with water removing all residue of cure-seal-hardener.
5. Squeegee surface completely dry, flushing any remaining slippery areas until no residue remains.
6. Wet vacuum or scrubbing machines may be used to remove residue, provided manufacturer's instructions are followed.

3.4 PROTECTION

- A. Protect installed floors until chemical reaction process is complete; at least three months.
 1. Comply with precautions listed under PROJECT CONDITIONS.
 2. Clean floor regularly in accordance with manufacturer's recommendations because water will accelerate the sealing and scrubbing will impart a shine.
 3. Clean up spills immediately and spot-treat stains with good degreaser or oil emulsifier.
- B. Precautions cleaning are the responsibility of the General Contractor until Substantial Completion.

++ END OF SECTION ++

SECTION 03400

PRECAST PRESTRESSED CONCRETE

PART 1 – GENERAL

1.1 SCOPE OF WORK

- A. Provide all labor, materials, equipment, and services required to furnish and install all precast prestressed hollow core slabs and double tees as shown on the Drawings.

1.2 RELATED WORK SPECIFIED ELSEWHERE

- A. Cast-in-Place Concrete: Section 03300.

1.3 APPLICABLE PUBLICATIONS:

The following publications of the American Concrete Institute form a part of this Specification to the extent indicated by the references thereto:

- A. ACI 301 Specifications for Structural Concrete for Buildings.
- B. ACI 318 Building Code Requirements for Reinforced Concrete.
- C. PCI MNL-120 PCI Design Handbook

1.4 GENERAL REQUIREMENTS

- A. All prestressed concrete shall conform to all applicable provisions of ACI 318 and to all applicable provisions of Section 03300 “Cast-in-Place Concrete”. The designs shall conform to the requirements contained in ACI 318.
- B. Precast prestressed elements shall be designed to support all live and dead loads as determined by an analysis conforming to ACI 318 for simply supported spans of the lengths indicated on the Drawings. Loading data is shown on the Drawings. In addition, elements shall be adequately reinforced to resist all handling and erection stresses.
- C. Calculations pertinent to the design of all elements shall be prepared by a Registered Structural Engineer.
- D. Submittals: Shop drawings shall be submitted in accordance with Section 01340. Complete shop detailed erection drawings and design computations shall be submitted for review and sealed by a licensed professional engineer.

1.5 WORK OF OTHER TRADES

- A. All inserts, welded plates, sleeves and other items for the Work of other trades shall be installed.

PART 2 – PRODUCTS

2.1 MATERIALS

- A. Concrete:
 - 1. Concrete shall be proportioned as specified in Section 03300 “Cast-in-Place Concrete” to produce a minimum 28-day compressive strength of 5000 pounds per square inch.
 - 2. Elements shall be cast using normal weight structural concrete. Aggregates for normal weight structural concrete shall conform to the requirements of ASTM C33.
 - 3. Concrete shall conform to all applicable requirements of Section 03300 “Cast-in-Place Concrete”. Calcium chloride shall not be used as an admixture.
- B. Prestressing tendons shall be of wire or strand and shall conform to ASTM A421 or A416, Grade 270. No corroded, oiled, frayed or damaged strands shall be used and all strands shall be in position before stressing operations are begun.
- C. Welded wire fabric shall conform to the requirements of ASTM A185.
- D. Reinforcing steel shall be deformed billet steel, conforming to the requirements of ASTM A615, Grade 60. Fabrication and placement of reinforcing accessories shall be as specified in Section 03300 “Cast-in- Place Concrete.” All mild steel reinforcing for pretensioned units shall be finally positioned after stressing or prestressing strands.
- E. Bearing Pads – AASHTO M251.

PART 3 – EXECUTION

3.1 CURING

- A. Precast units shall be cured by keeping the concrete damp for not less than 7 days if made of normal Portland cement, and for not less than 3 days if made of high-early-strength cement. For each decrease of 5° below 70°F in the average curing temperature the curing periods shall be increased by 4 days for units made of

normal Portland cement and by 2 days for units made of high-early-strength cement. The average curing temperature in no case shall be less than 50° F. Where units are cured by high-pressure steam, steam vapor, or other acceptable processes used to accelerate the hardening of the cement, the curing time may be reduced provided the compressive strength of the concrete is equal to that obtained by damp curing, and the 28-day strength meets the requirements specified herein. Units shall not be erected until they are at least 30 days old.

3.2 TESTING

- A. Testing shall be in accordance with provisions of ACI 301, except that it shall be paid for by the manufacturer of the precast prestressed concrete products.

3.3 WORKMANSHIP

- A. The nominal dimensions of the members shall be not less than those indicated on the Drawings, and members shall meet the following requirements for fabricating tolerances at the time they are erected:
 - 1. Overall Length of Members: Plus or minus 1/16 inch per 10 feet but not to exceed plus 1/8 inch or minus 1/4 inch.
 - 2. Cross sectional dimensions: Plus or minus 1/4 inch.
 - 3. Deviation from straight line in long members not more than 1/4 inch in 20 feet.
- B. The upward camber of the units in their final position shall not exceed 1/400th of the clear span and the differential camber between adjacent units shall not exceed 3/8 inch.
- C. Top surfaces of members shall have a broom finish. Other surfaces shall have an as-cast finish, except that honeycomb and other surface defects which do not impair the structural strength shall be carefully cut out and refilled with high strength mortar or concrete.
- D. Bearing and anchorage of all members shall be as indicated on the Drawings. All plates, angles, etc., shown shall be cast in member and substantially anchored. Additional confinement reinforcing shall be provided as necessary.
- E. The tension in the strands of pretensioned elements shall not be transferred to the concrete until the concrete has attained adequate strength. The transfer shall be accomplished gradually in an approved manner.
- F. Lift hooks or inserts located not more than 2 feet from the end shall be provided in all members.
- G. The ends of all strands, not enclosed or covered shall be cut flush. End of strands and anchorage devices shall be covered with a high strength mortar bonded to the

unit with a bonding compound as specified in Section 03300 "Cast-in-Place Concrete".

3.4 STORAGE AND HANDLING

- A. Members shall be stored on cribbing or other suitable platform that will prevent contact with the ground. Members shall be stored on level surfaces in an upright position with supports placed within two (2) feet of the ends of the members. Units shall be stored, stacked and transported in a manner to prevent the development of cracks and/or excessive stresses.

3.5 ERECTION

- A. Members shall be aligned and adjusted accurately before being permanently attached to their supports. Bearing surfaces and surfaces that will be in permanent contact shall be cleaned before members are erected. Lift hooks shall be cut off not less than 1/2 inch beneath top surface of the concrete and the surface shall be patched using high strength mortar and an epoxy bonding compound. Weld plates and other exposed metal surfaces shall be coated with two (2) coats of hard drying bitumastic paint.

++ END OF SECTION ++

SECTION 03450

ARCHITECTURAL PRECAST 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. This Section includes the following:
 - 1. Architectural precast concrete cladding and load-bearing units.
- B. Related Sections include the following:
 - 1. Section 03300 "Cast-in-Place Concrete" for installing connection anchors in concrete.
 - 2. Section 03400 "Precast Prestressed Concrete."
 - 3. Section 04810 "Unit Masonry Assemblies" for thin brick setting materials and installation after precast concrete panel production.
 - 4. Section 05120 "Structural Steel" for furnishing and installing connections attached to structural-steel framing.
 - 5. Section 05500 "Metal Fabrications" for kickers and other miscellaneous steel shapes.
 - 6. Section 07190 "Water Repellents" for water-repellent finish treatments.

1.3 DEFINITION

- A. Design Reference Sample: Sample of approved architectural precast concrete color, finish and texture, preapproved by Architect.

1.4 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Provide architectural precast concrete units and connections capable of withstanding the following design loads within limits and under conditions indicated:
 - 1. Loads: As indicated.
 - 2. Dead Loads: As indicated on structural Drawings.
 - 3. Live Loads: As indicated on structural Drawings.
 - 4. Wind Loads: Per Kentucky Building Code.
 - 5. Seismic Loads: As indicated on structural Drawings.
 - 6. Project Specific Loads: As indicated on structural Drawings.
 - 7. Design framing system and connections to maintain clearances at openings, to allow for fabrication and construction tolerances, to accommodate live-

load deflection, shrinkage and creep of primary building structure, and other building movements as follows:

- a. Upward and downward movement of 1/2 inch (13 mm).
8. Thermal Movements: Provide for in-plane thermal movements resulting from annual ambient temperature changes of 80 deg F (26 deg C).
9. Window Washing System: Design precast units supporting window washing system indicated to resist pull-out and horizontal shear forces transmitted from window washing equipment.
10. Vehicular Impact Loads: Design spandrel beams acting as vehicular barriers for passenger cars to resist a single 6000-lb (26.7-kN) service load and load applied horizontally in any direction to the spandrel beam, with anchorages or attachments capable of transferring this load to the structure. Design spandrel beams assuming the load to act at a height of 18 inches (460 mm) above the floor or ramp surface on an area not to exceed 1 sq. ft. (0.93 sq. m).

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. LEED Submittals:
 1. Project will not be certified however shall meet the intent.
 2. Product Data for Credit MR 4: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.
- C. Design Mixtures: For each precast concrete mixture. Include compressive strength and water-absorption tests.
- D. Shop Drawings: Detail fabrication and installation of architectural precast concrete units. Indicate locations, plans, elevations, dimensions, shapes, and cross sections of each unit. Indicate joints, reveals, and extent and location of each surface finish. Indicate details at building corners.
 1. Indicate separate face and backup mixture locations and thicknesses.
 2. Indicate welded connections by AWS standard symbols. Detail loose and cast-in hardware and connections.
 3. Indicate locations, tolerances, and details of anchorage devices to be embedded in or attached to structure or other construction.
 4. Indicate locations, extent, and treatment of dry joints if two-stage casting is proposed.
 5. Include plans and elevations showing unit location and sequence of erection for special conditions.
 6. Indicate location of each architectural precast concrete unit by same identification mark placed on panel.
 7. Indicate relationship of architectural precast concrete units to adjacent materials.

8. Design Modifications: If design modifications are proposed to meet performance requirements and field conditions, submit design calculations and Shop Drawings. Do not adversely affect the appearance, durability, or strength of units when modifying details or materials and maintain the general design concept.
 9. Comprehensive engineering analysis signed and sealed by the qualified professional engineer licensed in the State of Kentucky responsible for its preparation. Show governing panel types, connections, and types of reinforcement, including special reinforcement. Indicate location, type, magnitude, and direction of loads imposed on the building structural frame from architectural precast concrete.
- E. Samples: For each type of finish indicated on exposed surfaces of architectural precast concrete units, in sets of 3, illustrating full range of finish, color, and texture variations expected; approximately 12 by 12 by 2 inches (300 by 300 by 50 mm).
1. When other faces of precast concrete unit are exposed, include Samples illustrating workmanship, color, and texture of backup concrete as well as facing concrete.
 2. Samples for each brick unit required, showing full range of color and texture expected. Include Sample showing color and texture of joint treatment.
 - a. Grout Samples for Initial Selection: Color charts consisting of actual sections of grout showing manufacturer's full range of colors.
 - b. Grout Samples for Verification: Showing color and texture of joint treatment.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer, fabricator, and testing agency.
- B. Welding certificates.
- C. Material Certificates: For the following items, signed by manufacturers:
 1. Cementitious materials.
 2. Reinforcing materials and prestressing tendons.
 3. Admixtures.
 4. Bearing pads.
 5. Structural-steel shapes and hollow structural sections.
- D. Material Test Reports: For aggregates.
- E. Source quality-control test reports.
- F. Field quality-control test and special inspection reports.

1.7 QUALITY ASSURANCE

- A. **Installer Qualifications:** A precast concrete erector qualified and designated by PCI's Certificate of Compliance to erect Category A (Architectural Systems) for non-load and S2 (Complex Structural Systems) for load-bearing members.
- B. **Installer Qualifications:** A precast concrete erector who has retained a "PCI-Certified Field Auditor" to conduct a field audit of a project in same category as this Project before erection of precast concrete and who can produce an Erectors' Post-Audit Declaration.
- C. **Fabricator Qualifications:** A firm that assumes responsibility for engineering architectural precast concrete units to comply with performance requirements. This responsibility includes preparation of Shop Drawings and comprehensive engineering analysis by a qualified professional engineer.
 - 1. Participates in PCI's plant certification program at time of bidding and is designated a PCI-certified plant for Group A, Category A1 - Architectural Cladding and Load Bearing Units or participates in APA's "Plant Certification Program for Production of Architectural Precast Concrete Products" and is designated an APA-certified plant.
- D. **Testing Agency Qualifications:** An independent testing agency, acceptable to the Architect, qualified according to ASTM C 1077 and ASTM E 329 for testing indicated.
- E. **Design Standards:** Comply with ACI 318 and design recommendations of PCI MNL 120, "Precast Concrete," applicable to types of architectural precast concrete units indicated.
- F. **Quality-Control Standard:** For manufacturing procedures and testing requirements, quality-control recommendations, and dimensional tolerances for types of units required, comply with PCI MNL 117, "Manual for Quality Control for Plants and Production of Architectural Precast Concrete Products."
- G. **Welding:** Qualify procedures and personnel according to AWS D1.1/D.1.1M, "Structural Welding Code - Steel"; and AWS D1.4, "Structural Welding Code - Reinforcing Steel."
- H. **Sample Panels:** After sample approval and before fabricating architectural precast concrete units, produce a minimum of (2) two sample panels approximately 16 sq. ft. (1.5 sq. m) in area for review by Architect. Incorporate full-scale details of architectural features, finishes, textures, and transitions in sample panels.
 - 1. Locate panels where indicated or, if not indicated, as directed by Architect.
 - 2. Damage part of an exposed-face surface for each finish, color, and texture, and demonstrate adequacy of repair techniques proposed for repair of surface blemishes.

3. After acceptance of repair technique, maintain one sample panel at manufacturer's plant and one at Project site in an undisturbed condition as a standard for judging the completed Work.
 4. Demolish and remove sample panels when directed.
- I. Range Samples: After sample panel approval and before fabricating architectural precast concrete units, produce a minimum of (3) three sets of samples, approximately 4 sq. ft. (.38 sq. m) in area, representing anticipated range of each color and texture on Project's units. Following range sample, maintain one set of samples at Project site and remaining sample sets at manufacturer's plant as color and texture approval reference.
 - J. Mockups: After sample panel and range sample approval but before production of architectural precast concrete units, construct full-sized mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
 1. Build mockup as indicated on Drawings including all exterior elements and architectural precast concrete complete with anchors, connections, flashings, and joint fillers.
 2. Approved mockups may become part of the completed Work if undamaged at time of Substantial Completion.
 3. Approval of mockups does not constitute approval of deviations from the Contract Documents unless such deviations are specifically approved by Architect in writing.
 - K. Preinstallation Conference: Conduct conference at Project site to comply with requirements in General Requirements section of the specifications.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Deliver architectural precast concrete units in such quantities and at such times to limit unloading units temporarily on the ground.
- B. Support units during shipment on nonstaining shock-absorbing material.
- C. Store units with adequate dunnage and bracing and protect units to prevent contact with soil, to prevent staining, and to prevent cracking, distortion, warping or other physical damage.
- D. Place stored units so identification marks are clearly visible, and units can be inspected.
- E. Handle and transport units in a position consistent with their shape and design in order to avoid excessive stresses which would cause cracking or damage.
- F. Lift and support units only at designated points shown on Shop Drawings.

1.9 SEQUENCING

- A. Furnish loose connection hardware and anchorage items to be embedded in or attached to other construction without delaying the Work. Provide locations, setting diagrams, templates, instructions, and directions, as required, for installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Fabricators: Subject to compliance with requirements, fabricators offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Gate Bluegrass Precast Inc., Winchester, KY
 - 2. Equivalent manufacturer.

2.2 MOLD MATERIALS

- A. Molds: Rigid, dimensionally stable, non-absorptive material, warp and buckle free, that will provide continuous and true precast concrete surfaces within fabrication tolerances indicated; nonreactive with concrete and suitable for producing required finishes.
 - 1. Mold-Release Agent: Commercially produced liquid-release agent that will not bond with, stain or adversely affect precast concrete surfaces and will not impair subsequent surface or joint treatments of precast concrete.
- B. Form Liners: Units of face design, texture, arrangement, and configuration as indicated. Furnish with manufacturer's recommended liquid-release agent that will not bond with, stain, or adversely affect precast concrete surfaces and will not impair subsequent surface or joint treatments of precast concrete.
- C. Surface Retarder: Chemical set retarder, capable of temporarily delaying final hardening of newly placed concrete mixture to depth of reveal specified.

2.3 REINFORCING MATERIALS

- A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.
- B. Reinforcing Bars: ASTM A 615/A 615M, Grade 60 (Grade 420), deformed.
- C. Low-Alloy-Steel Reinforcing Bars: ASTM A 706/A 706M, deformed.
- D. Galvanized Reinforcing Bars: ASTM A 615/A 615M, Grade 60 (Grade 420), deformed bars, ASTM A 767/A 767M, Class II zinc coated, hot-dip galvanized, and chromate wash treated after fabrication and bending.

- E. Epoxy-Coated Reinforcing Bars: ASTM A 615/A 615M, Grade 60 (Grade 420), deformed bars, or ASTM A 934/A 934M epoxy coated.
- F. Steel Bar Mats: ASTM A 184/A 184M, fabricated from ASTM A 615/A 615M, Grade 60 (Grade 420), deformed bars, assembled with clips.
- G. Plain-Steel Welded Wire Reinforcement: ASTM A 185, fabricated from galvanized steel wire into flat sheets.
- H. Deformed-Steel Welded Wire Reinforcement: ASTM A 497/A 497M, flat sheet.
- I. Epoxy-Coated-Steel Wire: ASTM A 884/A 884M, Class A coated, deformed, flat sheet, Type 1 bendable coating.
- J. Supports: Suspend reinforcement from back of mold or use bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire reinforcement in place according to PCI MNL 117.

2.4 PRESTRESSING TENDONS

- A. Prestressing Strand: ASTM A 416/A 416M, Grade 270 (Grade 1860), uncoated, 7-wire, low-relaxation strand.
 - 1. Coat unbonded post-tensioning strand with corrosion inhibitor passing ASTM D 1743 and sheath with polypropylene tendon sheathing. Include anchorage devices and coupler assemblies.

2.5 CONCRETE MATERIALS

- A. Portland Cement: ASTM C 150, Type I or Type III, gray, unless otherwise indicated.
 - 1. For surfaces exposed to view in finished structure, mix gray with white cement, of same type, brand, and mill source.
- B. Supplementary Cementitious Materials:
 - 1. Fly Ash (15% maximum): ASTM C 618, Class C or F, with maximum loss on ignition of 6%.
 - 2. Metakaolin Admixture: ASTM C 618, Class N.
 - 3. Silica Fume Admixture: ASTM C 1240, with optional chemical and physical requirement.
 - 4. Ground Granulated Blast-Furnace Slag: ASTM C 989, Grade 100 or 120.
- C. Normal-Weight Aggregates: Except as modified by PCI MNL 117, ASTM C 33, with coarse aggregates complying with Class 5S. Stockpile fine and coarse aggregates for each type of exposed finish from a single source (pit or quarry) for Project.

1. Face-Mixture-Coarse Aggregates: Selected, hard, and durable; free of material that reacts with cement or causes staining; to match selected finish sample.
 - a. Gradation: Match design finish requirements approved in the mock-up.
 2. Face-Mixture-Fine Aggregates: Selected, natural or manufactured sand of same material as coarse aggregate, unless otherwise approved by Architect.
- D. Lightweight Aggregates: Except as modified by PCI MNL 117, ASTM C 330, with absorption less than 11 percent.
- E. Coloring Admixture: ASTM C 979, synthetic or natural mineral-oxide pigments or colored water-reducing admixtures, temperature stable, and nonfading.
- F. Water: Potable; free from deleterious material that may affect color stability, setting, or strength of concrete and complying with chemical limits of PCI MNL 117.
- G. Air-Entraining Admixture: ASTM C 260, certified by manufacturer to be compatible with other required admixtures.
- H. Chemical Admixtures: Certified by manufacturer to be compatible with other admixtures and to not contain calcium chloride, or more than 0.15 percent chloride ions or other salts by weight of admixture.
 1. Water-Reducing Admixtures: ASTM C 494/C 494M, Type A.
 2. Retarding Admixture: ASTM C 494/C 494M, Type B.
 3. Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.
 4. Water-Reducing and Accelerating Admixture: ASTM C 494/C 494M, Type E.
 5. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.
 6. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type G.
 7. Plasticizing and Retarding Admixture: ASTM C 1017/C 1017 M.

2.6 STEEL CONNECTION MATERIALS

- A. Carbon-Steel Shapes and Plates: ASTM A 36/A 36M.
- B. Carbon-Steel-Headed Studs: ASTM A 108, AISI 1018 through AISI 1020, cold finished, AWS D1.1/D1.1M, Type A or B, with arc shields and with minimum mechanical properties of PCI MNL 117, Table 3.2.3.
- C. Carbon-Steel Plate: ASTM A 283/A 283M.
- D. Malleable Iron Castings: ASTM A 47/A 47M.
- E. Carbon-Steel Castings: ASTM A 27/A 27M, Grade 60-30 (Grade 415-205).

- F. High-Strength, Low-Alloy Structural Steel: ASTM A 572/A 572M.
- G. Carbon-Steel Structural Tubing: ASTM A 500, Grade B.
- H. Wrought Carbon-Steel Bars: ASTM A 675/A 675M, Grade 65 (Grade 450).
- I. Deformed-Steel Wire or Bar Anchors: ASTM A 496 or ASTM A 706/A 706M.
- J. Carbon-Steel Bolts and Studs: ASTM A 307, Grade A (ASTM F 568M, Property Class 4.6); carbon-steel, hex-head bolts and studs; carbon-steel nuts, ASTM A 563 (ASTM A 563M); and flat, unhardened steel washers, ASTM F 844.
- K. High-Strength Bolts and Nuts: ASTM A 325 (ASTM A 325M), Type 1, heavy hex steel structural bolts; heavy hex carbon-steel nuts, ASTM A 563 (ASTM A 563M); and hardened carbon-steel washers, ASTM F 436 (ASTM F 436M).
- L. Zinc-Coated Finish: For exterior steel items, steel in exterior walls, and items indicated for galvanizing, apply zinc coating by hot-dip process according to ASTM A 123/A 123M or ASTM A 153/A 153M
- M. Shop-Primed Finish: Prepare surfaces of nongalvanized steel items, except those surfaces to be embedded in concrete, according to requirements in SSPC-SP 3 and shop-apply lead- and chromate-free, rust-inhibitive primer, complying with performance requirements in MPI 79 or SSPC-Paint 25 according to SSPC-PA 1.
- N. Welding Electrodes: Comply with AWS standards.

2.7 STAINLESS-STEEL CONNECTION MATERIALS

- A. Stainless-Steel Plate: ASTM A 666, Type 304, of grade suitable for application.
- B. Stainless-Steel Bolts and Studs: ASTM F 593, Alloy 304 or 316, hex-head bolts and studs; stainless-steel nuts; and flat, stainless-steel washers.
 - 1. Lubricate threaded parts of stainless-steel bolts with an antiseize thread lubricant during assembly.
- C. Stainless-Steel-Headed Studs: ASTM A 276, with minimum mechanical properties of PCI MNL 117, Table 3.2.3.

2.8 BEARING PADS

- A. Provide one of the following bearing pads for architectural precast concrete units as recommended by precast fabricator for application:
 - 1. Elastomeric Pads: AASHTO M 251, plain, vulcanized, 100 percent polychloroprene (neoprene) elastomer, molded to size or cut from a molded sheet,

Type A durometer hardness of 50 to 70, ASTM D 2240, minimum tensile strength 2250 psi (15.5 MPa), ASTM D 412.

2. Random-Oriented, Fiber-Reinforced Elastomeric Pads: Preformed, randomly oriented synthetic fibers set in elastomer. Type A durometer hardness of 70 to 90, ASTM D 2240; capable of supporting a compressive stress of 3000 psi (20.7 MPa) with no cracking, splitting, or delaminating in the internal portions of pad. Test one specimen for every 200 pads used in Project.
3. Cotton-Duck-Fabric-Reinforced Elastomeric Pads: Preformed, horizontally layered cotton-duck fabric bonded to an elastomer; Type A durometer hardness of 80 to 100, ASTM D 2240; complying with AASHTO's "AASHTO Load and Resistance Factor Design (LRFD) Bridge Design Specifications, Division II, Section 18.10.2, or with MIL-C-882E.
4. Frictionless Pads: Tetrafluoroethylene (Teflon), glass-fiber reinforced, bonded to stainless or mild-steel plate, of type required for in-service stress.
5. High-Density Plastic: Multimonomer, nonleaching, plastic strip.

2.9 ACCESSORIES

- A. Reglets: Specified in Section 07620 "Sheet Metal Flashing and Trim."
- B. Reglets: Stainless steel, Type 302 or 304, felt or fiber filled, or with face opening of slots covered.
- C. Precast Accessories: Provide clips, hangers, plastic or steel shims, and other accessories required to install architectural precast concrete units.

2.10 GROUT MATERIALS

- A. Sand-Cement Grout: Portland cement, ASTM C 150, Type I, and clean, natural sand, ASTM C 144 or ASTM C 404. Mix at ratio of 1 part cement to 2-1/2 parts sand, by volume, with minimum water required for placement and hydration.
- B. Nonmetallic, Nonshrink Grout: Premixed, nonmetallic, noncorrosive, nonstaining grout containing selected silica sands, portland cement, shrinkage-compensating agents, plasticizing and water-reducing agents, complying with ASTM C 1107, Grade A for drypack and Grades B and C for flowable grout and of consistency suitable for application within a 30-minute working time.
- C. Epoxy-Resin Grout: Two-component, mineral-filled epoxy resin; ASTM C 881/C 881M, of type, grade, and class to suit requirements.

2.11 INSULATED PANEL ACCESSORIES

- A. Extruded-Polystyrene Board Insulation: ASTM C 578, Type [IV, 1.60 lb/cu. ft. (26 kg/cu. m)] [ship-lap] edges; with R-value of (10) ten and thickness of 2 inches.

2.12 CONCRETE MIXTURES

- A. Prepare design mixtures for each type of precast concrete required.
 - 1. Limit use of fly ash and silica fume to 20 percent of portland cement by weight; limit metakaolin and silica fume to 10 percent of portland cement by weight.
- B. Design mixtures may be prepared by a qualified independent testing agency or by qualified precast plant personnel at architectural precast concrete fabricator's option.
- C. Limit water-soluble chloride ions to maximum percentage by weight of cement permitted by ACI 318 (ACI 318M) or PCI MNL 117 when tested according to ASTM C 1218/C 1218M.
- D. Normal-Weight Concrete Mixtures: Proportion full-depth mixture by either laboratory trial batch or field test data methods according to ACI 211.1, with materials to be used on Project, to provide normal-weight concrete with the following properties:
 - 1. Compressive Strength (28 Days): 5000 psi (34.5 MPa) minimum.
 - 2. Maximum Water-Cementitious Materials Ratio: 0.45.
- E. Water Absorption: 6 percent by weight or 14 percent by volume, tested according to PCI MNL 117.
- F. Lightweight Concrete Backup Mixtures: Proportion mixtures by either laboratory trial batch or field test data methods according to ACI 211.2, with materials to be used on Project, to provide lightweight concrete with the following properties:
 - 1. Compressive Strength (28 Days): 5000 psi (34.5 MPa).
 - 2. Unit Weight: Calculated equilibrium unit weight of 115 lb/cu. ft. (1842 kg/cu. m), plus or minus 3 lb/cu. ft. (48 kg/cu. m), according to ASTM C 567.
- G. Add air-entraining admixture at manufacturer's prescribed rate to result in concrete at point of placement having an air content complying with PCI MNL 117.
- H. When included in design mixtures, add other admixtures to concrete mixtures according to manufacturer's written instructions.

2.13 MOLD FABRICATION

- A. Molds: Accurately construct molds, mortar tight, of sufficient strength to withstand pressures due to concrete-placement operations and temperature changes and for prestressing and detensioning operations. Coat contact surfaces of molds with release agent before reinforcement is placed. Avoid contamination of reinforcement and prestressing tendons by release agent.

1. Place form liners accurately to provide finished surface texture indicated. Provide solid backing and supports to maintain stability of liners during concrete placement. Coat form liner with form-release agent.
- B. Maintain molds to provide completed architectural precast concrete units of shapes, lines, and dimensions indicated, within fabrication tolerances specified.
 1. Form joints are not permitted on faces exposed to view in the finished work.
 2. Edge and Corner Treatment: Uniformly [chamfered] [radiused].

2.14 FABRICATION

- A. Cast-in Anchors, Inserts, Plates, Angles, and Other Anchorage Hardware: Fabricate anchorage hardware with sufficient anchorage and embedment to comply with design requirements. Accurately position for attachment of loose hardware, and secure in place during precasting operations. Locate anchorage hardware where it does not affect position of main reinforcement or concrete placement.
 1. Weld-headed studs and deformed bar anchors used for anchorage according to AWS D1.1/D1.1M and AWS C5.4, "Recommended Practices for Stud Welding."
- B. Furnish loose hardware items including steel plates, clip angles, seat angles, anchors, dowels, cramps, hangers, and other hardware shapes for securing architectural precast concrete units to supporting and adjacent construction.
- C. Cast-in reglets, slots, holes, and other accessories in architectural precast concrete units as indicated on the Contract Drawings.
- D. Cast-in openings larger than 10 inches (250 mm) in any dimension. Do not drill or cut openings or prestressing strand without Architect's approval.
- E. Reinforcement: Comply with recommendations in PCI MNL 117 for fabricating, placing, and supporting reinforcement.
 1. Clean reinforcement of loose rust and mill scale, earth, and other materials that reduce or destroy the bond with concrete. When damage to epoxy-coated reinforcing exceeds limits specified in ASTM A 775/A 775M, repair with patching material compatible with coating material and epoxy coat bar ends after cutting.
 2. Accurately position, support, and secure reinforcement against displacement during concrete-placement and consolidation operations. Completely conceal support devices to prevent exposure on finished surfaces.
 3. Place reinforcement to maintain at least 3/4-inch (19-mm) minimum coverage. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position while placing concrete. Direct wire tie ends away from finished, exposed concrete surfaces.
 4. Place reinforcing steel and prestressing strand to maintain at least 3/4-inch (19-mm) minimum concrete cover. Increase cover requirements for reinforcing steel to 1-1/2 inches (38 mm) when units are exposed to corrosive

- environment or severe exposure conditions. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position while placing concrete. Direct wire tie ends away from finished, exposed concrete surfaces.
5. Install welded wire fabric in lengths as long as practicable. Lap adjoining pieces at least one full mesh spacing and wire tie laps, where required by design. Offset laps of adjoining widths to prevent continuous laps in either direction.
- F. Reinforce architectural precast concrete units to resist handling, transportation, and erection stresses.
- G. Prestress tendons for architectural precast concrete units by either pretensioning or post-tensioning methods. Comply with PCI MNL 117.
1. Delay detensioning or post-tensioning of precast, prestressed architectural concrete units until concrete has reached its indicated minimum design release compressive strength as established by test cylinders cured under same conditions as concrete.
 2. Detension pretensioned tendons either by gradually releasing tensioning jacks or by heat-cutting tendons, using a sequence and pattern to prevent shock or unbalanced loading.
 3. If concrete has been heat-cured, detension while concrete is still warm and moist to avoid dimensional changes that may cause cracking or undesirable stresses.
 4. Protect strand ends and anchorages with bituminous, zinc-rich, or epoxy paint to avoid corrosion and possible rust spots.
- H. Comply with requirements in PCI MNL 117 and requirements in this Section for measuring, mixing, transporting, and placing concrete. After concrete batching, no additional water may be added.
- I. Place face mixture to a minimum thickness after consolidation of the greater of 1 inch (25 mm) or 1.5 times the maximum aggregate size, but not less than the minimum reinforcing cover specified.
- J. Place concrete in a continuous operation to prevent seams or planes of weakness from forming in precast concrete units.
1. Place backup concrete mixture to ensure bond with face-mixture concrete.
- K. Thoroughly consolidate placed concrete by internal and external vibration without dislocating or damaging reinforcement and built-in items, and minimize pour lines, honeycombing, or entrapped air on surfaces. Use equipment and procedures complying with PCI MNL 117.
1. Place self-consolidating concrete without vibration according to PCI TR-6, "Interim Guidelines for the Use of Self-Consolidating Concrete in Precast/Prestressed Concrete Institute Member Plants."

- L. Comply with PCI MNL 117 for hot- and cold-weather concrete placement.
- M. Identify pickup points of architectural precast concrete units and orientation in structure with permanent markings, complying with markings indicated on Shop Drawings. Imprint or permanently mark casting date on each architectural precast concrete unit on a surface that will not show in finished structure.
- N. Cure concrete, according to requirements in PCI MNL 117, by moisture retention without heat or by accelerated heat curing using low-pressure live steam or radiant heat and moisture. Cure units until compressive strength is high enough to ensure that stripping does not have an effect on performance or appearance of final product.
- O. Discard and replace architectural precast concrete units that do not comply with requirements, including structural, manufacturing tolerance, and appearance, unless repairs meet requirements in PCI MNL 117 and Architect's approval.

2.15 INSULATED PANEL CASTING

- A. Cast and screed supported wythe over mold.
- B. Place insulation boards abutting edges and ends of adjacent boards. Insert wythe connectors through insulation, and consolidate concrete around connectors according to connector manufacturer's written instructions.
- C. Cast and screed top wythe to meet required finish.

2.16 FABRICATION TOLERANCES

- A. Fabricate architectural precast concrete units straight and true to size and shape with exposed edges and corners precise and true so each finished panel complies with PCI MNL 117 product tolerances as well as position tolerances for cast-in items.
- B. Fabricate architectural precast concrete units straight and true to size and shape with exposed edges and corners precise and true so each finished panel complies with the following product tolerances:
 - 1. Overall Height and Width of Units, Measured at the Face Exposed to View: As follows:
 - a. 10 feet (3 m) or under, plus or minus 1/8 inch (3 mm).
 - b. 10 to 20 feet (3 to 6 m), plus 1/8 inch (3 mm), minus 3/16 inch (5 mm).
 - c. 20 to 40 feet (6 to 12 m), plus or minus 1/4 inch (6 mm).
 - d. Each additional 10 feet (3 m), plus or minus 1/16 inch (1.5 mm).
 - 2. Overall Height and Width of Units, Measured at the Face Not Exposed to View: As follows:
 - a. 10 feet (3 m) or under, plus or minus 1/4 inch (6 mm).

- b. 10 to 20 feet (3 to 6 m), plus 1/4 inch (6 mm), minus 3/8 inch (10 mm).
 - c. 20 to 40 feet (6 to 12 m), plus or minus 3/8 inch (10 mm).
 - d. Each additional 10 feet (3 m), plus or minus 1/8 inch (3 mm).
3. Total Thickness or Flange Thickness: Plus 1/4 inch (6 mm), minus 1/8 inch (3 mm).
 4. Rib Thickness: Plus or minus 1/8 inch (3 mm).
 5. Rib to Edge of Flange: Plus or minus 1/8 inch (3 mm).
 6. Distance between Ribs: Plus or minus 1/8 inch (3 mm).
 7. Variation from Square or Designated Skew (Difference in Length of the Two Diagonal Measurements): Plus or minus 1/8 inch per 72 inches (3 mm per 1830 mm) or 1/2 inch (13 mm) total, whichever is greater.
 8. Length and Width of Block-outs and Openings within One Unit: Plus or minus 1/4 inch (6 mm).
 9. Location and Dimension of Block-outs Hidden from View and Used for HVAC and Utility Penetrations: Plus or minus 3/4 inch (19 mm).
 10. Dimensions of Haunches: Plus or minus 1/4 inch (6 mm).
 11. Haunch Bearing Surface Deviation from Specified Plane: Plus or minus 1/8 inch (3 mm).
 12. Difference in Relative Position of Adjacent Haunch Bearing Surfaces from Specified Relative Position: Plus or minus 1/4 inch (6 mm).
 13. Bowing: Plus or minus $L/360$, maximum 1 inch (25 mm).
 14. Local Smoothness: 1/4 inch per 10 feet (6 mm per 3 m).
 15. Warping: 1/16 inch per 12 inches (1.5 mm per 300 mm) of distance from nearest adjacent corner.
 16. Tipping and Flushness of Plates: Plus or minus 1/4 inch (6 mm).
 17. Dimensions of Architectural Features and Rustications: Plus or minus 1/8 inch (3 mm).
- C. Position Tolerances: For cast-in items measured from datum line location, as indicated on Shop Drawings.
1. Weld Plates: Plus or minus 1 inch (25 mm).
 2. Inserts: Plus or minus 1/2 inch (13 mm).
 3. Handling Devices: Plus or minus 3 inches (75 mm).
 4. Reinforcing Steel and Welded Wire Fabric: Plus or minus 1/4 inch (6 mm) where position has structural implications or affects concrete cover; otherwise, plus or minus 1/2 inch (13 mm).
 5. Reinforcing Steel Extending out of Member: Plus or minus 1/2 inch (13 mm) of plan dimensions.
 6. Tendons: Plus or minus 1/4 inch (6 mm), vertical; plus or minus 1 inch (25 mm), horizontal.
 7. Location of Rustication Joints: Plus or minus 1/8 inch (3 mm).
 8. Location of Opening within Panel: Plus or minus 1/4 inch (6 mm).
 9. Location of Flashing Reglets: Plus or minus 1/4 inch (6 mm).
 10. Location of Flashing Reglets at Edge of Panel: Plus or minus 1/8 inch (3 mm).
 11. Reglets for Glazing Gaskets: Plus or minus 1/8 inch (3 mm).

12. Electrical Outlets, Hose Bibs: Plus or minus 1/2 inch (13 mm).
13. Location of Bearing Surface from End of Member: Plus or minus 1/4 inch (6 mm).
14. Allowable Rotation of Plate, Channel Inserts, and Electrical Boxes: 2-degree rotation or 1/4 inch (6 mm) maximum over the full dimension of unit.
15. Position of Sleeve: Plus or minus 1/2 inch (13 mm).
16. Location of Window Washer Track or Buttons: Plus or minus 1/8 inch (3 mm).

2.17 FINISHES

- A. Panel faces shall be free of joint marks, grain, and other obvious defects. Corners, including false joints shall be uniform, straight, and sharp. Finish exposed-face surfaces of architectural precast concrete units to be selected from one of the following:
 1. Abrasive-Blast Finish: Use abrasive grit, equipment, application techniques, and cleaning procedures to expose aggregate and surrounding matrix surfaces.
 2. Acid-Etched Finish: Use acid and hot-water solution, equipment, application techniques, and cleaning procedures to expose aggregate and surrounding matrix surfaces. Protect hardware, connections, and insulation from acid attack.
 3. Honed Finish: Use continuous mechanical abrasion with fine grit, followed by filling and rubbing procedures.
- B. Finish exposed top, bottom and end surfaces of architectural precast concrete units to match face-surface finish. Finish back where exposed at the interior.
- C. Finish unexposed surfaces of architectural precast concrete units by float finish.

2.18 SOURCE QUALITY CONTROL

- A. Quality-Control Testing: Test and inspect precast concrete according to PCI MNL 117 requirements. If using self-consolidating concrete, also test and inspect according to PCI TR-6, "Interim Guidelines for the Use of Self-Consolidating Concrete in Precast/Prestressed Concrete Institute Member Plants."
- B. Owner will employ an independent testing agency to evaluate architectural precast concrete fabricator's quality-control and testing methods.
 1. Allow Owner's testing agency access to material storage areas, concrete production equipment, concrete placement, and curing facilities. Cooperate with Owner's testing agency and provide samples of materials and concrete mixtures as may be requested for additional testing and evaluation.
- C. Strength of precast concrete units will be considered deficient if units fail to comply with ACI 318 (ACI 318M) requirements for concrete strength.

- D. Testing: If there is evidence that strength of precast concrete units may be deficient or may not comply with ACI 318 (ACI 318M) requirements, precaster will employ an independent testing agency to obtain, prepare, and test cores drilled from hardened concrete to determine compressive strength according to ASTM C 42/C 42M.
1. A minimum of three representative cores will be taken from units of suspect strength, from locations directed by Architect.
 2. Cores will be tested in an air-dry condition.
 3. Strength of concrete for each series of 3 cores will be considered satisfactory if average compressive strength is equal to at least 85 percent of 28-day design compressive strength and no single core is less than 75 percent of 28-day design compressive strength.
 4. Test results will be made in writing on same day that tests are performed, with copies to Architect, Contractor, and precast concrete fabricator. Test reports will include the following:
 - a. Project identification name and number.
 - b. Date when tests were performed.
 - c. Name of precast concrete fabricator.
 - d. Name of concrete testing agency.
 - e. Identification letter, name, and type of precast concrete unit(s) represented by core tests; design compressive strength; type of break; compressive strength at breaks, corrected for length-diameter ratio; and direction of applied load to core in relation to horizontal plane of concrete as placed.
- E. Patching: If core test results are satisfactory and precast concrete units comply with requirements, clean and dampen core holes and solidly fill with precast concrete mixture that has no coarse aggregate, and finish to match adjacent precast concrete surfaces.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine supporting structural frame or foundation and conditions for compliance with requirements for installation tolerances, true and level bearing surfaces, and other conditions affecting performance.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.
- C. Do not install precast concrete units until supporting cast-in-place building structural framing has attained minimum allowable design compressive strength or supporting steel or other structure is complete.

3.2 INSTALLATION

- A. Install clips, hangers, bearing pads, and other accessories required for connecting architectural precast concrete units to supporting members and backup materials.
- B. Erect architectural precast concrete level, plumb, and square within specified allowable tolerances. Provide temporary supports and bracing as required to maintain position, stability, and alignment as units are being permanently connected.
 - 1. Install temporary steel or plastic spacing shims or bearing pads as precast concrete units are being erected. Tack weld steel shims to each other to prevent shims from separating.
 - 2. Maintain horizontal and vertical joint alignment and uniform joint width as erection progresses.
 - 3. Remove projecting lifting devices and grout fill voids within recessed lifting devices flush with surface of adjacent precast surfaces when recess is exposed.
 - 4. Unless otherwise indicated, maintain uniform joint widths of 3/4 inch (19 mm).
- C. Connect architectural precast concrete units in position by bolting, welding, grouting, or as otherwise indicated on Shop Drawings. Remove temporary shims, wedges, and spacers as soon as practical after connecting and grouting are completed.
 - 1. Do not permit connections to disrupt continuity of roof flashing.
- D. Welding: Comply with applicable AWS D1.1/D1.1M and AWS D1.4 for welding, welding electrodes, appearance, quality of welds, and methods used in correcting welding work.
 - 1. Protect architectural precast concrete units and bearing pads from damage by field welding or cutting operations, and provide noncombustible shields as required.
 - 2. Welds not specified shall be continuous fillet welds, using no less than the minimum fillet as specified by AWS.
 - 3. Clean weld-affected metal surfaces with chipping hammer followed by brushing, and apply a minimum 4.0-mil- (0.1-mm-) thick coat of galvanized repair paint to galvanized surfaces according to ASTM A 780.
 - 4. Clean weld-affected metal surfaces with chipping hammer followed by brushing, and reprime damaged painted surfaces.
 - 5. Remove, reweld, or repair incomplete and defective welds.
- E. At bolted connections, use lock washers, tack welding, or other approved means to prevent loosening of nuts after final adjustment.
 - 1. Where slotted connections are used, verify bolt position and tightness. For sliding connections, properly secure bolt but allow bolt to move within connection slot. For friction connections, apply specified bolt torque and check 25 percent of bolts at random by calibrated torque wrench.

- F. Grouting Connections: Grout connections where required or indicated. Retain grout in place until hard enough to support itself. Pack spaces with stiff grout material, tamping until voids are completely filled. Place grout to finish smooth, level, and plumb with adjacent concrete surfaces. Keep grouted joints damp for not less than 24 hours after initial set. Promptly remove grout material from exposed surfaces before it affects finishes or hardens.

3.3 ERECTION TOLERANCES

- A. Erect architectural precast concrete units level, plumb, square, true, and in alignment without exceeding the noncumulative erection tolerances of PCI MNL 117, Appendix I.
- B. Erect architectural precast concrete units level, plumb, square, and true, without exceeding the following noncumulative erection tolerances:
 - 1. Plan Location from Building Grid Datum: Plus or minus 1/2 inch (13 mm).
 - 2. Plan Location from Centerline of Steel: Plus or minus 1/2 inch (13 mm).
 - 3. Top Elevation from Nominal Top Elevation: As follows:
 - a. Exposed Individual Panel: Plus or minus 1/4 inch (6 mm).
 - b. Non-Exposed Individual Panel: Plus or minus 1/2 inch (13 mm).
 - c. Exposed Panel Relative to Adjacent Panel: 1/4 inch (6 mm).
 - d. Non-Exposed Panel Relative to Adjacent Panel: 1/2 inch (13 mm).
 - 4. Support Elevation from Nominal Support Elevation: As follows:
 - a. Maximum Low: 1/2 inch (13 mm).
 - b. Maximum High: 1/4 inch (6 mm).
 - 5. Maximum Plumb Variation over the Lesser of Height of Structure or 100 Feet (30 m): 1 inch (25 mm).
 - 6. Plumb in Any 10 Feet (3 m) of Element Height: 1/4 inch (6 mm).
 - 7. Maximum Jog in Alignment of Matching Edges: 1/4 inch (6 mm).
 - 8. Joint Width (Governs over Joint Taper): Plus or minus 1/4 inch (6 mm).
 - 9. Maximum Joint Taper: 3/8 inch (10 mm).
 - 10. Joint Taper in 10 Feet (3 m): 1/4 inch (6 mm).
 - 11. Maximum Jog in Alignment of Matching Faces: 1/4 inch (6 mm).
 - 12. Differential Bowing or Camber, as Erected, between Adjacent Members of Same Design: 1/4 inch (6 mm).
 - 13. Opening Height between Spandrels: Plus or minus 1/4 inch (6 mm).

3.4 FIELD QUALITY CONTROL

- A. Special Inspections: Owner will engage a qualified special inspector to perform the following special inspections and prepare reports:
 - 1. Erection of precast concrete members, as required by the authorities having jurisdiction.
- B. Testing Agency: Engage a qualified testing agency to perform tests and inspections and prepare test reports.

- C. Field welds will be subject to visual inspections and nondestructive testing according to ASTM E 165 or ASTM E 709. High-strength bolted connections will be subject to inspections.
- D. Testing agency will report test results promptly and in writing to Contractor and Architect.
- E. Repair or remove and replace work where tests and inspections indicate that it does not comply with specified requirements.
- F. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.5 REPAIRS

- A. Repair architectural precast concrete units if permitted by Architect. The Architect reserves the right to reject repaired units that do not comply with requirements.
- B. Mix patching materials and repair units so cured patches blend with color, texture, and uniformity of adjacent exposed surfaces and show no apparent line of demarcation between original and repaired work, when viewed in typical daylight illumination from a distance of 20 feet (6 m).
- C. Prepare and repair damaged galvanized coatings with galvanizing repair paint according to ASTM A 780.
- D. Wire brush, clean, and paint damaged prime-painted components with same type of shop primer.
- E. Remove and replace damaged architectural precast concrete units when repairs do not comply with requirements.

3.6 CLEANING

- A. Clean surfaces of precast concrete units exposed to view.
- B. Clean mortar, plaster, fireproofing, weld slag, and other deleterious material from concrete surfaces and adjacent materials immediately.
- C. Clean exposed surfaces of precast concrete units after erection and completion of joint treatment to remove weld marks, other markings, dirt, and stains.
 - 1. Perform cleaning procedures, if necessary, according to precast concrete fabricator's recommendations. Clean soiled precast concrete surfaces with detergent and water, using stiff fiber brushes and sponges, and rinse with clean water. Protect other work from staining or damage due to cleaning operations.

2. Do not use cleaning materials or processes that could change the appearance of exposed concrete finishes or damage adjacent materials.

+ + END OF SECTION + +

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SECTION 03600

PRECISION GROUTING

PART 1 - GENERAL

1.1 SCOPE OF WORK

- A. Provide all labor, material, equipment and services required for grouting of equipment, machinery, structural steel, handrails, anchor bolts and other items or work for which grouting is specified or required.
- B. The object of these Specifications is to obtain grout which can be mixed to a flowable consistency (i.e., thinner than plastic consistency), placed in leakproof forms, with a minimum of strapping, without bleed water exceeding Specification requirements. The requirement of 24 hour presoak of existing concrete is of prime importance and must be adhered to. Trade name of grout shall be submitted to Engineer for review well in advance of preparation for grouting.

1.2 RELATED WORK SPECIFIED ELSEWHERE

- A. Cast-in-place Concrete is included in Section 03300.
- B. Review all divisions and sections for equipment, machinery, and other items to be grouted.

1.3 DESCRIPTION OF WORK

- A. High strength, precision support of machine bases and soleplates, setting anchor bolts, including equipment subject to thermal movement and repetitive dynamic loading.
- B. Work includes providing a non-shrink, ready-to-use, fluid precision grout material; proportioned, pre-mixed and packaged at the factory; delivered to the job-site to place with only the addition of water; forming, placing and curing as specified in this section.

1.4 QUALITY ASSURANCE

Comply with the following codes, standards, tests and recommended practices for foundation concrete as applies to precision grouting.

- A. ACI 304R-85 " Guide for Measuring, Mixing, Transporting and Placing Concrete."

- B. ACI 305R-77 (Revised 1982) "Recommended Practice for Hot Weather Concreting."
- C. ACI 306R-78 (Revised 1983) "Recommended Practice for Cold Weather Concreting."
- D. ACI 347-78 "Recommended Practice for Concrete Formwork."
- E. ASTM C 309-74 "Standard Specifications for Liquid Membrane Forming Compounds for Curing Concrete."
- F. Manufacturer's Information Use of Grout: Attached to each bag of grout.
- G. Corps of Engineers CRD C-79 Method of Test for Flow of Grout Mixtures (Flow-Cone method).
- H. ASTM C 109-73 "Tentative Method of Test for Compressive Strength of Hydraulic Cement Mortars."

1.5 SUBMITTALS

- A. Purchase Orders: Furnish copies of purchase orders relating to materials in this Section to the Engineer prior to delivery.

PART 2 - PRODUCTS

2.1 GROUT

- A. Precision-support grout shall consist of a cementitious system, special graded and processed ferrous metallic internal reinforcing aggregate, carefully graded natural fine aggregate and additional technical components.
- B. Grouts which depend upon aluminum powders, chemicals or other agents which produce gas for expansion are not acceptable.
 - 1. Free of gas producing agents.
 - 2. Free of oxidizing catalysts.
 - 3. Free of inorganic accelerators, including chlorides.
- C. Provide Performance Characteristics when mixed to fluid consistency, 25 to 30 seconds (Flow Cone Method CRD C-79), as follows:
 - 1. No visible bleeding and/or settlement up to 2 hours on 1/4 to 2 gal. grout poured into gallon can, covered with glass plate to prevent evaporation. Grout shall meet the requirements of Paragraph 4.1 of Corps of Engineers CRD C 588-76.

2. Maintain firm, full contact with underside of 4'x 4' x 2" steel plate firmly bolted to supports at quarter points at 1, 7 and 14 days, evidenced by tapping of plate and visual observation after stripping. Grout shall be cured in accordance with manufacturer's printed instructions.
3. Provide strengths as specified in Paragraph 3.05 (2" x 2" cubes). Prepare specimens and test in accordance with ASTM C 109-73.

2.2 MEMBRANE CURING COMPOUND

A. Membrane forming curing compound shall be in accordance with ASTM C 309-74.

2.3 WATER

- A. Water shall be suitable for drinking.

PART 3 - EXECUTION

3.1 PREPARATION FOR GROUTING

- A. Remove laitance down to sound concrete.
- B. Surface to receive grout shall be rough and reasonably level.
- C. Surface shall be properly wet cured. DO NOT USE CURING COMPOUNDS. (See Section 03300).
- D. Clean surface of oil, grease, dirt, and loose particles.
- E. Clean bolt holes, bolts and underside of bed plate.
- F. Saturate concrete including bolt holes for 24 hours prior to grouting. Blow out excess water with oil free compressed air, or siphon prior to grouting.

3.2 FORMWORK

Formwork shall be compatible with proposed method of placing grout. Design for rapid, continuous and complete filling of space to be grouted.

- A. Build strong, tight forms braced so they will not leak or buckle under weight of fluid grout. On placing side, slant form at 45o angle and pour grout directly on slanted face. On other sides, place form 2" or more from base of bed plate and 1" or more higher than underside of the plate.
- B. Caulk forms with grouting material being used on inside or a sand-cement mortar outside to prevent leakage and loss of "head." Use expanded polystyrene or other

means to caulk between foundation and portions of the bed plate and equipment to seal off areas where grout is not desired.

3.3 PREPARATION OF GROUT

Preparation of grout shall be in paddle-type mortar mixer suitable mechanical mixer. DO NOT MIX BY HAND.

- A. Mix grout adjacent to area being grouted, have sufficient manpower and equipment available for rapid and continuous mixing and placing. DO NOT ADD CEMENT, SAND OR PEA GRAVEL ADDITIVES.
- B. Avoid a consistency that produces bleeding. Mix materials for a minimum of 3 minutes and place immediately. DO NOT RETEMPER. DO NOT USE MIXING WATER ABOVE 80oF. (27°C.).

3.4 PLACING

Placing of grout shall be at a temperature of 65-75 degrees F. (18-24 degrees C.) for foundation, bed plate and grout material. Maintain for 24 hours following installation, hereafter above 40 degrees F. (4 degrees C.) until strength exceed 4,000 psi (280 kg/cm².) DO NOT USE COKE-FIRED SALAMANDERS.

- A. Place grout quickly and continuously; avoid surface of overworking material and segregation. DO NOT VIBRATE GROUT. DO NOT OVERWORK GROUT.
- B. Field service representative of the manufacturer shall be available during initial planning for installation to suggest recommended procedures and at start of placement for further suggestions.
 - 1. A minimum of three (3) days notice shall be given by the Contractor to the manufacturer prior to use of the product.

3.5 FINISHING AND CURING

Follow manufacturer's printed instructions for the brand and type of grout being used.

- A. The grout shall meet the following strengths:

	Plastic Mix	Flowable Mix
1-day	4,000 psi	2,000 psi
3-days	6,000 psi	3,000 psi
7-days	8,000 psi	5,000 psi
28-days	10,000 psi	7,000 psi

++ END OF SECTION ++

SECTION 04810

UNIT MASONRY ASSEMBLIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Concrete masonry units.
2. Decorative concrete masonry units.
3. Face brick.
4. Stone trim units.
5. Mortar and grout.
6. Steel reinforcing bars.
7. Masonry joint reinforcement.
8. Ties and anchors.
9. Embedded flashing.
10. Miscellaneous masonry accessories.
11. Cavity-wall insulation.

B. Related Sections:

1. Division 5 Section "Metal Fabrications" for furnishing steel [lintels] for unit masonry.
2. Division 7 Section "Water Repellents" for water repellents applied to unit masonry assemblies.
3. Division 7 Section "Sheet Metal Flashing and Trim" for [exposed] sheet metal flashing and for furnishing manufactured reglets installed in masonry joints.

1.3 DEFINITIONS

- A. CMU(s): Concrete masonry unit(s).
- B. Reinforced Masonry: Masonry containing reinforcing steel in grouted cells.

1.4 PERFORMANCE REQUIREMENTS

- A. Provide structural unit masonry that develops indicated net-area compressive strengths at 28 days.
 - 1. Determine net-area compressive strength of masonry from average net-area compressive strengths of masonry units and mortar types (unit-strength method) according to Tables 1 and 2 in ACI 530.1/ASCE 6/TMS 602.
 - 2. Determine net-area compressive strength of masonry by testing masonry prisms according to ASTM C 1314.

1.5 PRECONSTRUCTION TESTING

- A. Preconstruction Testing Service: Owner will engage a qualified independent testing agency to perform preconstruction testing indicated below. Retesting of materials that fail to comply with specified requirements shall be done at Contractor's expense.
 - 1. Clay Masonry Unit Test: For each type of unit required, according to ASTM C 67 for compressive strength.
 - 2. Concrete Masonry Unit Test: For each type of unit required, according to ASTM C 140 for compressive strength.
 - 3. Mortar Test (Property Specification): For each mix required, according to ASTM C 109/C 109M for compressive strength, ASTM C 1506 for water retention, and ASTM C 91 for air content.
 - 4. Mortar Test (Property Specification): For each mix required, according to ASTM C 780 for compressive strength.
 - 5. Grout Test (Compressive Strength): For each mix required, according to ASTM C 1019.
 - 6. Prism Test: For each type of construction required, according to ASTM C 1314.

1.6 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. LEED Submittals:
 - 1. Project will not be certified however shall meet the intent.
 - 2. Product Certificates for Credit MR 5: For products and materials required to comply with requirements for regional materials indicating location and distance from Project of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include statement indicating cost for each regional material and the fraction by weight that is considered regional.
- C. Shop Drawings: For the following:
 - 1. Masonry Units: Show sizes, profiles, coursing, and locations of special shapes.

2. Stone Trim Units: Show sizes, profiles, and locations of each stone trim unit required.
 3. Reinforcing Steel: Detail bending and placement of unit masonry reinforcing bars. Comply with ACI 315, "Details and Detailing of Concrete Reinforcement."
 4. Fabricated Flashing: Detail corner units, end-dam units, and other special applications.
- D. Samples for Initial Selection:
1. Decorative CMUs, in the form of small-scale units.
 2. Face brick sample boards.
 3. Stone trim.
 4. Colored mortar.
 5. Weep holes/vents.
- E. Samples for Verification: For each type and color of the following:
1. Exposed Decorative CMUs.
 2. Face brick, in the form of straps of five or more bricks.
 3. Stone trim.
 4. Pigmented and colored-aggregate mortar. Make Samples using same sand and mortar ingredients to be used on Project.
 5. Weep holes and vents.
 6. Accessories embedded in masonry.

1.7 INFORMATIONAL SUBMITTALS

- A. List of Materials Used in Constructing Mockups: List generic product names together with manufacturers, manufacturers' product names, model numbers, lot numbers, batch numbers, source of supply, and other information as required to identify materials used. Include mix proportions for mortar and grout and source of aggregates.
1. Submittal is for information only. Neither receipt of list nor approval of mockup constitutes approval of deviations from the Contract Documents unless such deviations are specifically brought to the attention of Architect and approved in writing.
- B. Qualification Data: For testing agency.
- C. Material Certificates: For each type and size of the following:
1. Masonry units.
 - a. Include data on material properties.
 2. Cementitious materials. Include brand, type, and name of manufacturer.
 3. Preblended, dry mortar mixes. Include description of type and proportions of ingredients.
 4. Grout mixes. Include description of type and proportions of ingredients.
 5. Reinforcing bars.
 6. Joint reinforcement.

7. Anchors, ties, and metal accessories.
- D. Mix Designs: For each type of mortar and grout. Include description of type and proportions of ingredients.
 1. Include test reports for mortar mixes required to comply with property specification. Test according to ASTM C 109/C 109M for compressive strength, ASTM C 1506 for water retention, and ASTM C 91 for air content.
 2. Include test reports, according to ASTM C 1019, for grout mixes required to comply with compressive strength requirement.
 - E. Statement of Compressive Strength of Masonry: For each combination of masonry unit type and mortar type, provide statement of average net-area compressive strength of masonry units, mortar type, and resulting net-area compressive strength of masonry determined according to Tables 1 and 2 in ACI 530.1/ASCE 6/TMS 602.
 - F. Cold-Weather and Hot-Weather Procedures: Detailed description of methods, materials, and equipment to be used to comply with requirements.

1.8 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Qualified according to ASTM C 1093 for testing indicated.
- B. Source Limitations for Masonry Units: Obtain exposed masonry units of a uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, from single source from single manufacturer for each product required.
- C. Source Limitations for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color for exposed masonry, from single manufacturer for each cementitious component and from single source or producer for each aggregate.
- D. Masonry Standard: Comply with ACI 530.1/ASCE 6/TMS 602 unless modified by requirements in the Contract Documents.
- E. Sample Panels: Build sample panels to verify selections made under sample submittals and to demonstrate aesthetic effects. Comply with requirements in Division 1 Section "Quality Requirements" for mockups.
 1. Build sample panels for typical exterior and interior walls in sizes approximately 60 inches (1500 mm) long by 48 inches (1200 mm) high by full thickness.
 2. Where masonry is to match existing, erect panels adjacent and parallel to existing surface.
 3. Clean one-half of exposed faces of panels with masonry cleaner recommended by masonry unit manufacturer.

4. Protect approved sample panels from the elements with weather-resistant membrane.
 5. Approval of sample panels is for color, texture, and blending of masonry units; relationship of mortar and sealant colors to masonry unit colors; tooling of joints; aesthetic qualities of workmanship; and other material and construction qualities specifically approved by Architect in writing.
 - a. Approval of sample panels does not constitute approval of deviations from the Contract Documents contained in sample panels unless such deviations are specifically approved by Architect in writing.
- F. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination."

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Store masonry units on elevated platforms in a dry location. If units are not stored in an enclosed location, cover tops and sides of stacks with waterproof sheeting, securely tied. If units become wet, do not install until they are dry.
- B. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.
- C. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.
- D. Deliver preblended, dry mortar mix in moisture-resistant containers designed for use with dispensing silos. Store preblended, dry mortar mix in delivery containers on elevated platforms, under cover, and in a dry location or in covered weather-proof dispensing silos.
- E. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

1.10 PROJECT CONDITIONS

- A. Protection of Masonry: During construction, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress.
 1. Extend cover a minimum of 24 inches (600 mm) down both sides of walls and hold cover securely in place.
 2. Where one wythe of multiwythe masonry walls is completed in advance of other wythes, secure cover a minimum of 24 inches (600 mm) down face next to unconstructed wythe and hold cover in place.
- B. Do not apply uniform floor or roof loads for at least 12 hours and concentrated loads for at least three days after building masonry walls or columns.

- C. Stain Prevention: Prevent grout, mortar, and soil from staining the face of masonry to be left exposed or painted. Immediately remove grout, mortar, and soil that come in contact with such masonry.
 - 1. Protect base of walls from rain-splashed mud and from mortar splatter by spreading coverings on ground and over wall surface.
 - 2. Protect sills, ledges, and projections from mortar droppings.
 - 3. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes, from mortar droppings.
 - 4. Turn scaffold boards near the wall on edge at the end of each day to prevent rain from splashing mortar and dirt onto completed masonry.

- D. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Remove and replace unit masonry damaged by frost or by freezing conditions. Comply with cold-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.
 - 1. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F (4 deg C) and higher and will remain so until masonry has dried, but not less than seven days after completing cleaning.

- E. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.

PART 2 - PRODUCTS

2.1 MASONRY UNITS, GENERAL

- A. Defective Units: Referenced masonry unit standards may allow a certain percentage of units to contain chips, cracks, or other defects exceeding limits stated in the standard. Do not use units where such defects will be exposed in the completed Work.

- B. Fire-Resistance Ratings: Where indicated, provide units that comply with requirements for fire-resistance ratings indicated as determined by testing according to ASTM E 119, by equivalent masonry thickness, or by other means, as acceptable to authorities having jurisdiction.

2.2 CONCRETE MASONRY UNITS

- A. Regional Materials: CMUs shall be manufactured within 500 miles (800 km) of Project site from aggregates and cement that have been extracted, harvested, or recovered, as well as manufactured, within 500 miles (800 km) of Project site.

- B. Shapes: Provide shapes indicated and as follows, with exposed surfaces matching exposed faces of adjacent units unless otherwise indicated.
 - 1. Provide special shapes for lintels, corners, jambs, sashes, movement joints, headers, bonding, and other special conditions.

2. Provide square-edged bullnose units for outside corners unless otherwise indicated.
- C. Integral Water Repellent: Provide units made with integral water.
1. Integral Water Repellent: Liquid polymeric, integral water-repellent admixture that does not reduce flexural bond strength. Units made with integral water repellent, when tested according to ASTM E 514 as a wall assembly made with mortar containing integral water-repellent manufacturer's mortar additive, with test period extended to 24 hours, shall show no visible water or leaks on the back of test specimen.
 - a. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - 1) ACM Chemistries; RainBloc.
 - 2) BASF Aktiengesellschaft; Rheopel Plus.
 - 3) Grace Construction Products, W. R. Grace & Co. - Conn.; Dry-Block.
 - 4) Equivalent by other manufacturer.
- D. CMUs: ASTM C 90, Type 1.
1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 1900 psi at 28 days..
 2. Density Classification: [Lightweight] [Medium weight] [Normal weight][unless otherwise indicated].
 3. Size (Width): Manufactured to dimensions 3/8 inch less than nominal dimensions.
 4. Exposed Faces: Provide color and texture matching the range represented by Architect's sample.
- E. Decorative CMUs: ASTM C 90 (Ground Face).
1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Trendstone Plus Ground Face Masonry Unit as manufactured by Trenwyth.
 - b. Equivalent by other manufacturers.
 2. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 1900 psi at 28 days.
 3. Density Classification: [Lightweight] [Medium weight] [Normal weight].
 4. Size (Width): Manufactured to dimensions specified in "CMUs" Paragraph.
 5. Pattern and Texture:
 - a. Standard pattern, ground-face finish
 6. Colors: As selected by Architect from manufacturer's full range.
 - a. Vera Stone unit as manufactured by Trenwyth, color Fossil Reef.
 - b. Ground Face unit as manufactured by New Holland, color R3880.
 - c. Equivalent by other manufacturer.

2.3 CONCRETE AND MASONRY LINTELS

- A. General: Provide one of the following:
- B. Concrete Lintels: ASTM C 1623, matching CMUs in color, texture, and density classification; and with reinforcing bars indicated. Provide lintels with net-area compressive strength not less than CMUs.
- C. Concrete Lintels: Precast or formed-in-place concrete lintels complying with requirements in Division 3 Section "Cast-in-Place Concrete," and with reinforcing bars indicated.
- D. Masonry Lintels: Prefabricated or built-in-place masonry lintels made from bond beam CMUs with reinforcing bars placed as indicated and filled with coarse grout. Cure precast lintels before handling and installing. Temporarily support built-in-place lintels until cured.
- E. See Lintel Schedule on drawings for additional requirements.

2.4 BRICK

- A. Regional Materials: Brick shall be manufactured within 500 miles (800 km) of Project site from materials that have been extracted, harvested, or recovered, as well as manufactured, within 500 miles (800 km) of Project site.
- B. General: Provide shapes indicated and as follows, with exposed surfaces matching finish and color of exposed faces of adjacent units:
 - 1. For ends of sills and caps and for similar applications that would otherwise expose unfinished brick surfaces, provide units without cores or frogs and with exposed surfaces finished.
 - 2. Provide special shapes for applications where stretcher units cannot accommodate special conditions, including those at corners, movement joints, bond beams, sashes, and lintels.
 - 3. Provide special shapes for applications requiring brick of size, form, color, and texture on exposed surfaces that cannot be produced by sawing.
 - 4. Provide special shapes for applications where shapes produced by sawing would result in sawed surfaces being exposed to view.
- C. Face Brick: Facing brick complying with ASTM C 216 or hollow brick complying with ASTM C 652, Class H40V (void areas between 25 and 40 percent of gross cross-sectional area).
 - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Red colonial, modular, as manufactured by Sioux City Brick..
 - b. Equivalent by other manufacturer, similar in color and range to Backwash Treatment Building Addition.

2. Grade: SW.
3. Type: FBX.
4. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 3350 psi (23.10 MPa).
5. Initial Rate of Absorption: Less than 30 g/30 sq. in. (30 g/194 sq. cm) per minute when tested per ASTM C 67.
6. Efflorescence: Provide brick that has been tested according to ASTM C 67 and is rated "not effloresced."
7. Surface Coating: Brick with colors or textures produced by application of coatings shall withstand 50 cycles of freezing and thawing per ASTM C 67 with no observable difference in the applied finish when viewed from 10 feet (3 m)[or shall have a history of successful use in Project's area].
8. Size (Actual Dimensions): 3-5/8 inches (92 mm) wide by 2-1/4 inches (57 mm) high by 7-5/8 inches (194 mm) long.
9. Application: Use where brick is exposed unless otherwise indicated.

2.5 STONE TRIM UNITS

- A. Limestone: ASTM C 568, Classification II Medium Density.
 1. Variety and Sources: Indiana oolitic limestone quarried in Lawrence, Monroe, or Owen Counties, Indiana.
 - a. Grade and Color: Standard, buff Variegated, according to grade and color classification established by ILI.
- B. Finish: Smooth.
 1. Finish for Tops of Sills and Jamb Returns: Smooth.
- C. Provide stone units accurately shaped, with exposed faces dressed true, and with beds and joints at right angles to faces.
 1. For limestone, comply with recommendations in ILI's "Indiana Limestone Handbook."
- D. Contractors Option: Substitute architectural precast concrete to meet Specification 03450.

2.6 MORTAR AND GROUT MATERIALS

- A. Regional Materials: Aggregate for mortar and grout, cement, and lime shall be extracted, harvested, or recovered, as well as manufactured, within 500 miles (800 km) of Project site.
- B. Portland Cement: ASTM C 150, Type I or II, except Type III may be used for cold-weather construction. Provide natural color or white cement as required to produce mortar color indicated.
- C. Hydrated Lime: ASTM C 207, Type S.

- D. Portland Cement-Lime Mix: Packaged blend of portland cement and hydrated lime containing no other ingredients.
- E. Masonry Cement: ASTM C 91.
 - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Cemex S.A.B. de C.V.
 - b. Essroc, Italcementi Group.
 - c. Lehigh Cement Company.
 - d. Equivalent by other manufacturer.
- F. Aggregate for Mortar: ASTM C 144.
 - 1. For mortar that is exposed to view, use washed aggregate consisting of natural sand or crushed stone.
 - 2. For joints less than 1/4 inch (6 mm) thick, use aggregate graded with 100 percent passing the No. 16 (1.18-mm) sieve.
 - 3. White-Mortar Aggregates: Natural white sand or crushed white stone.
 - 4. Colored-Mortar Aggregates: Natural sand or crushed stone of color necessary to produce required mortar color.
- G. Aggregate for Grout: ASTM C 404.
- H. Epoxy Pointing Mortar: ASTM C 395, epoxy-resin-based material formulated for use as pointing mortar for structural-clay tile facing units (and approved for such use by manufacturer of units); in color indicated or, if not otherwise indicated, as selected by Architect from manufacturer's colors.
- I. Refractory Mortar Mix: Ground fireclay or non-water-soluble, calcium aluminate, medium-duty refractory mortar that passes ASTM C 199 test; or an equivalent product acceptable to authorities having jurisdiction.
- J. Cold-Weather Admixture: Nonchloride, noncorrosive, accelerating admixture complying with ASTM C 494/C 494M, Type C, and recommended by manufacturer for use in masonry mortar of composition indicated.
 - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Euclid Chemical Company (The); Accelguard 80.
 - b. Grace Construction Products, W. R. Grace & Co. - Conn.; Morset.
 - c. Sonneborn Products, BASF Aktiengesellschaft; Trimix-NCA.
 - d. Equivalent by other manufacturer.
- K. Water-Repellent Admixture: Liquid water-repellent mortar admixture intended for use with CMUs containing integral water repellent by same manufacturer.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. ACM Chemistries; RainBloc for Mortar.
 - b. BASF Aktiengesellschaft; Rheopel Mortar Admixture.
 - c. Grace Construction Products, W. R. Grace & Co. - Conn.; Dry-Block Mortar Admixture.
 - d. Equivalent by other manufacturer.

L. Water: Potable.

2.7 REINFORCEMENT

- A. Uncoated Steel Reinforcing Bars: ASTM A 615/A 615M or ASTM A 996/A 996M, Grade 60 (Grade 420).
- B. Masonry Joint Reinforcement, General: ASTM A 951/A 951M.
 1. See structural drawings and specifications.
- C. Masonry Joint Reinforcement for Single-Wythe Masonry: Either ladder or truss type with single pair of side rods.
- D. Masonry Joint Reinforcement for Multiwythe Masonry:
 1. Adjustable (two-piece) type, either ladder or truss design, with one side rod at each face shell of backing wythe and with separate adjustable ties with pintle-and-eye connections having a maximum adjustment of 1-1/4 inches (32 mm). Size ties to extend at least halfway through facing wythe but with at least 5/8-inch (16-mm) cover on outside face. Ties have hooks or clips to engage a continuous horizontal wire in the facing wythe.

2.8 TIES AND ANCHORS

- A. Materials: Provide ties and anchors specified in this article that are made from materials that comply with the following unless otherwise indicated.
 1. Hot-Dip Galvanized, Carbon-Steel Wire: ASTM A 82/A 82M; with ASTM A 153/A 153M, Class B-2 coating.
- B. Wire Ties, General: Unless otherwise indicated, size wire ties to extend at least halfway through veneer but with at least 5/8-inch (16-mm) cover on outside face. Outer ends of wires are bent 90 degrees and extend 2 inches (50 mm) parallel to face of veneer.
- C. Individual Wire Ties: Rectangular units with closed ends and not less than 4 inches (100 mm) wide.
 1. Where wythes [do not align] [are of different materials], use adjustable ties with pintle-and-eye connections having a maximum adjustment of 1-1/4 inches (32 mm).

2. Wire: Fabricate from 1/4-inch- (6.35-mm-) diameter, hot-dip galvanized steel.
- D. Adjustable Anchors for Connecting to Structural Steel Framing: Provide anchors that allow vertical or horizontal adjustment but resist tension and compression forces perpendicular to plane of wall.
1. Tie Section: Triangular-shaped wire tie, sized to extend within 1 inch (25 mm) of masonry face, made from 0.25-inch- (6.35-mm-) diameter, hot-dip galvanized steel.
- E. Adjustable Anchors for Connecting to Concrete: Provide anchors that allow vertical or horizontal adjustment but resist tension and compression forces perpendicular to plane of wall.
1. Connector Section: Dovetail tabs for inserting into dovetail slots in concrete and attached to tie section; formed from 0.105-inch- (2.66-mm-) thick, steel sheet, galvanized after fabrication] [0.062-inch- (1.59-mm-) thick.
 - a. [0.064-inch- (1.63-mm-)] [0.108-inch- (2.74-mm-)] thick, galvanized sheet may be used at interior walls unless otherwise indicated.
 2. Tie Section: Triangular-shaped wire tie, sized to extend within 1 inch (25 mm) of masonry face, made from 0.25-inch- (6.35-mm-) diameter, hot-dip galvanized steel.
- F. Adjustable Masonry-Veneer Anchors:
1. General: Provide anchors that allow vertical adjustment but resist tension and compression forces perpendicular to plane of wall, for attachment over sheathing to wood or metal studs, and as follows:
 - a. Structural Performance Characteristics: Capable of withstanding a 100-lbf (445-N) load in both tension and compression without deforming or developing play in excess of 0.05 inch (1.3 mm).
 2. Contractor's Option: Unless otherwise indicated, provide any of the following types of anchors:
 3. Screw-Attached, Masonry-Veneer Anchors: Units consisting of a wire tie and a metal anchor section.
 - a. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - 1) Dayton Superior Corporation, Dur-O-Wal Division; [D/A 213] [or] [D/A 210 with D/A 700-708].
 - 2) Heckmann Building Products Inc.; [315-D with 316] [or] [Pos-I-Tie].
 - 3) Hohmann & Barnard, Inc.; [DW-10] [DW-10HS] [or] [DW-10-X].
 - 4) Wire-Bond; [1004, Type III] [RJ-711] [or] [SureTie].
 - b. Anchor Section: Rib-stiffened, sheet metal plate with screw holes top and bottom, 2-3/4 inches (70 mm) wide by 3 inches (76 mm) high; with projecting tabs having slotted holes for inserting vertical legs of wire tie specially formed to fit anchor section.

- c. Wire Ties: Triangular-shaped wire ties fabricated from 0.25-inch- (6.35-mm-) diameter, hot-dip galvanized steel.

2.9 EMBEDDED FLASHING MATERIALS

- A. Flexible Flashing: Use[one of] the following unless otherwise indicated:
 - 1. Rubberized-Asphalt Flashing: Composite flashing product consisting of a pliable, adhesive rubberized-asphalt compound, bonded to a high-density, cross-laminated polyethylene film to produce an overall thickness of not less than 0.040 inch (1.02 mm).
 - a. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - 1) Advanced Building Products Inc.; Peel-N-Seal.
 - 2) Carlisle Coatings & Waterproofing; CCW-705-TWF Thru-Wall Flashing.
 - 3) Dayton Superior Corporation, Dur-O-Wal Division; Dur-O-Barrier Thru-Wall Flashing.
 - 4) Fiberweb, Clark Hammerbeam Corp.; Aquaflash 500.
 - 5) Grace Construction Products, W. R. Grace & Co. - Conn.; Perm-A-Barrier Wall Flashing.
 - 6) Heckmann Building Products Inc.; No. 82 Rubberized-Asphalt Thru-Wall Flashing.
 - 7) Hohmann & Barnard, Inc.; Textroflash.
 - 8) W. R. Meadows, Inc.; Air-Shield Thru-Wall Flashing.
 - 9) Polyguard Products, Inc.; Polyguard 400.
 - 10) Sandell Manufacturing Co., Inc.; Sando-Seal.
 - 11) Williams Products, Inc.; Everlastic MF-40.
 - 12) Equivalent by other manufacturer.
 - b. Accessories: Provide preformed corners, end dams, other special shapes, and seaming materials produced by flashing manufacturer.
- B. Adhesives, Primers, and Seam Tapes for Flashings: Flashing manufacturer's standard products or products recommended by flashing manufacturer for bonding flashing sheets to each other and to substrates.

2.10 MISCELLANEOUS MASONRY ACCESSORIES

- A. Compressible Filler: Premolded filler strips complying with ASTM D 1056, Grade 2A1; compressible up to 35 percent; of width and thickness indicated; formulated from neoprene.
- B. Preformed Control-Joint Gaskets: Made from styrene-butadiene-rubber compound, complying with ASTM D 2000, Designation M2AA-805 and designed to fit standard sash block and to maintain lateral stability in masonry wall; size and configuration as indicated.

- C. Bond-Breaker Strips: Asphalt-saturated, organic roofing felt complying with ASTM D 226, Type I (No. 15 asphalt felt).
- D. Weep/Vent Products: Use one of the following unless otherwise indicated:
 - 1. Wicking Material: Absorbent rope, made from cotton or UV-resistant synthetic fiber, 1/4 to 3/8 inch (6 to 10 mm) in diameter, in length required to produce 2-inch (50-mm) exposure on exterior and 18 inches (450 mm) in cavity. Use only for weeps.
- E. Cavity Drainage Material: Free-draining mesh, made from polymer strands that will not degrade within the wall cavity.
 - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Advanced Building Products Inc.; Mortar Break II.
 - b. Archovations, Inc.; CavClear Masonry Mat.
 - c. Dayton Superior Corporation, Dur-O-Wal Division; Polytite MortarS-top.
 - d. Mortar Net USA, Ltd.; Mortar Net.
 - e. Equivalent by other manufacturer.
 - 2. Provide one of the following configurations:
 - a. Strips, full-depth of cavity and 10 inches (250 mm) high, with dovetail shaped notches 7 inches (175 mm) deep that prevent clogging with mortar droppings.
- F. Reinforcing Bar Positioners: Wire units designed to fit into mortar bed joints spanning masonry unit cells and hold reinforcing bars in center of cells. Units are formed from 0.148-inch (3.77-mm) steel wire, hot-dip galvanized after fabrication. Provide units designed for number of bars indicated.
 - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Dayton Superior Corporation, Dur-O-Wal Division; D/A 810, D/A 812 or D/A 817.
 - b. Heckmann Building Products Inc.; No. 376 Rebar Positioner.
 - c. Hohmann & Barnard, Inc.; #RB or #RB-Twin Rebar Positioner.
 - d. Wire-Bond; O-Ring or Double O-Ring Rebar Positioner.
 - e. Equivalent by other manufacturer.

2.11 CAVITY-WALL INSULATION

- A. Extruded-Polystyrene Board Insulation: ASTM C 578, [Type IV] [Type X], closed-cell product extruded with an integral skin.
- B. Adhesive: Type recommended by insulation board manufacturer for application indicated.

2.12 MASONRY CLEANERS

- A. Proprietary Cleaner: Manufacturer's standard-strength cleaner designed for removing mortar/grout stains, efflorescence, and other new construction stains from new masonry without discoloring or damaging masonry surfaces. Use product expressly approved for intended use by cleaner manufacturer and manufacturer of masonry units being cleaned.

2.13 MORTAR AND GROUT MIXES

- A. General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures, unless otherwise indicated.
 - 1. Do not use calcium chloride in mortar or grout.
 - 2. Use masonry cement mortar unless otherwise indicated.
 - 3. For exterior masonry, use masonry cement mortar.
 - 4. For reinforced masonry, use masonry cement mortar.
 - 5. Add cold-weather admixture (if used) at same rate for all mortar that will be exposed to view, regardless of weather conditions, to ensure that mortar color is consistent.
- B. Preblended, Dry Mortar Mix: Furnish dry mortar ingredients in form of a preblended mix. Measure quantities by weight to ensure accurate proportions, and thoroughly blend ingredients before delivering to Project site.
- C. Mortar for Unit Masonry: Comply with ASTM C 270, Proportion Specification. Provide the following types of mortar for applications stated unless another type is indicated or needed to provide required compressive strength of masonry.
 - 1. For masonry below grade or in contact with earth, use [Type M].
 - 2. For reinforced masonry, use [Type S].
 - 3. For exterior, above-grade, load-bearing and non-load-bearing walls and parapet walls; for interior load-bearing walls; for interior non-load-bearing partitions; and for other applications where another type is not indicated, use Type N.
 - 4. For interior non-load-bearing partitions, Type O may be used instead of Type N.
- D. Grout for Unit Masonry: Comply with ASTM C 476.
 - 1. Use grout of type indicated or, if not otherwise indicated, of type (fine or coarse) that will comply with Table 1.15.1 in ACI 530.1/ASCE 6/TMS 602 for dimensions of grout spaces and pour height.
 - 2. Proportion grout in accordance with ASTM C 476, Table 1 or paragraph 4.2.2 for specified 28-day compressive strength indicated, but not less than 2000 psi (14 MPa).
 - 3. Provide grout with a slump of [8 to 11 inches (203 to 279 mm)] as measured according to ASTM C 143/C 143M.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
 - 1. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of work.
 - 2. Verify that foundations are within tolerances specified.
 - 3. Verify that reinforcing dowels are properly placed.
- B. Before installation, examine rough-in and built-in construction for piping systems to verify actual locations of piping connections.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

- A. Thickness: Build cavity and composite walls and other masonry construction to full thickness shown. Build single-wythe walls to actual widths of masonry units, using units of widths indicated.
- B. Build chases and recesses to accommodate items specified in this and other Sections.
- C. Leave openings for equipment to be installed before completing masonry. After installing equipment, complete masonry to match the construction immediately adjacent to opening.
- D. Use full-size units without cutting if possible. If cutting is required to provide a continuous pattern or to fit adjoining construction, cut units with motor-driven saws; provide clean, sharp, unchipped edges. Allow units to dry before laying unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.
- E. Select and arrange units for exposed unit masonry to produce a uniform blend of colors and textures.
 - 1. Mix units from several pallets or cubes as they are placed.
- F. Matching Existing Masonry: Match coursing, bonding, color, and texture of existing masonry.
- G. Wetting of Brick: Wet brick before laying if initial rate of absorption exceeds 30 g/30 sq. in. (30 g/194 sq. cm) per minute when tested per ASTM C 67. Allow units to absorb water so they are damp but not wet at time of laying.

3.3 TOLERANCES

A. Dimensions and Locations of Elements:

1. For dimensions in cross section or elevation do not vary by more than plus 1/2 inch (12 mm) or minus 1/4 inch (6 mm).
2. For location of elements in plan do not vary from that indicated by more than plus or minus 1/2 inch (12 mm).
3. For location of elements in elevation do not vary from that indicated by more than plus or minus 1/4 inch (6 mm) in a story height or 1/2 inch (12 mm) total.

B. Lines and Levels:

1. For bed joints and top surfaces of bearing walls do not vary from level by more than 1/4 inch in 10 feet (6 mm in 3 m), or 1/2 inch (12 mm) maximum.
2. For conspicuous horizontal lines, such as lintels, sills, parapets, and reveals, do not vary from level by more than 1/8 inch in 10 feet (3 mm in 3 m), maximum.
3. For vertical lines and surfaces do not vary from plumb by more than 1/4 inch in 10 feet (6 mm in 3 m), maximum.
4. For conspicuous vertical lines, such as external corners, door jambs, reveals, and expansion and control joints, do not vary from plumb by more than 1/8 inch in 10 feet (3 mm in 3 m), maximum.
5. For lines and surfaces do not vary from straight by more than 1/4 inch in 10 feet (6 mm in 3 m), maximum.
6. For vertical alignment of exposed head joints, do not vary from plumb by more than 1/4 inch in 10 feet (6 mm in 3 m), or 1/2 inch (12 mm) maximum.
7. For faces of adjacent exposed masonry units, do not vary from flush alignment by more than 1/16 inch (1.5 mm) except due to warpage of masonry units within tolerances specified for warpage of units.

C. Joints:

1. For bed joints, do not vary from thickness indicated by more than plus or minus 1/8 inch (3 mm), with a maximum thickness limited to 1/2 inch (12 mm).
2. For exposed bed joints, do not vary from bed-joint thickness of adjacent courses by more than 1/8 inch (3 mm).
3. For head and collar joints, do not vary from thickness indicated by more than plus 3/8 inch (9 mm) or minus 1/4 inch (6 mm).
4. For exposed head joints, do not vary from thickness indicated by more than plus or minus 1/8 inch (3 mm). Do not vary from adjacent bed-joint and head-joint thicknesses by more than 1/8 inch (3 mm).
5. For exposed bed joints and head joints of stacked bond, do not vary from a straight line by more than 1/16 inch (1.5 mm) from one masonry unit to the next.

3.4 LAYING MASONRY WALLS

- A. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint thicknesses and for accurate location of openings, movement-type joints, returns, and offsets. Avoid using less-than-half-size units, particularly at corners, jambs, and, where possible, at other locations.
- B. Bond Pattern for Exposed Masonry: Unless otherwise indicated, lay exposed masonry in running bond; do not use units with less than nominal 4-inch (100-mm) horizontal face dimensions at corners or jambs.
- C. Lay concealed masonry with all units in a wythe in running bond or bonded by lapping not less than 4-inches (100-mm). Bond and interlock each course of each wythe at corners. Do not use units with less than nominal 4-inch (100-mm) horizontal face dimensions at corners or jambs.
- D. Stopping and Resuming Work: Stop work by racking back units in each course from those in course below; do not tooth. When resuming work, clean masonry surfaces that are to receive mortar, remove loose masonry units and mortar, and wet brick if required before laying fresh masonry.
- E. Built-in Work: As construction progresses, build in items specified in this and other Sections. Fill in solidly with masonry around built-in items.
- F. Fill space between steel frames and masonry solidly with mortar unless otherwise indicated.
- G. Where built-in items are to be embedded in cores of hollow masonry units, place a layer of metal lath, wire mesh, or plastic mesh in the joint below and rod mortar or grout into core.
- H. Fill cores in hollow CMUs with grout 24 inches (600 mm) under bearing plates, beams, lintels, posts, and similar items unless otherwise indicated.
- I. Build non-load-bearing interior partitions full height of story to underside of solid floor or roof structure above unless otherwise indicated.
 - 1. Install compressible filler in joint between top of partition and underside of structure above.
 - 2. Fasten partition top anchors to structure above and build into top of partition. Grout cells of CMUs solidly around plastic tubes of anchors and push tubes down into grout to provide 1/2-inch (13-mm) clearance between end of anchor rod and end of tube. Space anchors 48 inches (1200 mm) o.c. unless otherwise indicated.
 - 3. Wedge non-load-bearing partitions against structure above with small pieces of tile, slate, or metal. Fill joint with mortar after dead-load deflection of structure above approaches final position.

4. At fire-rated partitions, treat joint between top of partition and underside of structure above to comply with Division 7 Section "Fire-Resistive Joint Systems."

3.5 MORTAR BEDDING AND JOINTING

- A. Lay hollow brick and CMUs as follows:
 1. With face shells fully bedded in mortar and with head joints of depth equal to bed joints.
 2. With webs fully bedded in mortar in all courses of piers, columns, and pilasters.
 3. With webs fully bedded in mortar in grouted masonry, including starting course on footings.
 4. With entire units, including areas under cells, fully bedded in mortar at starting course on footings where cells are not grouted.
- B. Lay solid masonry units with completely filled bed and head joints; butter ends with sufficient mortar to fill head joints and shove into place. Do not deeply furrow bed joints or slush head joints.
- C. Set stone trim units in full bed of mortar with full vertical joints. Fill dowel, anchor, and similar holes.
 1. Clean soiled surfaces with fiber brush and soap powder and rinse thoroughly with clear water.
 2. Allow cleaned surfaces to dry before setting.
 3. Wet joint surfaces thoroughly before applying mortar.
- D. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness unless otherwise indicated.
- E. Cut joints flush for masonry walls to receive plaster or other direct-applied finishes (other than paint) unless otherwise indicated.

3.6 CAVITY WALLS

- A. Bond wythes of cavity walls together using one of the following methods:
 1. Individual Metal Ties: Provide ties as shown installed in horizontal joints, but not less than one metal tie for 2.67 sq. ft. (0.25 sq. m) of wall area spaced not to exceed 16 inches (406 mm) o.c. horizontally and 16 inches (406 mm) o.c. vertically. Stagger ties in alternate courses. Provide additional ties within 12 inches (305 mm) of openings and space not more than 36 inches (915 mm) apart around perimeter of openings. At intersecting and abutting walls, provide ties at no more than 24 inches (610 mm) o.c. vertically.
 - a. Where bed joints of wythes do not align, use adjustable (two-piece) type ties.

- b. Where one wythe is of clay masonry and the other of concrete masonry, use adjustable (two-piece) type ties to allow for differential movement regardless of whether bed joints align.
 - 2. Masonry Joint Reinforcement: Installed in horizontal mortar joints.
 - c. Where one wythe is of clay masonry and the other of concrete masonry, use adjustable (two-piece) type reinforcement to allow for differential movement regardless of whether bed joints align.
 - 3. Header Bonding: Provide masonry unit headers extending not less than 3 inches (76 mm) into each wythe. Space headers not over 8 inches (203 mm) clear horizontally and 16 inches (406 mm) clear vertically.
 - 4. Masonry Veneer Anchors: Comply with requirements for anchoring masonry veneers.
- B. Bond wythes of cavity walls together using bonding system indicated on Drawings.
- C. Keep cavities clean of mortar droppings and other materials during construction. Bevel beds away from cavity, to minimize mortar protrusions into cavity. Do not attempt to trowel or remove mortar fins protruding into cavity.
- D. Parge cavity face of backup wythe in a single coat approximately 3/8 inch (10 mm) thick. Trowel face of parge coat smooth.
- E. Coat cavity face of backup wythe to comply with Division 7 Section "Bituminous Damproofing."
- F. Apply air barrier to face of backup wythe to comply with Division 7 Section "Fluid-Applied Membrane Air Barriers."
- G. Installing Cavity-Wall Insulation: Place small dabs of adhesive, spaced approximately 12 inches (300 mm) o.c. both ways, on inside face of insulation boards, or attach with plastic fasteners designed for this purpose. Fit courses of insulation between wall ties and other confining obstructions in cavity, with edges butted tightly both ways. Press units firmly against inside wythe of masonry or other construction as shown.
 - 1. Fill cracks and open gaps in insulation with crack sealer compatible with insulation and masonry.

3.7 MASONRY JOINT REINFORCEMENT

- A. General: Install entire length of longitudinal side rods in mortar with a minimum cover of 5/8 inch (16 mm) on exterior side of walls, 1/2 inch (13 mm) elsewhere. Lap reinforcement a minimum of 6 inches (150 mm).
 - 1. Space reinforcement not more than 16 inches (406 mm) o.c.
 - 2. Space reinforcement not more than 8 inches (203 mm) o.c. in foundation walls and parapet walls.

3. Provide reinforcement not more than 8 inches (203 mm) above and below wall openings and extending 12 inches (305 mm) beyond openings in addition to continuous reinforcement.
- B. Interrupt joint reinforcement at control and expansion joints unless otherwise indicated.
 - C. Provide continuity at wall intersections by using prefabricated T-shaped units.
 - D. Provide continuity at corners by using prefabricated L-shaped units.
 - E. Cut and bend reinforcing units as directed by manufacturer for continuity at corners, returns, offsets, column fireproofing, pipe enclosures, and other special conditions.

3.8 ANCHORING MASONRY TO STRUCTURAL STEEL AND CONCRETE

- A. Anchor masonry to structural steel and concrete where masonry abuts or faces structural steel or concrete to comply with the following:
 1. Provide an open space not less than 1/2 inch (13 mm) wide between masonry and structural steel or concrete unless otherwise indicated. Keep open space free of mortar and other rigid materials.
 2. Anchor masonry with anchors embedded in masonry joints and attached to structure.
 3. Space anchors as indicated, but not more than 24 inches (610 mm) o.c. vertically and 36 inches (915 mm) o.c. horizontally.

3.9 ANCHORING MASONRY VENEERS

- A. Anchor masonry veneers to concrete and masonry backup with masonry-veneer anchors to comply with the following requirements:
 1. Embed tie sections in masonry joints. Provide not less than 2 inches (50 mm) of air space between back of masonry veneer and face of sheathing.
 2. Locate anchor sections to allow maximum vertical differential movement of ties up and down.
 3. Space anchors as indicated, but not more than 18 inches (458 mm) o.c. vertically and 24 inches (610 mm) o.c. horizontally, with not less than 1 anchor for each 2 sq. ft. (0.2 sq. m) of wall area. Install additional anchors within 12 inches (305 mm) of openings and at intervals, not exceeding 8 inches (203 mm), around perimeter.
 4. Space anchors as indicated, but not more than 16 inches (406 mm) o.c. vertically and horizontally with not less than 1 anchor for each 2.67 sq. ft. (0.25 sq. m) of wall area. Install additional anchors within 12 inches (305 mm) of openings and at intervals, not exceeding 36 inches (914 mm), around perimeter.

3.10 CONTROL AND EXPANSION JOINTS

- A. General: Install control and expansion joint materials in unit masonry as masonry progresses. Do not allow materials to span control and expansion joints without provision to allow for in-plane wall or partition movement.
- B. Form control joints in concrete masonry using one of the following methods:
 - 1. Fit bond-breaker strips into hollow contour in ends of CMUs on one side of control joint. Fill resultant core with grout and rake out joints in exposed faces for application of sealant.
 - 2. Install preformed control-joint gaskets designed to fit standard sash block.
 - 3. Install interlocking units designed for control joints. Install bond-breaker strips at joint. Keep head joints free and clear of mortar or rake out joint for application of sealant.
 - 4. Install temporary foam-plastic filler in head joints and remove filler when unit masonry is complete for application of sealant.
- C. Form expansion joints in brick as follows:
 - 1. Build in compressible joint fillers where indicated.

3.11 LINTELS

- A. Install steel lintels where indicated.
- B. Provide concrete or masonry lintels where shown and where openings of more than 12 inches (305 mm) for brick-size units and 24 inches (610 mm) for block-size units are shown without structural steel or other supporting lintels.
- C. Provide minimum bearing of 8 inches (200 mm) at each jamb unless otherwise indicated.

3.12 FLASHING, WEEP HOLES, CAVITY DRAINAGE, AND VENTS

- A. General: Install embedded flashing and weep holes in masonry at shelf angles, lintels, ledges, other obstructions to downward flow of water in wall, and where indicated. Install vents at shelf angles, ledges, and other obstructions to upward flow of air in cavities, and where indicated.
- B. Install flashing as follows unless otherwise indicated:
 - 1. Prepare masonry surfaces so they are smooth and free from projections that could puncture flashing. Where flashing is within mortar joint, place through-wall flashing on sloping bed of mortar and cover with mortar. Before covering with mortar, seal penetrations in flashing with adhesive, sealant, or tape as recommended by flashing manufacturer.
 - 2. At multiwythe masonry walls, including cavity walls, extend flashing through outer wythe, turned up a minimum of 8 inches (200 mm), and 1-1/2 inches (38 mm) into the inner wythe.

3. At lintels and shelf angles, extend flashing a minimum of 6 inches (150 mm) into masonry at each end. At heads and sills, extend flashing 6 inches (150 mm) at ends and turn up not less than 2 inches (50 mm) to form end dams.
 4. Cut flexible flashing off flush with face of wall after masonry wall construction is completed.
- C. Install reglets and nailers for flashing and other related construction where they are shown to be built into masonry.
- D. Install weep holes in head joints in exterior wythes of first course of masonry immediately above embedded flashing and as follows:
1. Use wicking material to form weep holes above flashing under brick sills. Turn wicking down at lip of sill to be as inconspicuous as possible.
 2. Space weep holes formed from wicking material 16 inches (400 mm) o.c.
 3. Cover cavity side of weep holes with plastic insect screening at cavities insulated with loose-fill insulation.
 4. Trim wicking material flush with outside face of wall after mortar has set.
- E. Place cavity drainage material in cavities to comply with configuration requirements for cavity drainage material in "Miscellaneous Masonry Accessories" Article.

3.13 REINFORCED UNIT MASONRY INSTALLATION

- A. Temporary Formwork and Shores: Construct formwork and shores as needed to support reinforced masonry elements during construction.
1. Construct formwork to provide shape, line, and dimensions of completed masonry as indicated. Make forms sufficiently tight to prevent leakage of mortar and grout. Brace, tie, and support forms to maintain position and shape during construction and curing of reinforced masonry.
 2. Do not remove forms and shores until reinforced masonry members have hardened sufficiently to carry their own weight and other loads that may be placed on them during construction.
- B. Placing Reinforcement: Comply with requirements in ACI 530.1/ASCE 6/TMS 602.
- C. Grouting: Do not place grout until entire height of masonry to be grouted has attained enough strength to resist grout pressure.
1. Comply with requirements in ACI 530.1/ASCE 6/TMS 602 for cleanouts and for grout placement, including minimum grout space and maximum pour height.
 2. Limit height of vertical grout pours to not more than 60 inches (1520 mm).

3.14 FIELD QUALITY CONTROL

- A. Testing and Inspecting: Owner will engage special inspectors to perform tests and inspections and prepare reports. Allow inspectors access to scaffolding and work areas, as needed to perform tests and inspections. Retesting of materials that fail to comply with specified requirements shall be done at Contractor's expense.
- B. Inspections: Special inspections according to the "International Building Code."
 - 1. Begin masonry construction only after inspectors have verified proportions of site-prepared mortar.
 - 2. Place grout only after inspectors have verified compliance of grout spaces and of grades, sizes, and locations of reinforcement.
 - 3. Place grout only after inspectors have verified proportions of site-prepared grout.
- C. Testing Prior to Construction: One set of tests.
- D. Testing Frequency: One set of tests for each 5000 sq. ft. (464 sq. m) of wall area or portion thereof.
- E. Clay Masonry Unit Test: For each type of unit provided, according to ASTM C 67 for compressive strength.
- F. Concrete Masonry Unit Test: For each type of unit provided, according to ASTM C 140 for compressive strength.
- G. Mortar Aggregate Ratio Test (Proportion Specification): For each mix provided, according to ASTM C 780.
- H. Mortar Test (Property Specification): For each mix provided, according to ASTM C 780. Test mortar for [mortar air content] [and] [compressive strength].
- I. Grout Test (Compressive Strength): For each mix provided, according to ASTM C 1019.
- J. Prism Test: For each type of construction provided, according to ASTM C 1314 at [7 days and at]28 days.

3.15 REPAIRING, POINTING, AND CLEANING

- A. Remove and replace masonry units that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units. Install new units to match adjoining units; install in fresh mortar, pointed to eliminate evidence of replacement.

- B. Pointing: During the tooling of joints, enlarge voids and holes, except weep holes, and completely fill with mortar. Point up joints, including corners, openings, and adjacent construction, to provide a neat, uniform appearance. Prepare joints for sealant application, where indicated.
- C. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.
- D. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:
 - 1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
 - 2. Test cleaning methods on sample wall panel; leave one-half of panel uncleaned for comparison purposes. Obtain Architect's approval of sample cleaning before proceeding with cleaning of masonry.
 - 3. Protect adjacent stone and nonmasonry surfaces from contact with cleaner by covering them with liquid strippable masking agent or polyethylene film and waterproof masking tape.
 - 4. Wet wall surfaces with water before applying cleaners; remove cleaners promptly by rinsing surfaces thoroughly with clear water.
 - 5. Clean brick by bucket-and-brush hand-cleaning method described in BIA Technical Notes 20.
 - 6. Clean masonry with a proprietary acidic cleaner applied according to manufacturer's written instructions.
 - 7. Clean concrete masonry by cleaning method indicated in NCMA TEK 8-2A applicable to type of stain on exposed surfaces.
 - 8. Clean stone trim to comply with stone supplier's written instructions.
 - 9. Clean limestone units to comply with recommendations in ILI's "Indiana Limestone Handbook."

3.16 MASONRY WASTE DISPOSAL

- A. Salvageable Materials: Unless otherwise indicated, excess masonry materials are Contractor's property. At completion of unit masonry work, remove from Project site.

+ + END OF SECTION + +

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SECTION 05051

ANCHOR BOLTS, TOGGLE BOLTS, AND CONCRETE INSERTS

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:

1. CONTRACTOR shall provide all labor, materials, equipment, and incidentals as shown, specified, and required to furnish and install anchor systems.
2. This Section includes all anchor systems required for the Work, but not specified under other Sections.

B. Coordination:

1. Review installation procedures under this and other Sections and coordinate installation of items to be installed with or before anchor systems Work.
2. Notify other contractors in advance of the installation of anchor systems to provide them with sufficient time for installing items included in their contracts to be installed with or before anchor systems Work.

1.2 REFERENCES

A. Standards referenced in this Section are:

1. ACI 318, Building Code Requirements for Structural Concrete.
2. ACI 350, Code Requirements for Environmental Engineering Concrete Structures.
3. ACI 355.2, Standard for Evaluating the Performance of Post Installed Mechanical Anchors in Concrete.
4. ASTM A194, Specification for Carbon and Alloy Steel Nuts for Bolts for High Pressure or High Temperature Service, or Both.
5. ASTM A276, Specification for Stainless Steel Bars and Shapes.
6. ASTM A493, Specification for Stainless Steel Wire and Wire Rods for Cold Heading and Cold Forging.
7. ASTM A563, Specification for Carbon and Alloy Steel Nuts.
8. ASTM B633, Specification for Electrodeposited Coatings of Zinc on Iron and Steel.
9. ASTM C307, Standard Test Method for Tensile Strength of Chemical-Resistant Mortar, Grouts, and Monolithic Surfacing.
10. ASTM C579, Standard Test Methods for Compressive Strength of Chemical-Resistant Mortars, Grouts, Monolithic Surfacing, and Polymer Concretes.

11. ASTM C580, Standard Test Method for Flexural Strength and Modulus of Elasticity of Chemical-Resistant Mortars, Grouts, Monolithic Surfacing, and Polymer Concretes.
12. ASTM C881, Specification for Epoxy-Resin-Base Bonding Systems for Concrete.
13. ASTM D695, Standard Test Method for Compressive Properties of Rigid Plastics.
14. ASTM D790, Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials.
15. ASTM E329, Standard Specification for Agencies Engaged in Construction Inspection and/or Testing.
16. ASTM F593, Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs.
17. ASTM F1554, Specification for Anchor Bolts, Steel, 36, 55 and 105-ksi Yield Strength.
18. ICC Evaluation Service (ES) AC 01, Acceptance Criteria for Expansion Anchors in Masonry Elements.
19. ICC ES AC 58, Acceptance Criteria for Adhesive Anchors in Masonry Elements.
20. ICC ES AC 193, Acceptance Criteria for Mechanical Anchors in Concrete Elements.
21. ICC ES AC 308, Acceptance Criteria for Post-Installed Anchors in Concrete Elements.
22. Manufacturer's Standardization Society (MSS), ANSI/MSS SP-58 Pipe Hangers and Supports - Materials, Design and Manufacturer.
23. US General Services Administration (GSA), Federal Specification (FS) A-A-1922A for Shield, Expansion (Caulking Anchors, Single Lead).
24. US GSA, FS A-A-1923A for Concrete Expansion Anchors.
25. US GSA, FS A-A-55614 for Shield, Expansion (non-drilling expansion anchors).
26. US GSA, FS FF-B-588, Bolt, Toggle and Expansion Sleeve Screw.

1.3 QUALITY ASSURANCE

A. Qualifications:

1. Testing Laboratory: Shall conform to ASTM E329 and shall be experienced in tension testing of adhesive anchoring systems.
2. Adhesive Anchor Installer: Shall be experienced and certified by adhesive anchor system manufacturer as possessing training necessary for installing manufacturer's products. Distributors or manufacturer's representatives shall not provide product training unless qualified as certified trainers by anchor manufacturer.

1.4 SUBMITTALS

- A. Action Submittals: Submit the following:
1. Shop Drawings:
 - a. Listing of all anchor systems products intended for use in the Work including product type, intended location in the Work, and embedded lengths.
 2. Product Data:
 - a. Copies of manufacturer's specifications, load tables, dimension diagrams, acceptable base material conditions, acceptable drilling methods, and acceptable bored hole conditions.
 - b. Copies of valid ICC ES reports certifying load-carrying capacities and installation requirements for anchor systems.
 - c. Clearly indicate allowable strength design safety factors when ultimate load carrying capacities are submitted for approval.
 3. Samples:
 - a. Representative Samples of anchor systems proposed for use in the Work. Review will be for type and finish only. Compliance with all other requirements is exclusive responsibility of CONTRACTOR.
- B. Informational Submittals: Submit the following:
1. Certificates:
 - a. For each type of anchor bolts or threaded rods, certified copies of laboratory test reports and other data as required to show compliance with these Specifications.
 - b. Adhesive anchor system manufacturer's certification that installer is qualified for installing manufacturer's products.
 2. Manufacturer's Instructions:
 - a. Installation instructions for anchor systems, including bore hole cleaning procedures and adhesive injection, cure and gel time tables, and temperature ranges (storage, installation and in-service).
 3. Site Quality Control Submittals: Reports of Site quality control testing, as applicable.

1.5 DELIVERY, STORAGE AND HANDLING

- A. Packing, Shipping, Handling, and Unloading:
1. Deliver products to the Site to ensure uninterrupted progress of the Work. Deliver anchorage products to be embedded in concrete or masonry in ample time to prevent delaying the Work.
 2. Inspect products upon delivery to the Site and notify ENGINEER in writing of loss or damage to products. Promptly replace prior to installation.
 3. Conform to Section 01651, Transportation and Handling of Products.

- B. Storage and Protection:
 - 1. Keep materials dry during delivery and storage.
 - 2. Protect anchor systems from damage at the Site. Protect products from corrosion and deterioration.
 - 3. Conform to Section 01661, Storage and Protection of Products.

PART 2 – PRODUCTS

2.1 SYSTEM PERFORMANCE

- A. Design Criteria
 - 1. Size, Length, and Load-carrying Capacity: Conform to the Contract Documents. When size, length or load-carrying capacity of anchor system is not otherwise shown or indicated in the Contract Documents, provide the following:
 - a. Anchor Bolts: Provide size, length, and capacity required to carry design load based on values and requirements provided in Paragraph 3.2.A of this Section. For conditions outside limits of critical edge distance and spacing in Paragraph 3.2.A of this Section, minimum anchor bolt embedment as shown or indicated in Paragraph 3.2.A apply and capacity shall be based on requirements of Laws and Regulations, including applicable building codes.
 - b. Adhesive Anchors, Expansion Anchors, or Concrete Inserts: Provide size, length, type, and capacity required to carry design load based on values and requirements in manufacturer's load tables. Alternately, capacity may be based on tension and shear strength capacities determined by independent testing laboratory retained by manufacturer or CONTRACTOR, using minimum safety factor of four.
 - 1) Determine capacity considering reductions due to embedment length, strength of base fastening materials, spacing, and edge distance.
 - 2. Design Loads:
 - a. Equipment Anchors: Use design load recommended by equipment manufacturer.
 - b. Pipe Hangers and Supports: Use full weight of pipe, and fluid contained in pipe that are tributary to the support plus the full weight of valves and accessories located between the hanger or support being anchored and the next hanger or support.
- B. Application:
 - 1. Anchor Bolts:
 - a. Where anchor bolt is shown or indicated in the Contract Documents, use cast-in-place anchor bolt unless another anchor type is approved by ENGINEER.

- b. Provide anchor bolts as shown or indicated, or as required to secure structural element to appropriate anchor surface.
- 2. Adhesive Anchors:
 - a. Use where adhesive anchors are shown or indicated for installation in concrete, grout-filled concrete masonry units, or hollow concrete unit masonry.
 - b. Use where subject to vibration or where subject to freezing.
 - c. Use where submerged or buried.
 - d. Use for floor-mounted pipe supports.
 - e. Do not use in ceilings.
 - f. Do not use for pipe hangers.
- 3. Expansion Anchors:
 - a. Use where expansion anchors are shown or indicated for installation in concrete, grout-filled concrete masonry units, hollow concrete unit masonry, or solid brick.
 - b. Do not use where subject to vibration.
 - c. Do not use where submerged or buried.
 - d. Do not use in exterior locations subject to freezing.
 - e. Use in ceilings.
 - f. Expansion anchors may be used for hanging or supporting piping two-inch diameter and smaller. Do not use expansion anchors for supporting piping larger than two-inch diameter unless otherwise shown or approved by ENGINEER.
- 4. Concrete Inserts:
 - a. Use only where shown or indicated in the Contract Documents.
 - b. Use for pipe hangers and supports for pipe size and loading recommended by the insert manufacturer.
- 5. Toggle Bolts:
 - a. Use only when approved by ENGINEER for light-duty fastening brackets and other elements onto hollow concrete elements or hollow masonry units.

2.2 MATERIALS

- A. Anchor Bolts:
 - 1. Interior and Dry Locations: Provide threaded carbon steel rods complying with ASTM F1554, Grade 36, with heavy hex nuts complying with ASTM A563 Grade A, unless otherwise shown or indicated on the Drawings.
 - 2. Exterior, Buried, or Submerged Locations, or When Exposed to Wastewater: Provide stainless steel threaded rods complete with washers complying with ASTM F593, AISI Type 316, Condition A, with ASTM A194, Grade 8S (nitronic 60) stainless steel nuts and locknuts. Other AISI types may be used if approved by ENGINEER.
 - 3. Equipment: Provide anchor bolts conforming material requirements of this Section and equipment manufacturer's requirements relative to size, embedment length, and anchor bolt projection.

4. Anchoring of Structural Elements: Provide anchor bolts of size, material, and strength shown or indicated in the Contract Documents.
- B. Concrete Adhesive Anchors:
1. General:
 - a. Adhesive anchors shall consist of threaded rods anchored into hardened concrete using an adhesive system.
 2. Products and Manufacturers: Provide one of the following:
 - a. HIT-RE 500-SD Injection Epoxy Adhesive Anchoring System, by Hilti Fastening Systems, Inc.
 - b. Or equal.
 3. Adhesive:
 - a. Adhesive system shall use two-component adhesive mix.
 - b. Epoxy adhesives shall conform to physical requirements of ASTM C881 Type IV, Grade 2 and 3, Class A, B, and C except gel times.
 - c. Adhesives shall have an evaluation report by ICC ES and be successfully tested in accordance with ICC ES AC 308.
 4. Anchor:
 - a. Provide stainless steel adhesive anchor rod complying with ASTM F593, AISI Type 316, Condition CW, with ASTM A194, Grade 8S (nitronic 60) stainless steel nuts and locknuts.
- C. Grout-filled Masonry Adhesive Anchors:
1. General:
 - a. Adhesive anchors shall consist of threaded rods anchored into grout-filled concrete block masonry using an adhesive system.
 2. Products and Manufacturers: Provide one of the following:
 - a. HIT-HY 150 Adhesive Anchoring System, by Hilti Fastening Systems, Inc.
 - b. Acrylic-Tie Adhesive, by Simpson Strong-Tie Co.
 - c. Or equal.
 3. Adhesive:
 - a. Adhesive system shall use two-component adhesive mix.
 - b. Adhesives shall conform to physical requirements of ASTM C881 Type I and IV, Grade 3, Class A, B, and C.
 - c. Acrylate hybrid adhesives shall conform to the following:
 - 1) ASTM C579 Compressive Strength >7,252 psi
 - 2) ASTM C580 Flexural Strength > 2,900 psi
 - 3) ASTM C307 Modulus of Elasticity > 507,000 psi
 - d. Adhesives shall have evaluation report by ICC ES and be tested in accordance with ICC ES AC 58 for the following:
 - 1) Seismic and wind loading
 - 2) Long-term creep at elevated temperatures
 - 3) Static loading at elevated temperatures
 - 4) Damp and water-filled holes
 - 5) Freeze-thaw conditions

6) Critical and minimum edge distance and spacing

4. Anchor:
 - a. Provide stainless steel adhesive anchor rod complying with ASTM F593, AISI Type 316, Condition CW, with ASTM A194, Grade 8S (nitronic 60) stainless steel nuts and locknuts.
- D. Hollow Concrete Masonry Adhesive Anchors:
1. General:
 - a. Adhesive anchors shall consist of threaded rods with a cylindrical mesh screen tube anchored into hollow concrete block masonry using an adhesive system.
 2. Products and Manufacturers: Provide one of the following:
 - a. HIT-HY 20 for Masonry Anchoring System, by Hilti Fastening Systems, Inc.
 - b. Acrylic-Tie Adhesive, by Simpson Strong-Tie Co.
 - c. Or equal.
 3. Adhesive:
 - a. Adhesive system shall use two-component adhesive mix.
 - b. Adhesives shall conform to physical requirements of ASTM C881 Type I and IV, Grade 3, Class A, B, and C.
 - c. Hybrid adhesives shall conform to the following:
 - 1) ASTM D695 Compressive Strength: 10,420 psi
 - 2) ASTM D790 Modulus of Elasticity: 1.02×10^6 psi
 - d. Adhesives shall have an evaluation report by ICC ES and be tested in accordance with ICC ES AC 58 for the following
 - 1) Seismic and wind loading
 - 2) Long-term creep at elevated temperatures
 - 3) Static loading at elevated temperatures
 - 4) Damp and water-filled holes
 - 5) Freeze-thaw conditions
 - 6) Critical and minimum edge distance and spacing
 4. Anchor:
 - a. Provide stainless steel adhesive anchor rod complying with ASTM F593, AISI Type 316, Condition CW, with ASTM A194, Grade 8S (nitronic 60) stainless steel nuts and locknuts.
 5. Mesh Screen Tube:
 - a. Provide with mesh size, length, and diameter as specified by adhesive anchor manufacturer.
 - b. Mesh shall be manufactured of AISI 304 stainless steel.
- E. Concrete Wedge Expansion Anchors:
1. Where expansion anchors are shown or indicated to be installed in concrete, provide concrete wedge expansion anchors.
 2. Products and Manufacturers: Provide one of the following:
 - a. Kwik Bolt TZ Wedge Anchor, by Hilti Fastening Systems, Inc.

- b. Strong-Bolt Wedge Anchor, by Simpson Strong-Tie Co.
 - c. Or equal.
 - 3. Anchors shall conform to physical requirements of FS A-A-1923A, Type 4. Provide concrete wedge expansion anchors in accordance with ACI 318 and ACI 350, Appendix D. Demonstrate suitability of cracked concrete wedge anchors in accordance with ACI 355.2 prequalification tests.
 - 4. Interior and Dry Locations: Provide carbon steel anchors complete with nuts and washers, zinc plated, in accordance with ASTM B633.
 - 5. Exterior or Wet Locations: Provide expansion anchors complete with nuts and washers, AISI Type 304 stainless steel anchor body, in accordance with ASTM A276 or ASTM A493.
 - 6. Anchors shall be tested in accordance with ICC ES AC 193 for mandatory tests and the following:
 - a. Seismic and wind loading.
- F. Grout-filled Masonry Wedge Expansion Anchors:
- 1. Product and Manufacturers: Provide one of the following:
 - a. Kwik-Bolt 3 Expansion Anchors, by Hilti Fastening Systems, Inc.
 - b. Wedge-All Wedge Anchors, by Simpson Strong-Tie Co.
 - c. Or equal.
 - 2. Interior Locations: Where expansion anchors are shown or indicated as being installed in grout-filled masonry, provide masonry wedge type expansion anchors.
 - 3. Anchors shall conform to physical requirements of FS A-A-1923A, Type 4. Anchors shall be non-bottom bearing type with single-piece steel expansion clip providing 360-degree contact with base material and shall not require oversized holes for installation.
 - 4. Provide carbon steel anchors complete with nuts and washers, zinc plated, in accordance with ASTM B633.
 - 5. Anchors shall have an evaluation report issued by ICC ES and be tested in accordance with ICC ES AC 01 for the following:
 - a. Seismic and wind loading.
 - b. Combination of tension and shear loads.
 - c. Critical and minimum edge distance.
- G. Sleeve Expansion Anchors:
- 1. Where expansion anchors are shown or indicated for installation in hollow concrete unit masonry or solid brick, provide sleeve-type expansion anchors.
 - 2. Products and Manufacturers: Provide one of the following:
 - a. HLC Sleeve Anchors, by Hilti Fastening Systems, Inc.
 - b. Sleeve-All Sleeve Anchor, by Simpson Strong-Tie Co.
 - c. Or equal.
 - 3. Anchors shall conform to physical requirements of FS A-A-1922A. Anchors shall be non-bottom bearing type with single-piece steel expansion

sleeve providing 360-degree contact with base material, and shall not require oversized holes for installation.

4. Interior Locations: Provide carbon steel anchors complete with nuts and washers, zinc plated, in accordance with ASTM B633.
 5. Exterior Locations: Provide expansion anchors complete with nuts and washers, Type 304 stainless steel, in accordance with ASTM A276 or ASTM A493.
 6. Anchors shall be tested in accordance with ICC ES AC 01 for the following:
 - a. Static loads.
 - b. Critical and minimum edge distance and spacing.
- H. Drop-in Expansion Anchors:
1. Where light-duty expansion anchors, to be installed in concrete or grout-filled concrete unit masonry, are required by CONTRACTOR for supporting piping or conduit two-inch diameter or smaller, properly-sized drop-in anchors will be acceptable.
 2. Products and Manufacturers: Provide one of the following:
 - a. HDI Drop-In Anchors, by Hilti Fastening Systems, Inc.
 - b. Drop-In Anchor, by Simpson Strong-Tie Co.
 - c. Or equal.
 3. Provide carbon steel anchors complete with nuts and washers, zinc plated, in accordance with ASTM B633, conforming to physical requirements of FS A-A-55614, Type I. Anchors shall be bottom-bearing type with slotted, single-piece steel shell and tapered expander plug providing 360-degree contact with base material.
 4. Anchors shall be tested in accordance with ICC ES AC 01 for the following:
 - a. Seismic and wind loading.
 - b. Combination of tension and shear loads.
 - c. Critical and minimum edge distance and spacing.
- I. Concrete Inserts:
1. Provide malleable iron inserts for pipe hangers, grating, floor plate, and masonry lintels. Comply with ANSI/MSS SP-58. Provide inserts recommended by insert manufacturer for required loading.
 2. Finish shall be black.
 3. Products and Manufacturers: Provide one of the following:
 - a. Figure 282, by Anvil International Inc.
 - b. No. 380E, by Hohmann and Barnard, Inc.
 - c. Or equal.
- J. Toggle Bolts:
1. Where light-duty toggle bolts, to be installed in hollow concrete unit masonry, hollow brick or gypsum wallboard, are required by CONTRACTOR to support piping or conduit one-inch diameter or smaller, properly sized toggle bolts are acceptable.
 2. Products and Manufacturers: Provide one of the following:

- a. Toggler Bolt by Hilti Fastening Systems, Inc.
 - b. Toggle Bolt by The Simpson Strong-Tie Co.
 - c. Or equal.
3. Toggle Bolts: FS FF-B-588, Type I, Class A, Style 1. Provide spring-wing toggle bolts, with two-piece wings.
 4. Provide carbon steel bolts with zinc coating in accordance with ASTM B633.
- K. Do not use powder activated fasteners and other types of bolts and fasteners not specified in this Section, unless approved by ENGINEER.

PART 3 – EXECUTION

3.1 INSPECTION

- A. Examine conditions under which materials are to be installed and notify ENGINEER in writing of conditions detrimental to proper and timely completion of the Work. Do not proceed with the Work until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Anchor Bolts:
 1. Provide anchor bolts as shown or indicated in the Contract Documents, or as required to secure structural element to the appropriate anchor surface.
 2. Locate and accurately set anchor bolts using templates or other devices as required, prior to placing concrete. Wet setting of anchor bolts is not allowed.
 3. Protect threads and shank from damage during installation and subsequent construction operations.
 4. Unless otherwise shown or approved by ENGINEER anchor bolts shall conform to Table 05051-A:

**TABLE 05051-A
SINGLE ANCHOR ALLOWABLE LOADS ON ANCHOR BOLTS¹**

Bolt Diameter (inch)	F1554 Grade 36				F1554			
	F593 Type 316, Condition A				Grade 55			
	Minimum Embedment (inch)	Minimum Edge Distance and Spacing ² (inch)	Shear ^{3,4} (lb)	Tension ³ (lb)	Minimum Embedment (inch)	Minimum Edge Distance and Spacing ² (inch)	Shear ³ (lb)	Tension ³ (lb)
1/2	6	9	1,262	2,420	8.5	12.75	1,660	3,190
5/8	7.5	11.25	2,010	3,860	10.5	15.75	2,640	5,080
3/4	9	13.5	2,974	5,720	13	19.5	3,910	7,520
7/8	10.5	15.75	4,106	7,890	15	22.5	5,400	10,390
1	12	18	5,386	10,360	17	25.5	7,090	13,450
1 1/8	13.5	20.25	6,787	13,052	19	28.5	8,930	16,580
1 1/4	15	22.5	8,617	16,572	21	31.5	11,340	20,040

Table Notes:

1. Table is based on ACI 318 and ACI 350, Appendix D, $f'c = 4000$ psi. This table is not applicable to anchor bolts embedded in grouted masonry.
2. Critical edge distance and spacing are indicated in the table. Capacity of anchor bolts for other combination of edge distances and spacing shall be evaluated in accordance with ACI 318 and ACI 350, Appendix D.
3. Values for shear and tension listed are not considered to act concurrently. Interaction of tension and shear will be evaluated by ENGINEER in accordance with ACI 318 and ACI 350, Appendix D.

B. Adhesive Anchors:

1. Comply with manufacturer's installation instructions regarding hole diameter, drilling method, embedment depth required to fully develop tensile strength of anchor ($0.75 \times F_u$), and hole cleaning/preparation. Unless more-stringent standards are required by adhesive system manufacturer, comply with the following.
2. Drill holes to adhesive system manufacturer's recommended diameter and depth to develop required tensile strength. Hole diameter shall not be greater than 1/8-inch more than nominal rod diameter. Holes shall be hammer-drilled with carbide bits; do not core-drill holes.
3. Unless otherwise shown or indicated in the Contract Documents or approved by ENGINEER, provide minimum anchor spacing and edge distance of 12 anchor diameters. Affect on anchor capacity of deviations, if any, in spacing and edge distance shall be investigated by ENGINEER in accordance with adhesive anchor system manufacturer's requirements.

4. Prior to drilling, locate existing reinforcing steel in vicinity of proposed holes. If reinforcing conflicts with proposed hole location, obtain ENGINEER's approval of alternate hole locations to avoid drilling through or damaging existing reinforcing bars.
5. Before setting adhesive anchor, hole shall be made free of dust and debris by method recommended by adhesive anchor system manufacturer. Hole shall be brushed with adhesive system manufacturer-approved brush and blown clean with clean, dry, oil-free compressed air to remove all dust and loose particles. Hole shall be dry as defined by adhesive system manufacturer.
6. Before injecting adhesive, obtain Engineers approval that hole is dry and free of oil and other contaminants.
7. Inject adhesive into hole through injection system-mixing nozzle and necessary extension tubes, placed to bottom of hole. Discharge end shall be withdrawn as adhesive is placed but kept immersed to prevent formation of air pockets. Fill hole to depth that ensures that excess material is expelled from hole during anchor placement.
8. Before installing, verify that anchor is dry and free of oil and other contaminants.
9. Twist anchors during insertion into partially filled hole to guarantee full wetting of rod surface with adhesive. Insert rod slowly to avoid developing air pockets.
10. Limitations:
 - a. Installation Temperature: See manufacturer's instructions for installation temperature requirements.
 - b. Oversized Holes: Notify ENGINEER immediately if size of drilled hole is larger than recommended by anchor system manufacturer. Cost of corrective measures, including but not limited to redesign of anchors due to decreased anchor capacities, shall be paid by CONTRACTOR.

C. Expansion Anchors:

1. Unless otherwise shown or approved by ENGINEER, provide minimum anchor spacing and edge distance of seven anchor diameters. Affect on anchor capacity of deviations, if any, in spacing and edge distance shall be evaluated in accordance with requirements of the anchor system manufacturer.
2. Protect threads from damage during anchor installation. Set anchors to manufacturer's recommended torque, using a torque wrench.

D. Concrete Inserts:

1. Protect embedded items from damage and, during concrete placing, ensure that embedded items are not filled with concrete.

3.3 CLEANING

- A. After embedding concrete is placed, remove protection and clean bolts and inserts.

3.4 SITE QUALITY CONTROL

- A. Site Tests:
 1. CONTRACTOR shall employ an independent testing and inspection agency to perform Site quality testing of post installed anchors.
 - a. Test at least ten percent of all types of post installed anchors to 50 percent of ultimate tensile capacity of post installed anchors.
 - b. Apply test loads with hydraulic ram.
 - c. Displacement of post-installed anchors shall not exceed D/10, where D is nominal diameter of anchor.
 2. If a post-installed anchor fails the test, CONTRACTOR shall pay cost of testing all post-installed anchors of same diameter and type not initially tested.
 3. CONTRACTOR shall correct defective Work by removing and replacing or correcting, as directed by ENGINEER.
 4. CONTRACTOR shall pay for all corrections and subsequent testing required to confirm integrity of post-installed anchors.
 5. Independent testing and inspection agency shall complete report on each area of the Work relative to anchor systems. Report shall summarize observations made by inspector and be submitted to ENGINEER.
 6. Special Inspection, periodic or continuous, of post-installed anchors shall be provided as required by ICC ES evaluation reports and in accordance with Section 01416, Special Inspections.
- B. Manufacturer's Services:
 1. Provide services at the Site of qualified adhesive manufacturer's representative during initial installation of adhesive anchor systems to train CONTRACTOR personnel in proper selection and installation procedures. Manufacturer's representative shall observe to confirm the installer demonstrates proper installation procedures for adhesive anchors and adhesive material.

+ + END OF SECTION + +

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SECTION 05120

STRUCTURAL STEEL

PART 1 – GENERAL

1.1 SCOPE OF WORK

- A. Provide all labor, materials, equipment and services for furnishing and installing the structural steel as shown on the Drawings and specified herein.

1.2 RELATED WORK SPECIFIED ELSEWHERE

- A. Metal Fabrications: Section 05500
- B. Cast-In-Place Concrete: Section 03300

1.3 SUBMITTALS

- A. Complete shop and erection drawings shall be submitted for review. Shop drawings shall be submitted in accordance with Section 01340. All welds shall be indicated by standard welding symbols of the AWS.
- B. Templates shall be furnished, together with instructions for the setting of anchors, anchor bolts, and bearing plates. The Contractor shall ascertain that the items are properly set during the progress of the work.

1.4 APPLICABLE PUBLICATIONS

The current issue of the following publications form a part of this specification to the extent indicated by the reference thereto:

- A. American Institute of Steel Construction publications: (AISC):
 - 1. Code of Standard Practice for Steel Buildings and Bridges.
 - 2. Specification for the Design, Fabrication, and Erection of Structural Steel for Buildings.
 - 3. Manual of Steel Construction - Thirteenth Edition.
- B. American Welding Society Publication (AWS): Structural Welding Code, D1.1-82.
- C. Research Council on Riveted and Bolted Structural Joints (RCRBSJ) of the Engineering Foundation Publication: Specifications for Structural Joints Using ASTM A 325 or a 490 Bolts.

1.5 GENERAL REQUIREMENTS

- A. Except as otherwise specified hereinafter, the AISC Specification for the Design, Fabrication, and Erection of Structural Steel for Buildings shall govern the Work. Welding shall be in accordance with AWS Code D1.1. High-strength bolting shall be in accordance with RCRBSJ Specifications for structural joints using ASTM A 325 or A 490 Bolts.
- B. Design of members and connections for any portion of the structures not indicated on the Contract Drawings shall be completed by the fabricator and indicated on the shop drawings.
- C. Substitution of sections or modification of details, or both, and the reasons therefore shall be submitted with the shop drawings for review. Approved substitutions, modifications, and necessary changes in related portions of the work shall be coordinated by the Contractor and shall be accomplished at no additional cost to the Owner.
- D. Responsibility for Errors: The Contractor shall be responsible for all errors of detailing, fabrication, and for the correct fitting of the structural member.
- E. Storage of Materials: Materials shall be stored out of contact with the ground in such a manner and location which will minimize contamination and deterioration.

PART 2 – PRODUCTS

2.1 MATERIAL

- A. Material shall conform to the following:
 - 1. Wide Flange Shapes ASTM A992
 - 2. Steel Plates, Channels, S-shapes, and HP-shapes ASTM A36
 - 3. Rectangular or Round Hollow Structural Sections ASTM A500, Grade B
F_y = 42 KSI F_y = 42 ksi
 - 4. Steel Pipes F_y = 35 KSI ASTM A53, Grade B
F_y = 35 ksi
 - 5. Crane Rails ASTM A759
 - 6. Bolts ASTM A325
 - 7. Anchor Bolts ASTM F1554
 - 8. Rolled Steel Floor Plates ASTM A786
 - 9. Steel Castings ASTM A27, Grade 65-35
 - 10. Tension-control Twist-off type Bolt ASTM F1852

Assemblies

11. Hardened Steel Washers

ASTM F436

- B. Welding electrodes shall conform to requirements shown in Table 4.1.1 of AWS D1.1 and shall be E70XX or F7XEXXX.

PART 3 – EXECUTION

3.1 FABRICATION

- A. Structural material shall be fabricated and assembled in the shop to the greatest extent possible. Shearing, flame cuttings, and chipping shall be done carefully and accurately. Sheared and flame cut edges shall be finished smooth by grinding, chipping, or planing. The radii of re-entrant flame cut fillets shall be not less than one inch and as much larger as practicable. Sole plates of beams and girders shall have full contact with the flanges. Where shown or required, stiffeners shall be fitted neatly between the flanges of beams and girders and, where tight fits are required to transmit bearing, the ends of stiffeners shall be milled or ground to secure an even bearing against the flanges or shall be grooved and fully butt welded to the flanges. The corners of stiffener plates shall be cut to clear fillets of beams. The clearance between the ends of spliced web plates shall not exceed 1/4 inch. Assembled pieces shall be taken apart, if necessary, for the removal of burrs and shavings produced by the reaming operation. Structural steelwork shall be prepared for painting in accordance with the AISC specification and primed with paint materials hereinafter specified.
- B. Connections shall be as shown or, if connection details are not shown on the Drawings, the connections shall be designed for the reactions shown on the Drawings. Where connection details or reactions are not shown on the Drawings, the connections shall be designed for a shear equal to one-half of the allowable uniform load for simple beams, laterally supported, for the spans indicated, as tabulated in the AISC manual of steel construction, plus 5000 pounds. Connections shall be designed in accordance with the recommendations given in the AISC manual of steel construction, Thirteenth Edition. One-sided or other types of eccentric connections will be permitted only where shown on the Contract Drawings or accepted by the Engineer.
- C. Steel work to be encased in concrete, including surfaces of top flanges of members supporting concrete slabs shall, after fabrication, be cleaned of all oil or grease by solvent cleaners and, after erection, be cleaned of dirt and foreign material by thoroughly sweeping with a stiff fiber brush or other approved method.

3.2 ERECTION

- A. The erection of structural steel shall be in accordance with the applicable provisions of the AISC code of standard practice.
- B. Anchor bolts and anchors shall be properly located and built into connecting work. Bolts and anchors shall be preset by the use of templates or such other methods as may be required to locate the anchors and anchor bolts accurately.
- C. Column base and bearing plates shall be provided under all columns, and other members resting on walls or footings. Base and bearing plates may be attached or loose as noted on the shop drawings. Base plates and bearing plates shall be supported and aligned on steel wedges or shims. After the supported members have been plumbed and properly positioned and the anchor nuts tightened, the entire bearing area under the plate shall be filled solid with nonshrinking grout. Wedges and shims shall be cut off flush with edges of column base and bearing plates, and shall be left in place.
- D. Holes, except for turned and ribbed bolts, shall not be enlarged more than 1/16 inch greater than the specified hole size without the approval of the CCA.
- E. Lockwashers shall be provided under all A 307 nuts. Threading shall be excluded from the shear planes for all a 307 and a 325 bearing-type bolted connections.
- F. Driftpins may be used only to bring together the several parts and shall not be used in such manner as to distort or damage the metal.
- G. Gas Cutting: The use of a gas-cutting torch in the field for correcting fabrication errors will not be permitted on any major member in the structural framing. The use of gas-cutting torch will be permitted only on minor members, when the member is not under stress, and then only after the approval of the CCA has been obtained.

3.3 PAINTING

- A. All steel work shall be painted with one shop coat in accordance with Section 09900 "Painting", with the exception of the following:
 - 1. Steel work encased in concrete and contact surfaces of welded and/or bolted connections not conforming to Paragraph 3 (C) of RCRBSJ Specifications for Structural Joints Using ASTM A 325 or A 490 Bolts shall not be painted.
- B. After erection, a prime coat shall be applied to all bolts, connections, damaged spots and areas which have been omitted in shop painting. Field painting shall be in accordance with Section 09900 "Painting."

3.4 QUALITY CONTROL

- A. The Owner shall engage and pay for an independent testing and inspection agency to inspect high-strength bolted connections and welded connections and to perform tests and prepare test reports.
- B. Testing agency shall conduct and interpret tests, state in each report whether test specimens comply with requirements, and specifically state any deviation therefrom.
- C. Provide access for testing agency to places where structural steel work is being fabricated or produced so that required inspection and testing can be accomplished.
- D. Testing agency may inspect structural steel at plant before shipment.
- E. Correct deficiencies in structural steel work that inspections and laboratory test reports have indicated to be not in compliance with requirements. Perform additional tests, at Contractor's expense, as necessary to reconfirm any noncompliance or original work and to show compliance of corrected work.
- F. Bolted Connections: Inspect or test in accordance with AISC specifications.
- G. Welding: Inspect and test during fabrication of structural steel assemblies, as follows:
 - 1. Certify welders and conduct inspections and tests as required. Record types and locations of defects found in work. Record work required and performed to correct deficiencies.
 - 2. Perform tests of welds (Ultrasonic Inspection: ASTM E 164).

++ END OF SECTION ++

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SECTION 05312

METAL ROOF DECK

PART 1 - GENERAL

1.1 SCOPE OF WORK

- A. Provide all labor, materials, equipment and method of installation necessary for the construction of the metal roof deck, complete with all appurtenances.

1.2 RELATED WORK SPECIFIED ELSEWHERE

- A. Structural Steel: Section 05120

1.3 QUALITY ASSURANCE

- A. The following specifications and codes form a part of this section of these specifications.
 - 1. American welding Society (AWS):
Latest Structural Welding Code - Sheet Steel
 - 2. American Iron and Steel Institute (AISI), Specification for the Design of Cold- Formed Steel Structural Members, Latest Edition.
 - 3. American Society for Testing and Materials (ASTM), A 525-91b, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process.
 - 4. American Society for Testing and Materials (ASTM), A446/A446M-91 Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process, Structural (Physical) Quality.
 - 5. Steel Deck Institute (SDI), Latest Design Manual for Composite Decks, Form Decks, Roof Decks, and Cellular Metal Floor Deck with Electrical Distribution.
- B. Qualifications of Welding Work:
 - 1. Qualify welding processes and welding operators in accordance with AWS D1.3.
 - 2. Decking welded in place is subject to inspection and testing. Remove work found to be defective and provide new acceptable work.

1.4 PERFORMANCE REQUIREMENTS

- A. Compute the properties of metal roof deck section on the basis of the effective design width as limited by the provisions of the AISI Specifications. Provide not less than the metal deck section properties shown on the drawings, including section modulus and moment of inertia per foot of width.

1.5 SUBMITTALS

- A. General: Submit each item in this Article according to the Conditions of the Contract and Section 01332 of the Specification.
- B. Product Data: For information only, submit 2 copies of manufacturer's specifications and installation instructions for each product specified. Include manufacturer's notarized certification to show compliance with these specifications. Indicate by copy of transmittal form that a copy of each instruction has been distributed to the Installer.
- C. Shop Drawings: Submit detailed drawings showing plan layout of deck panels, anchorage details and every condition requiring closure panels, supplementary framing, special jointing or other accessories.

1.6 INSPECTION AND TESTING

- A. Inspections and tests shall be performed by the Owner's testing agency complying with ASTM E 329. All material to be furnished shall be subject to inspections and tests in the shop and field.
- B. Inspection and testing shall include deck placement, deck condition and welding.
- C. Reports of inspections and testing shall be made by the laboratory on a weekly basis.

1.7 JOB CONDITIONS

- A. Store metal deck units above the ground with one end elevated to provide drainage. Protect from elements with a waterproof covering, ventilated to avoid condensation. Maintain all materials free of dirt, grease, or other foreign matter and do not allow materials to corrode.
- B. Scheduling and Sequencing: Erection drawings and delivery of materials to job shall be in accord with project progress schedule, allowing time for the review process.
- C. Inspect job in accordance with provisions of other sections of these specifications for conditions which would prevent execution of this work as specified. Verify that deck supports, including supplementary supports required around openings, have been installed in locations indicated. Do not proceed until such conditions have been corrected.

PART 2 - PRODUCTS

2.1 METAL ROOF DECK

- A. Manufacture metal roof deck from galvanized steel sheets conforming to ASTM A446 and having a minimum yield strength of 33,000 pounds per square inch. Coating shall conform to ASTM A 525, G-60. Provide minimum physical

properties shown on the drawings. Decking shall be nesting or interlocking type at sides and furnished in lengths to cover at least 3 spans. All flashings and accessories shall conform to the above ASTM designation.

- B. Acceptable Manufacturers:
 - 1. Bowman Metal Deck
 - 2. Consolidated Systems, Inc.
 - 3. Epic Metals Corporation
 - 4. Marlyn Steel Products, Inc.
 - 5. Roof Deck, Inc.
 - 6. United Steel Deck, Inc.
 - 7. Vulcraft, Div. Nucor Corp.
 - 8. Wheeling Corrugating Co.
 - 9. Approved Equal

- C. Where the drawings indicate the roof structure to be part of an Underwriter's Laboratory's (UL) design number, provide deck units labeled and marked as required by UL.

2.2 METAL CLOSURE STRIPS

- A. Metal closure strips shall not be less than 20 gage galvanized sheet steel, and formed to the configuration required to provide tight fitting closures at open ends, sides and vertical interruptions.

2.3 ROOF SUMP PANS

- A. Fabricate from a single piece of not less than 14 gage galvanized sheet steel with level bottoms and sloping sides to direct water flow to the drain unless otherwise shown. Provide sump pans of adequate size (minimum 4 square feet) to receive roof drains and with bearing flanges not less than 3" wide. Recess pans not less than drain flange thickness below deck surface, unless otherwise shown or required by deck configuration. Holes for drains shall be cut in the field.

2.4 GALVANIZING REPAIR

- A. Galvanizing Repair shall use an approved stick repair compound of zinc rich galvanizing repair paint.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. General:
 - 1. Install metal deck units and accessories in accordance with manufacturer's recommendations and final shop drawings, and as specified herein. Place deck units on supporting steel framework and adjust to final position with ends bearing on supporting members and accurately aligned end to end before being permanently fastened. Provide not less than 1.5 inches end

bearing. Lap ends of roof decking not less than 2". Do not stretch or contract the side lap interlocks. Place deck units flat and square, secured to supporting framing without warp or excessive deflection. End laps shall occur over supports.

2. No ceiling, duct, piping or conduit larger than 3/4" diameter or metal stud work may be suspended directly from the metal roof deck. Provide supplementary support from beams or joists.
- B. Coordinate and cooperate with structural steel erector in locating decking bundles to prevent overloading structural members. Do not use deck units for storage or working platforms until permanently secured.
 - C. Roof deck units shall be welded or screwed to supports with side laps screwed. Screws shall be a minimum size 10.
 - D. Roof deck units shall be welded to supports with 5/8-inch diameter puddle weld or equivalent at all edge ribs and alternate interior ribs to provide a maximum average spacing of 12". Weld metal shall penetrate all layers of deck material at end laps and side joints and have good fusion to supporting members. Side lap fastenings shall be equally spaced between supports, as noted on drawings.
 - E. Cut and fit deck units and accessories around other work projecting through or adjacent to the roof decking as shown on the drawings. Provide neat, square and trim cut.

3.2 ROOF DECK ACCESSORIES

- A. Reinforcement - Provide additional metal reinforcement and closure pieces as required for strength, continuity of decking and support of other work, unless otherwise shown. Reinforce roof decking around openings less than 15" in any dimension by means of a flat galvanized steel sheet placed over the opening and fusion welded to the surface of the deck. Provide galvanized steel sheet of the same quality as the deck units, not less than 16 gage and at least 12" wider and longer than the opening. Provide welds at each corner and spaced not more than 12" o.c. along each side. All openings 15" in any dimension, and larger shall be supported by additional structural steel furnished and installed under Structural Steel Section 05120.
- B. Sump Pans shall be placed over openings provided in the roof decking and welded to the top decking surface. Space welds not more than 12" o.c. with at least one weld at each corner. Cut opening in bottom as part of drain installation.
- C. Insulation supports shall be provided where rib openings in the top surface of roof decking occur adjacent to edges and openings. weld closure strips into position.

3.3 PROTECTION

- A. All weld points and areas with damaged coating shall be wire brushed and given one application with a galvanizing repair stick.

3.4 INSPECTION

- A. After notice, the Owner's representative shall have an opportunity to inspect and pass upon the placement of the decking before insulation is placed thereon. Inspection of the roof deck shall include the roofing applicator.

++END OF SECTION++

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SECTION 05500

METAL FABRICATIONS

PART 1 - GENERAL

1.1 SCOPE OF WORK

- A. Provide all labor, materials, equipment and services for furnishing and installing the metal fabrications as shown on the Drawings and specified herein.
- B. Metal fabrications include items made from iron and steel shapes, plates, bars, strips, tubes, pipes and castings which are not a part of structural steel or other metal systems specified elsewhere.

1.2 RELATED WORK SPECIFIED ELSEWHERE

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

1.3 SUBMITTALS

Refer to Section 01340 for submittal requirements.

- A. Product Data: Submit manufacturer's specifications, anchor details and installation instructions for products used in miscellaneous metal fabrications, including paint products and grout.
- B. Shop Drawings: Submit shop drawings for fabrication and erection of miscellaneous metal fabrications. Include plans, elevations and details of sections and connections. Show anchorage and accessory items. Provide templates for anchor and bolt installation by others.

1.4 QUALITY ASSURANCE

- A. Pre-assemble items in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Ferrous Metals: For fabrication of miscellaneous metal work which will be exposed to view, use only materials which are smooth and free of surface blemishes including pitting, seam marks, roller marks, rolled trade names and roughness.
- B. Steel Plates, Shapes and Bars: ASTM A 992.
- C. Steel Tubing: Cold formed, ASTM A 500; or hot rolled, ASTM A 501.
- D. Structural Steel Sheet: Hot-rolled, ASTM A 570; or cold-rolled ASTM A 611, Class 1, of grade required for design loading.
- E. Steel Pipe: ASTM A 53; Type and grade (if applicable) as selected by fabricator and as required for design loading; black finish unless galvanizing is indicated; standard weight (schedule 40), unless otherwise indicated.
- F. Malleable Iron Castings: ASTM A 47, grade as selected by fabricator.
- G. Brackets, Flanges and Anchors: Cast or formed metal of the same type material and finish as supported rails, unless otherwise indicated.
- H. Grout: Non-Shrink Non-Metallic Grout, Pre-mixed, factory-packaged, non-staining, non-corrosive, non-gaseous grout complying with CE CRD-C621. Provide grout specifically recommended by manufacturer for interior and exterior applications of type specified in this Section.
- I. Fasteners:

General: Provide zinc-coated fasteners for exterior use or where built into exterior walls. Select fasteners for the type, grade and class required.

 - 1. Bolts and Nuts: Regular hexagon head type, ASTM A 307, Grade A.
 - 2. Lag Bolts: Square head type, FS FF-B-561.
 - 3. Machine Screws: Cadmium plated steel, FS FF-S-92.
 - 4. Wood Screws: Flat head carbon steel, FS FF-S-111.
 - 5. Plain Washers: Round, carbon steel, FS FF-W-92.
 - 6. Masonry Anchorage Devices: Expansion shields, FS FF-S-325.
 - 7. Toggle Bolts: Tumble-wing type, FS FF-B-588, type, class and style as required.
 - 8. Lock Washers: Helical spring type carbon steel, FS FF-W-84.
- J. Paint:
 - 1. Shop Primer for Ferrous Metal: Manufacturer's or Fabricator's standard, fast-curing, lead-free, "universal" primer; selected for good resistance to normal atmospheric corrosion, for compatibility with finish paint systems indicated and for capability to provide a sound foundation for field-applied topcoats prolonged exposure; complying with performance requirements of FS TT-P-645.

2. Galvanizing Repair Paint: High zinc dust content paint for regalvanizing welds in galvanized steel, complying with the Military Specifications MIL-P-21035 (Ships) or SSPC-Paint-20.

2.2 FABRICATION, GENERAL

- A. Workmanship: Use materials of size and thickness indicated or, if not indicated, as required to produce strength and durability in finished product for use intended. Work to dimensions indicated or accepted on shop drawings, using proven details of fabrication and support. Use type of materials indicated or specified for various components of work.
- B. Form exposed work true to line and level with accurate angles and surfaces and straight sharp edges. Ease exposed edges to a radius of approximately 1/32" unless otherwise indicated. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.
- C. Weld corners and seams continuously, complying with AWS recommendations. At exposed connections, grind exposed welds smooth and flush to match and blend with adjoining surfaces.
- D. Form exposed connection with hairline joints, flush and smooth, using concealed fasteners wherever possible. Use exposed fasteners of type indicated or, if not indicated, Phillips flat-head (countersunk) screws or bolts.
- E. Provide for anchorage of type indicated, coordinated with supporting structure. Fabricate and space anchoring devices to provide adequate support for intended use.
- F. Cut, reinforce, drill and tap miscellaneous metal work as indicated to receive finish hardware and similar items.
- G. Galvanizing: Provide a zinc coating for those items indicated or specified to be galvanized, and conform to ASTM A 153 requirements for galvanizing iron and steel hardware.
- H. Fabricate joints, which will be exposed to weather, in a manner to exclude water. Provide weep holes where water may accumulate.
- I. Shop Painting: Apply shop primer to surfaces of metal fabrications except those which are galvanized or as indicated to be embedded in concrete or masonry, unless otherwise indicated, and in compliance with requirements of SSPC-PAL "Paint Application Specification No. 1" for shop painting.
- J. Surface Preparation: Prepare ferrous metal surfaces to comply with minimum requirements indicated below for SSPC surface preparation specifications and environmental exposure conditions of installed metal fabrications:

1. Exteriors (SSPC Zone IB): SSPC-SP6 "Commercial Blast Cleaning".
2. Interiors (SSPC Zone 1A): SSPC-SP3 "Power Tool Cleaning".

2.3 ROUGH HARDWARE

- A. Furnish bent or otherwise custom fabricated bolts, plates, anchors, hangers, dowels and other miscellaneous steel and iron shapes as required for framing and supporting woodwork, and for anchoring or securing woodwork to concrete or other structures. Straight bolts and other stock rough hardware items are specified in Division-6 sections.
- B. Fabricate items to sizes, shapes and dimensions required. Furnish malleable-iron washers for heads and nuts which bear on wood structural connections; elsewhere, furnish steel washers.

2.4 STAIR SAFETY NOSINGS

- A. Step safety nosings shall be 4-inch wide, aluminum grit, crosshatched surface, complete with screws, nuts and wing anchors for anchoring to concrete, pre-drilled to admit anchor screws, Wooster WP4T Alumogrit as manufactured by Wooster Products Company, Wooster, Ohio; Style AXPf Nosing by SAFE-T-METAL Company; or equal. Nosings shall be furnished for all new interior concrete steps only.

2.5 GALVANIZED STEEL GRATING STAIR TREADS

- A. Provide hot-dip galvanized steel heavy-duty steel grating (1-1/2 inch x 1/8 inch bearing bars) for stair treads where metal stairs are shown on the Drawings.

2.6 LOOSE STEEL LINTELS

- A. Provide loose structural steel lintels for openings and recesses in masonry walls and partitions as shown. Weld adjoining members together to form a single unit where indicated. Provide not less than 6" bearing at each side of openings, unless otherwise indicated.

<u>Wall Width</u>	<u>Opening Range</u>	<u>Lintel</u>
4"	0'- 0" to 6'- 0"	L 4 x 4 x 5/16
	6'- 0" to 10'- 0"	-
8"	0'- 0" to 6'- 0"	Bond Beam w/ 2 #5
	6'- 0" to 10'- 0"	W 8 X 28 w/ Plate 1/4" x 7"
12"	0'- 0" to 6'- 0"	Bond Beam w/ 2#5
	6'- 0" to 10'- 0"	W 8 x 28 w/ Plate 5/16" x 11"
14"	0'- 0' to 6'- 0"	Plate 13' x 3/8" w/ 2 - 6" x 5/8" Plate Legs
	6'- 0" to 10'- 0"	W8 x 28 w/ Plate 5/16" x 13"

20"	0'- 0" to 6'- 0"	Plate 19" x 3/8" w/ 2 - 6" x 5/8" Plate Legs
	6'- 0" to 10'- 0"	W8 x 31 w/ Plate 5/16" x 17"

2.7 MISCELLANEOUS FRAMING AND SUPPORTS

- A. Provide miscellaneous steel framing and supports, which are not a part of structural steel framework, as required to complete work.
- B. Fabricate miscellaneous units to sizes, shapes and profiles indicated or, if not indicated, of required dimensions to receive adjacent other work to be retained by framing. Except as otherwise indicated, fabricate from structural steel shapes and plates and steel bars of welded construction using mitered joints for field connection. Cut, drill and tap units to receive hardware and similar items.
- C. Equip units with integrally welded anchors for casting into concrete or building into masonry. Furnish inserts if units must be installed after concrete is placed. Except as otherwise indicated, space anchors 24" O.C. and provide minimum anchor units of 1-1/4" x 1/4" x 8" steel straps.

2.8 SHELF ANGLES

- A. Provide structural steel shelf angles of sizes indicated for attachment to concrete framing. Provide slotted holes to receive 3/4" bolts, spaced not more than 6" from ends and not more than 24" O.C., unless otherwise indicated.

2.9 STRUCTURAL STEEL DOOR FRAMES FOR OVERHEAD DOORS

- A. Fabricate steel doorframes from structural shapes and bars of size and to dimensions indicated, fully welded together, with 5/8 inch x 1-1/2 inch steel bar stops, unless otherwise indicated. Plug-weld built-up members and continuously weld exposed joints. Secure removable stops to frame with countersunk machine screws, uniformly spaced at not more than ten (10) inches O.C., Reinforce frames and drill and tap as required to accept finish hardware.
- B. Provide steel strap anchors for securing doorframes into adjoining concrete or masonry, using 1/8 inch x 2 inch straps of the length required for a minimum 8 inch embedment, unless otherwise indicated. Weld anchors to frame jambs no more than 12 inches from both bottom and head of frame and space anchors not more than 30 inches apart.

2.10 ACCESS RUNGS

- A. Provide access rungs as shown on the Drawings. Conform to requirements of 29 CFR 1910 and ANSI A14.3.
- B. Products and Manufacturers: Provide one of the following:
 - a. R-1982-W, manufactured by Neenah Foundry Company.
 - b. Or equal.
- C. Vertical separation of steps shall be uniform at maximum of 12 inches on centers. Steps shall project evenly from wall.
- D. Material: Extruded aluminum.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Field Measurements: Take field measurements prior to preparation of shop drawings and fabrication, where possible. Do not delay job progress; allow for trimming and fitting where taking field measurements before fabrication might delay work.
- B. Coordinate and furnish anchorages, setting drawings, diagrams, templates, instructions, and directions for installation of anchorages, such as concrete inserts, sleeves, anchor bolts and miscellaneous items having integral anchors, which are to be embedded in concrete or masonry construction. Coordinate delivery of such items to project site.

3.2 INSTALLATION

- A. General Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing miscellaneous metal fabrications to in-place construction; including, threaded fasteners for concrete and masonry inserts, toggle bolts, through-bolts, lag bolts, wood screws and other connectors as required.
- B. Cutting, Fitting and Placement: Perform cutting, drilling and fitting required for installation of miscellaneous metal fabrications. Set work accurately in location, alignment and elevation, plumb, level, true and free of rack, measured from established lines and levels. Provide temporary bracing or anchors in form work for items which are to be built into concrete masonry or similar construction.

- C. Fit exposed connections accurately together to form tight hairline joints. Weld connections that are not to be left as exposed joints, but cannot be shop welded because of shipping size limitations. Grind exposed joints smooth and touch-up shop paint coat. Do not weld, cut or abrade the surfaces of exterior units, which have been hot-dip galvanized after fabrication, and are intended for bolted or screwed field connections.
- D. Field Welding: Comply with AWS Code for procedures of manual shielded metal-arc welding, appearance and quality of welds made, and methods used in correcting welding work.
- E. Bar Gratings: Comply with recommendations of NAAMM Metal Bar Grating Manual for installation of gratings, including installation clearances and standard anchoring details. Secure removable units to supporting members with type and size clips and fasteners indicated, or if not indicated as recommended by grating manufacturer for type of installation conditions shown. Secure non-removable units to supporting members by welding where both materials are the same, otherwise fasten by bolting as indicated above. Attach toe-plates to gratings by welding, at locations indicated.

3.3 ADJUSTING AND CLEANING

- A. Cleaning and touch-up painting of field welds, bolted connections and abraded areas of the shop paint on miscellaneous metal is specified in Division 9 of these Specifications.
- B. For galvanized surfaces: Clean field welds, bolted connections and abraded areas and apply galvanizing repair paint to comply with ASTM A 780.

++ END OF SECTION ++

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SECTION 05511
ALUMINUM LADDERS

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Fixed aluminum wall ladders.
- B. Fasteners and installation accessories.

1.2 RELATED SECTIONS

- A. Section 06100 - Rough Carpentry
- B. Section 08370- Access Hatches

1.3 REFERENCES

- A. ANSI A14.3 - American National Standard for Ladders -- Fixed -- Safety Requirements; 1992.
- B. ASTM B 210 - Standard Specification for Aluminum and Aluminum-Alloy Drawn Seamless Tubes; 2002.
- C. ASTM B 221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2000.
- D. ASTM B 308 - Standard Specification for Aluminum - Alloy T6061-T6 Standard Structural; 2002
- E. OSHA 29 CFR Standard 1910.27 - Fixed ladders; Occupational Safety and Health Standards; current edition

1.4 SUBMITTALS

- A. Submit under provisions of Section 01340.
- B. Product Data: Manufacturer's data sheets on each product to be used, including:
 - 1. Preparation instructions and recommendations.
 - 2. Storage and handling requirements and recommendations.
 - 3. Installation methods.

- C. Shop Drawings: Detailed drawings showing complete dimensions, all materials, mounting attachments, and fabrication details.
- D. At the time of submission, the Contractor shall in writing, call the Engineer's attention to any deviations that the Drawings may vary from the requirements of the Engineer's Specifications. Comply with the requirements of Section 01330.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in the engineering and manufacturing of metal ladders, with not less than twenty years of experience.

1.6 WARRANTY

- A. See Section 01782 - Closeout Submittals, for additional warranty requirements.
- B. Provide manufacturer's standard limited five-year warranty against defects in materials and workmanship.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Acceptable Manufacturers: Subject to compliance with requirements, provide products of one of the following:
 - 1. Alaco Ladder Co.
 - 2. ACL Industries, Inc.
 - 3. Jomy Products, Inc.
 - 4. O'Keeffe's, Inc.
- B. Requests for substitutions will be considered in accordance with provisions of Section 01631.

2.2 MATERIALS

- A. Extruded Aluminum Profiles: ASTM B 221, ASTM B 210, ASTM B 308, Alloy 6061-T6; standard mill finish.
- B. Aluminum Sheet and Plate: ASTM B 209, Alloy 6061-T6; standard mill finish.
- C. Fasteners: Aluminum solid aircraft rivets rated at 300 lbs shear strength.

D. Cast fittings, connectors and rung ends: Cast Aluminum alloy 356.

2.3 LADDERS

- A. Ladders - General: Comply with ANSI A14.3 and OSHA regulations.
- B. Fixed Wall Ladders: Extruded aluminum; serrated rungs 1-1/8 inches (29 mm) in diameter, connected to 2-7/8 inch (73 mm) side rail channels with cast aluminum rung connectors, each secured to rails by means of four solid aircraft rivets.
 - 1. Capacity: 500 lbs (225 kg).
 - 2. 24" Wide.

2.4 FINISHES

- A. Provide all aluminum in standard mill finish.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Do not begin installation until substrates have been properly prepared.

3.2 INSTALLATION

- A. Install in accordance with manufacturer's instructions and approved shop drawings, and in compliance with ANSI A14.3 and OSHA 1910.27.

3.3 PROTECTION

- A. Protect installed products until completion of project.
- B. Touch-up, repair or replace damaged products before Substantial Completion.

++ END OF SECTION ++

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SECTION 05520

HANDRAILS AND RAILINGS

PART 1 - GENERAL

1.1 DESCRIPTION

A. Scope:

1. Extent and dimensions of handrails and railings are indicated on Drawings and include miscellaneous handrails and railing systems not included in other Sections of these Specifications.
2. Type of handrails and railing systems in this Section is aluminum pipe handrails and railing systems, and galvanized steel handrails and railing systems.
3. Products furnished but not installed under this Section include inserts and anchors preset in masonry and concrete for anchorage of hand rails and railing systems.

B. Coordination:

1. Review installation procedures under other sections and coordinate the installation of items that must be installed with, or before, the Handrail and Railing.

C. Related Sections:

1. Section 05500, Metal Fabrications.
2. Section 05120, Structural Steel.

1.2 REFERENCES

A. Standards referenced in this Section are:

1. ASTM E985-railings.

1.3 QUALITY ASSURANCE

A. Single Source Responsibility: Obtain handrails and railing systems of each type and material from a single manufacturer.

B. Design Responsibility: Engage a qualified professional engineer to prepare or supervise the preparation of structural computations for handrails and railing systems to determine compliance with structural performance requirements indicated.

1.4 SUBMITTALS

- A. Product Data:
 - 1. Manufacturer's technical data for products and processes used in handrails and railing systems, including finishes and grout.
- B. Shop Drawings:
 - 1. Shop details of fabrication and installation for each type and material of handrail and railing system required including plans, elevations, sections, profiles of rails, fittings, connections, and anchors.
- C. Samples:
 - 1. Prepare samples of each type of metal finish required on metal of same thickness and alloy indicated for final work. Where finish involves normal color and texture variations, include sample sets composed of two (2) or more units showing limits of such variations expected in completed work. Include 6" long samples of each distinctly different railing member including handrails, top rails, posts, and samples of fittings and brackets.
- D. Submission:
 - 1. At the time of submission, the Contractor shall in writing, call the Engineer's attention to any deviations that the Drawings may vary from the requirements of the Engineer's Specifications. Comply with the requirements of Section 01330.

1.5 DELIVERY, STORAGE AND HANDLING

- A. Store handrails and railing systems in clean, dry location, away from uncured concrete and masonry, protected against damage of any kind. Cover with waterproof paper, tarpaulin, or polyethylene sheeting; allow for air circulation inside the covering.

1.6 WARRANTY

- A. General Warranty:
 - 1. The guaranty period shall be set forth in specification Section 00710, "General Conditions". In the event that the manufacturers guarantee period exceeds that as stated in the General Conditions, the manufacturers guarantee period will stay in effect and shall not be replaced by the previously stated.

PART 2 - PRODUCTS

2.1 SYSTEM PERFORMANCE

- A. Structural Performance of Handrails and Railing Systems: Design, engineer, fabricate, and install handrails and railing systems to withstand the following structural loads without exceeding the allowable design working stress of the materials for handrails, railing systems, anchors, and connections. Apply each load to produce the maximum stress in each of the respective components comprising handrails and railing systems.
1. Top Rail of Guardrail Systems: Concentrated load of 200 lbf (890 N) applied at any point and in any direction and a uniform load of 50 lbf per linear foot (730 N/m) applied horizontally and concurrently with a uniform load of 100 lbf per linear foot (1460 N/m) applied vertically downward. Concentrated and uniform loads need not be assumed to act concurrently.
 2. Handrails Not Serving as Top Rails: Concentrated load of 200 lbf (890 N) applied at any point and in any direction and a uniform load of 50 lbf per linear foot (730 N/m) applied in any direction. Concentrated and uniform loads need not be assumed to act concurrently.
 3. Infill Area of Guardrail Systems: Horizontal concentrated load of 200 lbf (890 N) applied to 1 sq. ft. (0.09 sq. m) at any point in the system including gates, panels, intermediate rails, balusters, or other elements composing the infill area. Loads on infill area need not be assumed to act concurrently with loads on top rails.
- B. Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.
- C. Material for rails and gates shall be a minimum of 1-1/2" diameter Schedule 40 and for posts, a minimum of Schedule 80.

2.2 MANUFACTURERS

- A. Aluminum:
1. Manufacturer: Provide product of one of the following:
 - a. Tufrail CS Manufactured by Thompson Fabricating Company, Inc., Birmingham, Alabama.
 - b. Superior Railing Company
 - c. Alumaguard
 - d. Approved Equal
- B. Hot Dip Galvanized Steel:
1. Manufacturer: Provide product of one of the following:
 - a. Thompson Fabricating Company, Inc., Birmingham, Alabama.
 - b. Approved Equal.

2.3 DETAILS OF CONSTRUCTION

- A. General: Comply with standards indicated for forms and types of metals indicated or required for handrail and railing system components.

- B. Aluminum: Provide alloy and temper recommended by aluminum producer or finisher for type of use and finish indicated, and with not less than the strength and durability properties of the alloy and temper designated below for each aluminum form required.
 - 1. Extruded Bar and Shapes: ASTM B 221, 6063-T6.
 - 2. Extruded Pipe and Tube: ASTM B 429, 6063-T6.
 - 3. Plate and Sheet: ASTM B 209, 6061-T6.
 - 4. Die and Hand Forgings: ASTM B 247, 6061-T6.
 - 5. Castings: ASTM B 26, 356-T6.

- C. Hot Dip Galvanized Steel:
 - 1. Structural grade steel pipe will be acceptable.

- D. Miscellaneous Materials:
 - 1. Nonshrink Nonmetallic Grout: Pre-mixed, factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with CE CRD C621. Provide grout specifically recommended by manufacturer for interior and exterior applications of type specified in this Section.
 - 2. Welding Electrodes and Filler Metal: Provide type and alloy of filler metal and electrodes as recommended by producer of metal to be welded, complying with applicable AWS Specifications, and as required for color match, strength, and compatibility in fabricated items.
 - 3. Fasteners: Use fasteners of stainless steel for aluminum components, unless otherwise indicated. Do not use metals which are corrosive or incompatible with materials joined.
 - 4. Provide concealed fasteners for interconnection of handrail and railing components and for their attachment to other work except where exposed fasteners are unavoidable or are the standard fastening method for handrail and railing system indicated.
 - 5. Provide Phillips flat-head machine screws for exposed fasteners, unless otherwise indicated.
 - 6. Anchors and Inserts: Provide anchors of type, size, and material required for type of loading and installation condition shown, as recommended by manufacturer, unless otherwise indicated. Use nonferrous metal of hot-dipped galvanized anchors and inserts for exterior locations and elsewhere as required for corrosion resistance. Anchors shall be designed in accordance with KBC and ACI 318 Appendix D. The anchors shall be tested in accordance with ICC and have an up to date ESR. Use toothed steel or expansion bolt devices for drilled-in-place anchors.

7. Galvanizing Repair Paint: High zinc dust content paint for regalvanizing welds in galvanized steel: Sherwin-Williams Zinc-Clad Galvanizing Compound #143-0255 or equal.
8. Bituminous Paint: SSPC-Paint 12 (cold-applied asphalt mastic).
9. Zinc Chromate Primer for Galvanized Metals: Sherwin-Williams Galvite, B50W3 or equal; for Ferrous Metals: Sherwin-Williams KemKromik Universal, B50Z Series or equal.

E. Fabrication:

1. General: Fabricate handrails and railing systems to design, dimensions and details shown. Provide handrail and railing members in sizes and profiles indicated, with supporting posts and brackets of size and spacing shown, but not less than required to comply with requirements indicated for structural performance. Handrail systems which use fittings which are glued or pop-riveted will not be acceptable.
2. Shop Assembly: Pre-assemble items in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.
3. Nonwelded Connections: Fabricate railing systems and handrails for interconnection of members by means of railing manufacturer's standard concealed mechanical fasteners and fittings unless otherwise indicated. Fabricate members and fittings to produce flush, smooth, rigid, hairline joints.
4. Welded Connections for Aluminum Pipe: Fabricate aluminum pipe handrails and railing systems for interconnection of members by concealed internal welds, which eliminate surface grinding, using manufacturer's standard system of sleeve and socket fittings.
5. Form changes in direction of railing members by bending members, insertion of prefabricated elbow fittings, radius bends, or by mitering.
6. For handrails and railing systems with nonwelded connections which are exposed to exterior or to moisture from condensation or other sources, provide weepholes or other means for evacuation of entrapped water in hollow sections of railing members.
7. Toe Boards: Where required by O.S.H.A. and where indicated on the Drawings, provide toe boards at railing systems around openings and at edge of open-sided floors and platforms. Fabricate to dimensions and details shown or, if not shown, use manufacturer's standard detail. Toe boards shall be 4" high.
8. Brackets, Flanges, Fittings and Anchors: Provide manufacturer's standard wall brackets, flanges, hinges, miscellaneous fittings and anchors for interconnection of handrail and railing members to other work, unless otherwise indicated.
9. Furnish inserts and other anchorage devices for connecting handrails and railing systems to concrete or masonry work. Fabricate anchorage devices

which are capable of withstanding loadings imposed by handrails and railing systems. Coordinate anchorage devices with supporting structure.

10. For railing posts set in concrete provide preset sleeves of steel, not less than 6" long and inside dimensions not less than 2" greater than outside dimensions of post, with steel plate forming bottom closure.
11. Provide slip-fit metal sockets to receive removable railing posts. Fabricate sockets for a close fit with posts and to limit deflection of post without lateral load, measured at top, not to exceed 1/12 of post height. Design and fabricate socket covers to resist accidental dislodgement.
12. Gates: Provide gates of equal structural properties of railing system, with toe board. Hinges shall be capable of providing a swing of 180 degrees. Provide positive latching device which shall be operable from both sides of gate.

F. Metal Finishes, General:

- 1.. Comply with NAAMM "Metal Finishes Manual" for recommendations and designations of finishes, except as otherwise indicated.
2. Class I Clear Anodized Finish: AA-M10C22A41 (medium satin directional textured mechanical finish; chemical etch, medium matte; 0.7 mil min. thick clear anodic coating) complying with AAMA 607.1.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Coordinate setting drawings, diagrams, templates, instructions, and directions for installation of anchorages, such as sleeves, concrete inserts, anchor bolts, and miscellaneous items having integral anchors, which are to be embedded in concrete as masonry construction. Coordinate delivery of such items to project site.
- B. Field Measurements:
 1. Take field measurements prior to fabrication.

3.2 INSTALLATION, GENERAL

- A. General:
 1. Fit exposed connections accurately together to form tight, hairline joints.
 2. Perform cutting, drilling, and fitting required for installation of handrails and railing systems. Set work accurately in location, alignment, and elevation, plumb, level, true, and free of rack, measured from established lines and levels. Do not weld, cut or abrade surfaces of handrails and railing components which have been coated or finished after fabrication, and are intended for field connection by mechanical means without further cutting or fitting.

3. Field Welding: Comply with applicable AWS Specification for procedures of manual shielded metal-arc welding, for appearance and quality, of welds made, and for methods used in correcting welding work. Weld connections which are not to be left as exposed joints, but cannot be shop welded because of shipping size limitations. Grind exposed welded joints smooth and restore finish to match finish of adjacent rail surfaces.
 4. Corrosion Protection: Coat concealed surfaces of aluminum, which will be in contact with grout, concrete, masonry, wood, or dissimilar metals, with a heavy coat of bituminous paint or zinc chromate primer.
 5. Adjust handrails and railing systems prior to anchoring to ensure matching alignment at abutting joints. Space posts at 5'-0" o.c. MAX but not more than that required by design loadings.
- B. Anchoring Posts:
1. Anchor aluminum handrail posts to concrete with manufacturer's base flange assembly (3 anchors per base) for top and side mount brackets recommended for meeting the design criteria. Base flanges and side mount brackets will not be welded to the post but will be mechanically fastened so as to achieve a rigid construction without annealing the post. All connections to concrete will be made using stainless steel wedge anchors, which are to be sized and furnished by the handrail manufacturer as an integral part of their handrail system. Anchor post on new concrete shall be side mounted except where shown otherwise on the drawings.
 2. Anchor posts to metal surfaces with manufacturer's standard fittings designed for this purpose unless otherwise indicated.
 3. Provide removable railing sections as indicated, using slip-fit metal sockets. Accurately locate sockets to match post spacing.
- C. Railing Connections
1. Nonwelded Connections: Use manufacturer's standard mechanical joints for permanently connecting railing components. Components that are glued or pop riveted at the joints will not be acceptable. All components must be mechanically fastened with stainless steel hardware. Use wood blocks and padding to prevent damage to railing members and fittings. Seal recessed holes of exposed locking screws using plastic filler cement colored to match finish of handrails and railing systems.
 2. Welded Connections: Use fully welded joints for permanently connecting railing components by welding. Cope or butt components to provide 100 percent contact or use manufacturer's standard fittings designed for this purpose.
- D. Anchoring Railing Ends
1. Anchor railing ends into concrete or masonry with manufacturer's standard fittings designed for this purpose, unless otherwise indicated.
 2. Anchor railing ends to metal surfaces with manufacturer's standard fittings using concealed fasteners, unless otherwise indicated.

3. Expansion Joints: Provide expansion joints at locations indicated or, if not indicated, at intervals not to exceed 40 feet. Provide slip-joint internal sleeve extending 2" beyond joint on either side; fasten internal sleeve securely to one side, locate joint within 6" of post.
- E. Attachment of Handrails To Walls:
1. General: Secure handrails to walls with manufacturer's standard wall brackets and end fittings, unless otherwise indicated.
 2. For concrete and solid masonry, use drilled-in expansion shields and concealed hanger bolts, unless otherwise indicated.
 3. For hollow masonry anchorage, use toggle bolts with square heads, unless otherwise indicated.
- F. Protection
1. Protect finishes of railing systems and handrails from damage during construction period by use of temporary protective coverings approved by railing manufacturer. Remove protective covering at time of Substantial Completion.
 2. Restore finishes damaged during installation and construction period so that no evidence remains of correction work. Return items which cannot be refinished in the field to the shop; make required alterations and refinish entire unit, or provide new units as required.

++ END OF SECTION ++

SECTION 05530

GRATING

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Scope:
 - 1. Provide all labor, materials, equipment and services required to furnish and install metal bar grating in accordance with the Drawings and specified herein.
- B. Coordination:
 - 1. Review installation procedures under other Sections and coordinate the installation of items that must be installed with, or before, the Grating.
- C. Related Sections:
 - 1. Section 05500, Metal Fabrications.

1.2 REFERENCES

- A. Design, fabrication and installation of grating shall be in accordance with Standard Specifications and Voluntary Code of Practice in Metal Bar Grating Manual, 1979 Edition, published by National Association of Architectural Metal Manufacturers, Chicago, Illinois (ANSI A 202.1).

1.3 SUBMITTALS

- A. Shop Drawings:
 - 1. Submit shop drawings to the Engineer for review before fabrication.
 - 2. Indicate areas to receive grating, grating details and dimensions, and material specifications.
 - 3. Show anchorage details and locations.
 - 4. Indicate coordination with equipment suppliers where openings for such equipment are required.
- B. At the time of submission, the Contractor shall in writing, call the Engineer's attention to any deviations that the Drawings may vary from the requirements of the Engineer's Specifications. Comply with the requirements of Section 01330.

1.4 WARRANTY

- A. General Warranty:

1. The guaranty period shall be set forth in specification Section 00710, "General Conditions". In the event that the manufacturers guarantee period exceeds that as stated in the General Conditions, the manufacturers guarantee period will stay in effect and shall not be replaced by the previously stated.

PART 2 - PRODUCTS

2.1 SYSTEM PERFORMANCE

A. Performance Criteria:

1. Support uniform live load of 100 psf.
2. Deflection not to exceed span of bearing bars (in inches) divided by 360.
3. Maximum fiber stress: 12,000 psi.

B. Design Criteria:

1. Shape
 - a. Rectangular.
2. Type Construction
 - a. Pressure locked.
3. Bar Sizes, unless otherwise shown on the Drawings:
 - a. Bearing Bars: 1-1/2" x 3/16".
 - b. Cross Bars: 1" x 1/8".
4. Maximum Bar Spacing:
 - a. Bearing Bars: 1-3/16" c-c.
 - b. Cross Bars: 4" c-c.
5. Banding Bars:
 - a. Same thickness as bearing bars to which they are attached.
 - b. At free ends: Same depth as bearing bars.
 - c. At supported ends: 1/8" less in depth than bearing bars.
6. Bearing and crossbars shall be flush at surface.
7. All free and supported bar ends around perimeter and around cutouts shall be banded.
8. Provide removable sections of grating with suitable end bearing where noted on the Drawings or otherwise required.

2.2 MATERIALS

A. Aluminum Grating:

1. Bearing Bars: ASTM B 221, 6061-T6 or 6063-T6, aluminum.
2. Cross Bars: ASTM B 221 (extruded) or ASTM B 210 (drawn) aluminum.
3. All steel fasteners used with aluminum grating shall be galvanized.
4. Finish: Aluminum mill finish (as fabricated).
5. Anchors: Saddle clips of manufacturer's standard design, galvanized.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Aluminum Grating:

1. Grating shall be fabricated as indicated by shop drawings which have been revised to reflect actual field measurements.
2. Grating shall be set with full and uniform end bearing to preclude rocking; do not use wedges or shims.
3. Provide 1-inch minimum bearing with maximum erection clearance of 1/4-inch all around.
4. Anchor grating with saddle clips in accordance with manufacturer's recommendations or as detailed on the Drawings.
5. Provide cutouts for the passage of pipe, valve and equipment operators, conduit, stems and similar work; cutouts for circular obstructions shall be at least 2" larger in diameter than the obstruction.
6. Protect all surfaces of angles and frames to be in contact with concrete or dissimilar metals with two (2) coats of Fed. Spec. TT-V-51F Asphalt Varnish.

++ END OF SECTION ++

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SECTION 05531

HOT DIP GALVANIZED STEEL

PART 1 - GENERAL

1.1 DESCRIPTION

A. Scope:

1. Furnish all labor, materials, equipment and incidentals necessary to install the hot dip galvanized steel grating, stair treads, handrail, ladders and structurals as shown on the drawings and as specified herein.

B. Coordination:

1. Review installation procedures under other Sections and coordinate the installation of items that must be installed with, or before, the Hot Dip Galvanized Steel.

1.2 QUALITY ASSURANCE

A. Qualifications:

1. The material covered by these specifications shall be furnished by a reputable and qualified manufacturer of proven ability who has regularly engaged in the manufacture and installation of Hot Dip Galvanized Steel systems.
2. Firm experienced in successfully producing Hot Dip Galvanized Steel fabrications similar to that indicated for this project, with sufficient production capacity to produce required units without causing delay in the work.

B. General:

1. Substitution of any component or modification of system shall be made only when approved by the Engineer.
2. In addition to requirements of these specifications, comply with manufacturer's instructions and recommendations for work.

1.3 SUBMITTALS

A. Samples:

1. Samples of each type of grating proposed shall be submitted for approval prior to placement of purchase orders.

- B. Shop Drawings:
1. Shop drawings of all Hot Dip Galvanized Steel structural members, handrails, gratings, plate, ladders and appurtenances shall be submitted to the Engineer for approval in accordance with the requirements of Section 01330, Submittal Procedures.
 2. Manufacturer's catalog data showing:
 - a. Dimensions, spacings, and construction of grating.
 - b. Design tables showing limits for span length and deflection under various uniform and concentrated loads.
 - c. Materials of construction.
 3. Detail shop drawings showing:
 - a. Dimensions of grating, ladders, handrail, and structural members.
 - b. Sectional assembly.
 - c. Location and identification mark.
 - d. Size and type of supporting frames required.
 - e. Anchorage and accessory items.
- D. Samples of each type of grating proposed shall be submitted for approval prior to placement of purchase orders.
- E. At the time of submission, the Contractor shall in writing, call the Engineer's attention to any deviations that the Drawings may vary from the requirements of the Engineer's Specifications. Comply with the requirements of Section 01330.

1.4 DELIVERY, STORAGE AND HANDLING

- A. Packing:
1. All systems, sub-systems and structures shall be shop fabricated and assembled into the largest practical size suitable for transporting.
 2. Identify and match-mark all materials, items, and fabrications for installation and field assembly.
- B. Storage and Protection:
1. All materials and equipment necessary for the fabrication and installation of the grating, plate, handrails, stair treads, and structural shapes shall be stored before, during, and after shipment in a manner to prevent damage of any kind to the materials or equipment. Any material which, in the opinion of the Engineer, has become damaged as to be unfit for use shall be promptly removed from the site of work, and the Contractor shall receive no compensation for the damaged material or its removal.

1.5 WARRANTY

- A. General Warranty:
1. The guaranty period shall be set forth in specification Section 00710,

“General Conditions”. In the event that the manufacturers guarantee period exceeds that as stated in the General Conditions, the manufacturers guarantee period will stay in effect and shall not be replaced by the previously stated.

PART 2 – PRODUCTS

2.1 SYSTEM PERFORMANCE

A. System Performance Criteria:

1. Structural Performance:

a. Design, engineer, fabricate, and install the following Hot Dip Galvanized Steel fabrications to withstand the following structural loads without exceeding the allowable design working stress of the materials involved, including anchors and connections. Apply each load to produce the maximum stress in each respective component of each Hot Dip Galvanized fabrication.

2. Stair Tread Performance:

a. Capable of withstanding a uniform load of 100 lbs per sq. ft. or a concentrated load of 300 lbs on an area of 4 sq. inches located in the center of the tread, whichever produces the greater stress.

3. Platforming And Stair Platform Performance:

a. Capable of withstanding a uniform load of 100 lbs per sq. ft.

4. Handrails Systems Performance:

a. Capable of withstanding a concentrated load of 200 lbs applied at any point noncurrently, vertically downward, or horizontally.

B. Design Criteria:

1. The design of Hot Dip Galvanized Steel products including connections shall be in accordance with governing building codes and standards as applicable.

2. Design of Hot Dip Galvanized live loads on grating shall not be less than 100 pounds per sq. ft. Grating deflection at the center of a simple span not to exceed 0.25 inch. Deflection in any direction shall not be more than L/180 of span for structural members. Connections shall be designed to transfer the above loads.

2.2 MANUFACTURERS

A. Manufacturers: Provide product of one of the following:

1. Thompson Fabricating Company, Inc., Birmingham, Alabama.
2. Approved equal.

PART 3 - EXECUTION

3.1 INSPECTION

A. Hot Dip Galvanized Steel

1. The Engineer shall have the right to inspect and test all materials to be furnished under these specifications prior to their shipment from the point of manufacture.
2. All labor, power, materials, equipment, and appurtenances required for testing shall be furnished by the Contractor at no cost to the Owner.

3.2 INSTALLATION

A. General

1. Install items specified as indicated and in accordance with manufacturer's instructions.

++ END OF SECTION ++

SECTION 05533

HEAVY DUTY STEEL GRATING

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Scope:
 - 1. Provide all labor, materials, equipment and services required to furnish and install metal bar grating in accordance with the Drawings and specified herein.
- B. Coordination:
 - 1. Review installation procedures under other Sections and coordinate the installation of items that must be installed with, or before, the Heavy Duty Steel Grating.
- C. Related Sections:
 - 1. Section 05500, Metal Fabrications.

1.2 REFERENCES

- A. Design, fabrication and installation of grating shall be in accordance with Standard Specifications and Voluntary Code of Practice in Metal Bar Grating Manual, 1979 Edition, published by National Association of Architectural Metal Manufacturers, Chicago, Illinois (ANSI A 202.1).

1.3 SUBMITTALS

- A. Shop Drawings:
 - 1. Submit shop drawings to the Engineer for review before fabrication.
 - 2. Indicate areas to receive grating, grating details and dimensions, and material specifications.
 - 3. Show anchorage details and locations.
 - 4. Indicate coordination with equipment suppliers where openings for such equipment are required.
 - 5. At the time of submission, the contractor shall in writing, call the Engineer's attention to any deviations that the Drawings may vary from the requirements of the Engineer's Specifications. Comply with the requirements of Section 01330.

1.4 WARRANTY

- A. General Warranty:

1. The guaranty period shall be set forth in specification Section 00710, "General Conditions". In the event that the manufacturers guarantee period exceeds that as stated in the General Conditions, the manufacturers guarantee period will stay in effect and shall not be replaced by the previously stated.

PART 2 - PRODUCTS

2.1 SYSTEM PERFORMANCE

- A. Performance Criteria:
 1. Support airport loading conditions.
- B. Design Criteria:
 1. Shape
 - a. Rectangular.
 2. Bearing and crossbars shall be flush at surface.
 3. All free and supported bar ends around perimeter and around cutouts shall be banded.
 4. Provide removable sections of grating with suitable end bearing where noted on the Drawings or otherwise required.

2.2 MANUFACTURERS

- A. Manufacturer and Product, Provide the following:
 1. R-4990-FX, Neenah Foundry.
 2. Approved Equal.

2.3 MATERIALS

- A. Heavy Duty Steel Grating:
 1. Shall be manufactured of Cast Gray Iron ASTM A-48, Class 35 B.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Heavy Duty Steel Grating:
 1. Shall be installed per manufacturer's instructions.

++ END OF SECTION ++

SECTION 05542

FLOOR ACCESS HATCH COVERS

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Scope:
 - 1. Provide all labor, materials, equipment, and service required for the complete installation of the access hatches as specified herein and shown on the Drawings.
- B. Coordination:
 - 1. Review installation procedures under other Sections and coordinate the installation of items that must be installed with, or before, the Floor Access Hatch Covers.
- C. Related Sections:
 - 1. Section 03300, Cast-in-Place Concrete.

1.2 SUBMITTALS

- A. Shop Drawings:
 - 1. Submit product literature material specifications, dimension prints, and installation recommendations for Engineer review.
 - 2. At the time of submission, the contractor shall in writing, call the Engineer's attention to any deviations that the drawings may vary from the requirements of the Engineer's specifications. Comply with the requirements of Section 01330.

1.3 WARRANTY

- A. General Warranty:
 - 1. The guaranty period shall be set forth in specification Section 00710, "General Conditions". In the event that the manufacturers guarantee period exceeds that as stated in the General Conditions, the manufacturers guarantee period will stay in effect and shall not be replaced by the previously stated.

PART 2 - PRODUCTS

2.1 SYSTEM PERFORMANCE

A. System Description:

1. Access hatch for equalization basin P.T. building.
 - a. Access hatch shall be double leaf or single leaf, as indicated on the Contract Drawings or by the Engineer, aluminum, gutter type, watertight, exterior, flush floor hatch design. Door leaves shall be 1/4 inch aluminum diamond pattern plate to withstand a live load of 300 pounds per sq. ft. Channel frames shall be 1/4 inches aluminum with an anchor flange around the perimeter. Provide 1-1/2 inch female NPT threaded aluminum drainage coupling welded under frame at right front corner for connection of drain pipe.
 - b. Door shall be equipped with 316 stainless steel hinges, a lockable hasp for use with a padlock, stainless steel pins, spring operator for easy operation and an automatic hold-open arm with release handle. Provide inside stainless steel snap locks with removable wrench lift handle outside. Furnish threaded aluminum plug to seal lock aperture. Hardware shall be cadmium plated.
 - c. Doors and frames shall be mill finish with bituminous coating applied to the exterior of the frame. Hatches shall have an odor resistant gasket.
 - d. Size of hatch shall be 3'-6" by 3'-6".
2. Access hatch for GAC wet well.
 - a. Access hatch shall be double leaf or single leaf, as indicated on the Contract Drawings or by the Engineer, aluminum, gutter type, watertight, exterior, flush floor hatch design. Door leaves shall be 1/4 inch aluminum diamond pattern plate to withstand a live load of 300 pounds per sq. ft. Channel frames shall be 1/4 inches aluminum with an anchor flange around the perimeter. Provide 1-1/2 inch female NPT threaded aluminum drainage coupling welded under frame at right front corner for connection of drain pipe.
 - b. Door shall be equipped with 316 stainless steel hinges, a lockable hasp for use with a padlock, stainless steel pins, spring operator for easy operation and an automatic hold-open arm with release handle. Provide inside stainless steel snap locks with removable wrench lift handle outside. Furnish threaded aluminum plug to seal lock aperture. Hardware shall be cadmium plated.
 - c. Doors and frames shall be mill finish with bituminous coating applied to the exterior of the frame. Hatches shall have an odor resistant gasket.
 - d. Size of hatch shall be 3'-0" by 3'-0".
3. Access hatch for GAC roof access.
 - a. Access hatch shall be double leaf or single leaf, as indicated on the Contract Drawings or by the Engineer, aluminum, gutter type, watertight, exterior, flush floor hatch design. Door leaves shall be 1/4 inch aluminum diamond pattern plate to withstand a live load of 300 pounds per sq. ft. Channel frames shall be 1/4 inches aluminum with an anchor flange around the perimeter. Provide 1-1/2 inch female

- NPT threaded aluminum drainage coupling welded under frame at right front corner for connection of drain pipe.
- b. Door shall be equipped with 316 stainless steel hinges, a lockable hasp for use with a padlock, stainless steel pins, spring operator for easy operation and an automatic hold-open arm with release handle. Provide inside stainless steel snap locks with removable wrench lift handle outside. Furnish threaded aluminum plug to seal lock aperture. Hardware shall be cadmium plated.
 - c. Doors and frames shall be mill finish with bituminous coating applied to the exterior of the frame. Hatches shall have an odor resistant gasket.
 - d. Size of hatch shall be 3'-0" by 2'-6".
4. Access hatch for truck isle:
- a. Door leaf (leaves) shall be ½-inch thick ASTM 36 structural steel diamond plate reinforced with ASTM A572 or A588 structural steel. Hatches with reinforcing rib spans up to 24-inches shall be designed to carry a maximum load of 280 psi uniformly distributed over the entire cover. For hatches with rib spans over 24-inches, the load capacity decreases linearly 25 psi per feet. The frame shall be 3/8-inch thick material with ¼" x 2" anchor straps welded to the frame for casting concrete.
 - b. The floor access door shall be equipped with a flush steel lifting handle that does not protrude above the cover, and steel automatic hold open arms and door stops to automatically keep the cover in its upright position. The door shall have stainless steel hinges with stainless steel tamper resistant bolts/locknuts. The cover shall be bolted to the frame with ¾-inch diameter stainless steel bolts for security as well as to prevent the cover from rattling. The door shall be equipped with stainless steel compression springs to assist in the opening of the door and reduce the force during closing.
 - c. The floor access door shall be hot dip galvanized after fabrication. Installation shall be in accordance with the manufacturer's attached instructions. The entire frame including the seat on which the reinforcing rests shall be supported by concrete or other material designed to support the specified load.
 - d. Size of hatch shall be 2'-0" by 2'-0".
5. Access hatches for FTWR meter vault.
- a. Access hatch shall be double leaf or single leaf, as indicated on the Contract Drawings or by the Engineer, aluminum, gutter type, watertight, exterior, flush floor hatch design. Door leaves shall be 1/4 inch aluminum diamond pattern plate to withstand an AASHTO H-20 wheel loading for vehicular traffic in off-street locations. Channel frames shall be 1/4 inches aluminum with an anchor flange around the perimeter. Provide 1-1/2 inch female NPT threaded aluminum drainage coupling welded under frame at right front corner for connection of drain pipe.

- b. Door shall be equipped with 316 stainless steel hinges, a lockable hasp for use with a padlock, stainless steel pins, spring operator for easy operation and an automatic hold-open arm with release handle. Provide inside stainless steel snap locks with removable wrench lift handle outside. Furnish threaded aluminum plug to seal lock aperture. Hardware shall be cadmium plated.
 - c. Doors and frames shall be mill finish with bituminous coating applied to the exterior of the frame. Hatches shall have an odor resistant gasket.
 - d. Size of hatches shall be 4'-0" by 4'-0", 2'-6" by 3'-0" and 4'-0" by 6'-0".
6. Access hatch for chemical feed manholes.
- a. Access hatch shall be single leaf, aluminum, gutter type, watertight, exterior, flush floor hatch design. Door leaves shall be 1/4 inch aluminum diamond pattern plate to withstand a live load of 300 pounds per sq. ft. Channel frames shall be 1/4 inches aluminum with an anchor flange around the perimeter. Provide 1-1/2 inch female NPT threaded aluminum drainage coupling welded under frame at right front corner for connection of drain pipe.
 - b. Door shall be equipped with 316 stainless steel hinges, a lockable hasp for use with a padlock, stainless steel pins, spring operator for easy operation and an automatic hold-open arm with release handle. Provide inside stainless steel snap locks with removable wrench lift handle outside. Furnish threaded aluminum plug to seal lock aperture. Hardware shall be cadmium plated.
 - c. Doors and frames shall be mill finish with bituminous coating applied to the exterior of the frame. Hatches shall have an odor resistant gasket.
 - d. Size of hatch shall be 4'-0" by 4'-0".

2.2 ACCEPTABLE MANUFACTURERS

A. Truck Isle Hatch:

- 1. Manufacturers: Provide product of one of the following:
 - a. U.S.F. Fabrications.
 - b. Approved Equal.

B. All Other Hatches:

- 1. Manufacturers: Provide product of one of the following:
 - a. Bilco Company, New Haven, Connecticut.
 - b. Babcock-Davis Associates, Inc., Arlington, Massachusetts.
 - c. Milcor Division Inryco, Inc., Milwaukee, Wisconsin.
 - d. Approved Equal.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General:

1. Installation shall be in accordance with manufacturer's instructions.
2. Manufacturer shall guarantee against defects in material of workmanship for a period of five years.

++END OF SECTION++

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SECTION 05721

ORNAMENTAL RAILINGS

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Custom aluminum decorative guardrails.
- B. Related Sections:
 - 1. Division 5 Section "Metal Stairs" for steel tube railings included with metal stairs.
 - 2. Division 5 Section "Pipe and Tube Railings" for railings fabricated from pipe and tube components.

1.3 DEFINITIONS

- A. Railings: Guards, handrails, and similar devices used for protection of occupants at open-sided floor areas, pedestrian guidance and support, visual separation, or wall protection.

1.4 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Design railings, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
- B. General: In engineering railings to withstand structural loads indicated, determine allowable design working stresses of railing materials based on the following:
 - 1. Aluminum: The lesser of minimum yield strength divided by 1.65 or minimum ultimate tensile strength divided by 1.95.
- C. Structural Performance: Railings shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:
 - 1. Handrails and Top Rails of Guards: as required by the Kentucky Building Code or as indicated on the Structural Drawings but not less than:
 - a. Uniform load of 50 lbf/ft. (0.73 kN/m) applied in any direction.
 - b. Concentrated load of 200 lbf (0.89 kN) applied in any direction.

- c. Uniform and concentrated loads need not be assumed to act concurrently.
 - 2. Infill of Guards:
 - a. Concentrated load of 50 lbf (0.22 kN) applied horizontally on an area of 1 sq. ft. (0.093 sq. m).
 - b. Infill load and other loads need not be assumed to act concurrently.
- D. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on exterior metal fabrications by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects.
 - 1. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.
- E. Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.

1.5 PRECONSTRUCTION TESTING

- A. Preconstruction Testing Service: Engage a qualified testing agency to perform preconstruction testing on laboratory mockups. Payment for these services will be made by Contractor. Retesting of products that fail to meet specified requirements shall be done at Contractor's expense.
 - 1. Build laboratory mockups at testing agency facility; use personnel, materials, and methods of construction that will be used at Project site.
 - 2. Test railings according to ASTM E 894 and ASTM E 935.
 - 3. Notify Architect seven (7) days in advance of the dates and times when laboratory mockups will be tested.

1.6 ACTION SUBMITTALS

- A. Product Data: For the following:
 - 1. Manufacturer's product lines of railings assembled from standard components.
 - 2. Grout, anchoring cement, and paint products.
- B. LEED Submittals:
 - 1. Project will not be certified however shall meet the intent.
 - 2. Product Data for Credit MR 4: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.
 - 2. Certificates for Credit MR 6 Credit MR 7: Chain-of-custody certificates indicating that wood rails comply with forest certification requirements. Include documentation that manufacturer is certified for chain of custody by

- an FSC-accredited certification body. Include statement indicating cost for each certified wood product.
3. Laboratory Test Reports for Credit IEQ 4: For paints and coatings on interior decorative metal items, documentation indicating that products comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- C. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
1. For illuminated railings, include wiring diagrams and roughing-in details.
- D. Samples for Initial Selection: For products involving selection of color, texture, or design, including mechanical finishes.
- E. Samples for Verification: For each type of exposed finish required.
1. Sections of each distinctly different linear railing member, including handrails, top rails, posts, and balusters.
 2. Each type of glass required.
 3. Fittings and brackets.
 4. Welded connections.
 5. Brazed connections.
 6. Assembled Samples of railing systems, made from full-size components, including top rail, post, handrail, and infill. Show method of finishing members at intersections. Samples need not be full height.
- F. Delegated-Design Submittal: For installed products indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.7 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified professional structural engineer.
- B. Mill Certificates: Signed by manufacturers of stainless-steel products certifying that products furnished comply with requirements.
- C. Welding certificates.
- D. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, according to ASTM E 894 and ASTM E 935.
- E. Preconstruction test reports.

1.8 QUALITY ASSURANCE

- A. Source Limitations: Obtain each type of railing from single source from single manufacturer.
- B. Product Options: Information on Drawings and in Specifications establishes requirements for system's aesthetic effects and performance characteristics. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction. Performance characteristics are indicated by criteria subject to verification by one or more methods including structural analysis, preconstruction testing, field testing, and in-service performance.
 - 1. Do not modify intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If modifications are proposed, submit comprehensive explanatory data to Architect for review.
- C. Product Options: Drawings indicate size, profiles, and dimensional requirements of railings and are based on the specific system indicated. Refer to Division 1 Section "Product Requirements."
 - 1. Do not modify intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If modifications are proposed, submit comprehensive explanatory data to Architect for review.
- D. Welding Qualifications: Qualify procedures and personnel according to the following:
 - 1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
 - 2. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum."
 - 3. AWS D1.6, "Structural Welding Code - Stainless Steel."
- E. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.
 - 1. Build mockups as shown on Drawings.
 - 2. Build mockups for each form and finish of railing consisting of two posts, top rail, infill area, and anchorage system components that are full height and are not less than 24 inches (600 mm) in length.
 - 3. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.
- F. Preinstallation Conference: Conduct conference at Project site.

1.9 PROJECT CONDITIONS

- A. Field Measurements: Verify actual locations of walls and other construction contiguous with railings by field measurements before fabrication and indicate measurements on Shop Drawings.

1.10 COORDINATION AND SCHEDULING

- A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.
- B. Coordinate installation of anchorages for railings. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.
- C. Schedule installation so wall attachments are made only to completed walls. Do not support railings temporarily by any means that do not suit structural performance requirements.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Aluminum Decorative Railings:
 - a. Architectural Metal Works.
 - b. Architectural Railings & Grilles, Inc.
 - c. ATR Technologies, Inc.
 - d. Blum, Julius & Co., Inc.
 - e. Blumcraft of Pittsburgh.
 - f. Braun, J. G., Company; a division of the Wagner Companies.
 - g. CraneVeyor Corp.
 - h. Laurence, C. R. Co., Inc.
 - i. Livers Bronze Co.
 - j. Newman Brothers, Inc.
 - k. Pisor Industries, Inc.
 - l. Platers Polishing Company; a division of Rippel Architectural Metals.
 - m. Poma Corporation.
 - n. Sterling Dula Architectural Products, Inc.; Div. of Kane Manufacturing.
 - o. Superior Aluminum Products, Inc.
 - p. Wagner, R & B, Inc.; a division of the Wagner Companies.
 - q. Wylie Systems.
 - r. Equivalent by other manufacturer.

2.2 METALS, GENERAL

- A. Metal Surfaces, General: Provide materials with smooth surfaces, without seam marks, roller marks, rolled trade names, stains, discolorations, or blemishes.
- B. Brackets, Flanges, and Anchors: Same metal and finish as supported rails unless otherwise indicated.
 - 1. Provide cast-metal brackets with flange tapped for concealed anchorage to threaded hanger bolt.
 - 2. Provide either formed- or cast-metal brackets with predrilled hole for exposed bolt anchorage.
 - 3. Provide formed-steel brackets with predrilled hole for bolted anchorage and with snap-on cover that matches rail finish and conceals bracket base and bolt head.
 - 4. Provide extruded-aluminum brackets with interlocking pieces that conceal anchorage. Locate set screws on bottom of bracket.

2.3 ALUMINUM

- A. Aluminum, General: Provide alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated, and with strength and durability properties for each aluminum form required not less than that of alloy and temper designated below.
- B. Extruded Bars and Shapes, Including Extruded Tubing: ASTM B 221 (ASTM B 221M), Alloy 6063-T5/T52.
- C. Extruded Structural Pipe and Round Tubing: ASTM B 429/B 429M, Alloy 6063-T6.
 - 1. Provide Standard Weight (Schedule 40) pipe unless otherwise indicated.
- D. Drawn Seamless Tubing: ASTM B 210 (ASTM B 210M), Alloy 6063-T832.
- E. Plate and Sheet: ASTM B 209 (ASTM B 209M), Alloy 5005-H32 or Alloy 6061-T6 as determined by manufacturer railing.
- F. Die and Hand Forgings: ASTM B 247 (ASTM B 247M), Alloy 6061-T6.
- G. Castings: ASTM B 26/B 26M, Alloy A356.0-T6.

2.4 FASTENERS

- A. Fastener Materials: Unless otherwise indicated, provide the following:
 - 1. Aluminum Components: Type 304 or Type 316 stainless-steel fasteners.
- B. Fasteners for Anchoring to Other Construction: Select fasteners of type, grade, and class required to produce connections suitable for anchoring railings to other types of construction indicated and capable of withstanding design loads.

- C. Provide concealed fasteners for interconnecting railing components and for attaching railings to other work.
- D. Anchors, General: Anchors capable of sustaining, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing according to ASTM E 488, conducted by a qualified independent testing agency.
- E. Post-Installed Anchors: Torque-controlled expansion anchors or chemical anchors.
 - 1. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B 633 or ASTM F 1941 (ASTM F 1941M), Class Fe/Zn 5, unless otherwise indicated.
 - 2. Material for Exterior Locations and Where Stainless Steel Is Indicated: Alloy Group 1 (A1) or Group 2 (A4) stainless-steel bolts, ASTM F 593 (ASTM F 738M), and nuts, ASTM F 594 (ASTM F 836M) as determined by railing manufacturer.

2.5 MISCELLANEOUS MATERIALS

- A. Low-Emitting Paints and Coatings: Paints and coatings applied to interior decorative metal railings shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- B. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107. Provide grout specifically recommended by manufacturer for interior and exterior applications.
- C. Anchoring Cement: Factory-packaged, nonshrink, nonstaining, hydraulic-controlled expansion cement formulation for mixing with water at Project site to create pourable anchoring, patching, and grouting compound.
 - 1. Water-Resistant Product: At exterior locations provide formulation that is resistant to erosion from water exposure without needing protection by a sealer or waterproof coating and that is recommended by manufacturer for exterior use.

2.6 FABRICATION

- A. General: Fabricate railings to comply with requirements indicated for design, dimensions, member sizes and spacing, details, finish, and anchorage, but not less than that required to support structural loads.
- B. Assemble railings in the shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling li-

- mitations. Clearly mark units for reassembly and coordinated installation. Use connections that maintain structural value of joined pieces.
- C. Make up wire-rope assemblies in the shop to field-measured dimensions with fittings machine swaged. Minimize amount of turnbuckle take-up used for dimensional adjustment so maximum amount is available for tensioning wire ropes. Tag wire-rope assemblies and fittings to identify installation locations and orientations for coordinated installation.
 - D. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch (1 mm) unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.
 - E. Form work true to line and level with accurate angles and surfaces.
 - F. Fabricate connections that will be exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate. Locate weep holes in inconspicuous locations.
 - G. Cut, reinforce, drill, and tap as indicated to receive finish hardware, screws, and similar items.
 - H. Connections: Fabricate railings with welded connections unless otherwise indicated.
 - I. Welded Connections: Cope components at connections to provide close fit, or use fittings designed for this purpose. Weld all around at connections, including at fittings.
 - 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 flux immediately.
 - 4. At exposed connections, finish exposed welds to comply with NOMMA's "Voluntary Joint Finish Standards" for Type 1 welds: no evidence of a welded joint.
 - J. Welded Connections for Aluminum Pipe: Fabricate railings to interconnect members with concealed internal welds that eliminate surface grinding, using manufacturer's standard system of sleeve and socket fittings.
 - K. Mechanical Connections: Connect members with concealed mechanical fasteners and fittings. Fabricate members and fittings to produce flush, smooth, rigid, hair-line joints.
 - 1. Fabricate splice joints for field connection using an epoxy structural adhesive if this is manufacturer's standard splicing method.
 - L. Form changes in direction as follows:

1. As detailed.
 2. By bending.
 3. By flush bends.
 4. By radius bends of radius indicated.
 5. By bending to smallest radius that will not result in distortion of railing member.
- M. Bend members in jigs to produce uniform curvature for each configuration required; maintain cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of components.
- N. Close exposed ends of hollow railing members with prefabricated end fittings.
- O. Provide wall returns at ends of wall-mounted handrails unless otherwise indicated. Close ends of returns, unless clearance between end of rail and wall is 1/4 inch (6 mm) or less.
- P. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, flanges, miscellaneous fittings, and anchors to interconnect railing members to other work unless otherwise indicated.
1. At brackets and fittings fastened to plaster or gypsum board partitions, provide crush-resistant fillers, or other means to transfer loads through wall finishes to structural supports and prevent bracket or fitting rotation and crushing of substrate.
- Q. Provide inserts and other anchorage devices for connecting railings to concrete or masonry work. Fabricate anchorage devices capable of withstanding loads imposed by railings. Coordinate anchorage devices with supporting structure.

2.7 GENERAL FINISH REQUIREMENTS

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipment.
- C. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.
- D. Provide exposed fasteners with finish matching appearance, including color and texture, of railings.

2.8 ALUMINUM FINISHES

- A. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.
- B. Mechanical Finish: AA-M3x (Mechanical Finish: as specified); sand top rails, handrails, and intermediate rails in one direction only, parallel to length of railing, with 120- and 320-grit abrasive. After installation, polish railings with No. 0 steel wool immersed in paste wax, then rub to a luster with a soft dry cloth.
- C. Clear Anodic Finish: AAMA 611, AA-M12C22A41, Class I, 0.018 mm, or thicker.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine plaster and gypsum board assemblies, where reinforced to receive anchors, to verify that locations of concealed reinforcements have been clearly marked for Installer. Locate reinforcements and mark locations if not already done.

3.2 INSTALLATION, GENERAL

- A. Fit exposed connections together to form tight, hairline joints.
- B. Perform cutting, drilling, and fitting required for installing railings. Set railings accurately in location, alignment, and elevation; measured from established lines and levels and free of rack.
 - 1. Do not weld, cut, or abrade surfaces of railing components that have been coated or finished after fabrication and that are intended for field connection by mechanical or other means without further cutting or fitting.
 - 2. Set posts plumb within a tolerance of 1/16 inch in 3 feet (2 mm in 1 m).
 - 3. Align rails so variations from level for horizontal members and variations from parallel with rake of steps and ramps for sloping members do not exceed 1/4 inch in 12 feet (5 mm in 3 m).
- C. Corrosion Protection: Coat concealed surfaces of aluminum and copper alloys that will be in contact with grout, concrete, masonry, wood, or dissimilar metals, with a heavy coat of bituminous paint.
- D. Adjust railings before anchoring to ensure matching alignment at abutting joints.
- E. Fastening to In-Place Construction: Use anchorage devices and fasteners where necessary for securing railings and for properly transferring loads to in-place construction.

3.3 RAILING CONNECTIONS

- A. Nonwelded Connections: Use mechanical or adhesive joints for permanently connecting railing components. Use wood blocks and padding to prevent damage to railing members and fittings. Seal recessed holes of exposed locking screws using plastic cement filler colored to match finish of railings.
- B. Welded Connections: Use fully welded joints for permanently connecting railing components. Comply with requirements for welded connections in "Fabrication" Article whether welding is performed in the shop or in the field.
- C. Expansion Joints: Install expansion joints at locations indicated but not farther apart than required to accommodate thermal movement. Provide slip-joint internal sleeve extending 2 inches (50 mm) beyond joint on either side, fasten internal sleeve securely to one side, and locate joint within 6 inches (150 mm) of post.

3.4 ATTACHING RAILINGS

- A. Anchor railing ends to concrete and masonry with brackets on underside of rails connected to railing ends and anchored to wall construction with anchors and bolts.
- B. Anchor railing ends to metal surfaces with flanges bolted to metal surfaces and welded to railing ends.
- C. Attach handrails to walls with wall brackets except where end flanges are used. Provide brackets with 1-1/2-inch (38-mm) clearance from inside face of handrail and finished wall surface. Locate brackets as indicated or, if not indicated, at spacing required to support structural loads.
 - 1. Use type of bracket with flange tapped for concealed anchorage to threaded hanger bolt, predrilled hole for exposed bolt anchorage, or embedded bolt as determined by the railing manufacturer.
 - 2. Locate brackets as indicated or, if not indicated, at spacing required to support structural loads.
- D. Secure wall brackets and railing end flanges to building construction as follows:
 - 1. For concrete and solid masonry anchorage, use drilled-in expansion shields and hanger or lag bolts.

3.5 FIELD QUALITY CONTROL

- A. Testing Agency: Contractor will engage a qualified testing and inspecting agency to perform field tests and inspections and prepare test reports.
- B. Extent and Testing Methodology: Testing agency will randomly select completed railing assemblies for testing that are representative of different railing designs

and conditions in the completed Work. Railings will be tested according to ASTM E 894 and ASTM E 935 for compliance with performance requirements.

- C. Remove and replace railings where test results indicate that they do not comply with specified requirements unless they can be repaired in a manner satisfactory to Architect and will comply with specified requirements.
- D. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.6 CLEANING

- A. Clean aluminum and stainless steel by washing thoroughly with clean water and soap, rinsing with clean water, and wiping dry.

3.7 PROTECTION

- A. Protect finishes of railings from damage during construction period with temporary protective coverings approved by railing manufacturer. Remove protective coverings at time of Substantial Completion.
- B. Restore finishes damaged during installation and construction period so no evidence remains of correction work. Return items that cannot be refinished in the field to the shop; make required alterations and refinish entire unit, or provide new units.

++ END OF SECTION ++

SECTION 06402

INTERIOR ARCHITECTURAL WOODWORK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Plastic-laminate cabinets.
 - 2. Solid-surfacing-material countertops.
- B. Related Sections include the following:
 - 1. Division 6 Section "Rough Carpentry" for wood furring, blocking, shims, and hanging strips required for installing woodwork and concealed within other construction before woodwork installation.
 - 2. Division 6 Section "Finish Carpentry" for interior carpentry exposed to view that is not specified in this Section.
 - 3. Division 6 Section "Paneling."
 - 4. Division 9 Section "Interior Stone Facing" for stone countertops.

1.3 DEFINITIONS

- A. Interior architectural woodwork includes wood furring, blocking, shims, and hanging strips for installing woodwork items unless concealed within other construction before woodwork installation.
- B. Rough carriages for stairs are a part of interior architectural woodwork. Platform framing, headers, partition framing, and other rough framing associated with stairwork are specified in Division 6 Section "Rough Carpentry."

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated, including cabinet hardware and accessories handrail brackets and finishing materials and processes.
- B. Product Data: For panel products, high-pressure decorative laminate, adhesive for bonding plastic laminate, solid-surfacing material, fire-retardant-treated materials, cabinet hardware and accessories, handrail brackets, and finishing materials and processes.

1. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements.
- C. LEED Submittals:
1. Project will not be certified, however shall meet the intent.
 2. Product Data for Credit MR 4: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.
 3. Certificates for [Credit MR 6] [Credit MR 7]: Chain-of-custody certificates indicating that interior architectural woodwork complies with forest certification requirements. Include documentation that manufacturer is certified for chain of custody by an FSC-accredited certification body. Include statement indicating cost for each certified wood product.
 4. Product Data for Credit IEQ 4.1: For installation adhesives, documentation including printed statement of VOC content.
 5. Product Data for Credit IEQ 4.4: For composite wood products and adhesives, documentation indicating that product contains no urea formaldehyde.
 6. Laboratory Test Reports for Credit IEQ 4: For adhesives, composite wood products and finishing materials, documentation indicating that products comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- D. Shop Drawings: Show location of each item, dimensioned plans and elevations, large-scale details, attachment devices, and other components.
1. Show details full size.
 2. Show locations and sizes of furring, blocking, and hanging strips, including concealed blocking and reinforcement specified in other Sections.
 3. Show locations and sizes of cutouts and holes for plumbing fixtures, faucets, soap dispensers, and other items installed in architectural woodwork.
 4. Apply a WI-certified compliance label to first page of Shop Drawings.
- E. Samples for Initial Selection:
1. Plastic laminates.
 2. PVC edge material.
 3. Solid-surfacing materials.
- F. Samples for Verification:
1. Plastic laminates, 8 by 10 inches (200 by 250 mm), for each type, color, pattern, and surface finish, with 1 sample applied to core material and specified edge material applied to 1 edge.
 2. Solid-surfacing materials, 6 inches (150 mm) square.
 3. Corner pieces as follows:

- a. Cabinet-front frame joints between stiles and rails, as well as exposed end pieces, 18 inches (450 mm) high by 18 inches (450 mm) wide by 6 inches (150 mm) deep.
- 4. Exposed cabinet hardware and accessories, one unit for each type and finish.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer and fabricator.
- B. Product Certificates: For each type of product, signed by product manufacturer.
- C. Woodwork Quality Standard Compliance Certificates: AWI Quality Certification Program certificates.

1.6 QUALITY ASSURANCE

- A. Fabricator Qualifications: Shop that employs skilled workers who custom-fabricate products similar to those required for this Project and whose products have a record of successful in-service performance. Shop is a certified participant in AWI's Quality Certification Program.
- B. Installer Qualifications: Fabricator of products is a Certified participant in AWI's Quality Certification Program.
- C. Quality Standard: Unless otherwise indicated, comply with AWI's "Architectural Woodwork Quality Standards" for grades of interior architectural woodwork indicated for construction, finishes, installation, and other requirements.
 - 1. Provide AWI Quality Certification Program labels and certificates indicating that woodwork, including installation, complies with requirements of grades specified.
- D. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination."

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Do not deliver woodwork until painting and similar operations that could damage woodwork have been completed in installation areas. If woodwork must be stored in other than installation areas, store only in areas where environmental conditions comply with requirements specified in "Project Conditions" Article.

1.8 PROJECT CONDITIONS

- A. Environmental Limitations: Do not deliver or install woodwork until building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period.

- B. Environmental Limitations: Do not deliver or install woodwork until building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature between 60 and 90 deg F (16 and 32 deg C) and relative humidity between 25 and 55 percent during the remainder of the construction period.
- C. Field Measurements: Where woodwork is indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication, and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
 - 1. Locate concealed framing, blocking, and reinforcements that support woodwork by field measurements before being enclosed, and indicate measurements on Shop Drawings.
 - 2. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating woodwork without field measurements. Provide allowance for trimming at site, and coordinate construction to ensure that actual dimensions correspond to established dimensions.

1.9 COORDINATION

- A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections to ensure that interior architectural woodwork can be supported and installed as indicated.
- B. Hardware Coordination: Distribute copies of approved hardware schedule specified in Division 8 Section "Door Hardware (Scheduled by Describing Products)" to fabricator of architectural woodwork; coordinate Shop Drawings and fabrication with hardware requirements.

PART 2 - PRODUCTS

2.1 WOODWORK FABRICATORS

- A. Available Fabricators: Subject to compliance with requirements, fabricators offering interior architectural woodwork that may be incorporated into the Work include, but are not limited to, the following:
- B. Fabricators: Subject to compliance with requirements, provide interior architectural woodwork by one of the following:

2.2 MATERIALS

- A. General: Provide materials that comply with requirements of AWT's quality standard for each type of woodwork and quality grade specified, unless otherwise indicated.

- B. Certified Wood: Interior architectural woodwork shall be produced from wood obtained from forests certified by an FSC-accredited certification body to comply with FSC STD-01-001, "FSC Principles and Criteria for Forest Stewardship."
- C. Wood Products: Comply with the following:
 - 1. Recycled Content of Medium-Density Fiberboard and Particleboard: Post-consumer recycled content plus one-half of preconsumer recycled content not less than 20 percent.
 - 2. Low-Emitting Materials: Composite wood products shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
 - 3. Hardboard: AHA A135.4.
 - 4. Medium-Density Fiberboard: ANSI A208.2, Grade MD, made with binder containing no urea formaldehyde.
 - 5. Particleboard: ANSI A208.1, Grade M-2, made with binder containing no urea formaldehyde.
 - 6. Particleboard: Straw-based particleboard complying with requirements in ANSI A208.1, Grade M-2, except for density.
 - 7. Softwood Plywood: DOC PS 1, Medium Density Overlay.
- D. Thermoset Decorative Panels: Particleboard or medium-density fiberboard finished with thermally fused, melamine-impregnated decorative paper complying with LMA SAT-1.
 - 1. Provide PVC or polyester edge banding complying with LMA EDG-1 on components with exposed or semiexposed edges.
- E. High-Pressure Decorative Laminate: NEMA LD 3, grades as indicated or, if not indicated, as required by woodwork quality standard.
 - 1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering high-pressure decorative laminates that may be incorporated into the Work include, but are not limited to, the following:
 - 2. Manufacturer: Subject to compliance with requirements, provide high-pressure decorative laminates by one of the following:
 - a. Abet Laminati, Inc.
 - b. Arborite; Division of ITW Canada, Inc.
 - c. Formica Corporation.
 - d. Lamin-Art, Inc.
 - e. Nevamar Company, LLC; Decorative Products Div.
 - f. Panolam Industries International Incorporated.
 - g. Westinghouse Electric Corp.; Specialty Products Div.
 - h. Wilsonart International; Div. of Premark International, Inc.
 - i. Equivalent manufacturer.
- F. Solid-Surfacing Material: Homogeneous solid sheets of filled plastic resin complying with ISSFA-2.

1. 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:
2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. ABA Industries.
 - b. Avonite, Inc.
 - c. E. I. du Pont de Nemours and Company.
 - d. Formica Corporation.
 - e. LG Chemical, Ltd.
 - f. Meganite Inc.; a division of the Pyrochem Group.
 - g. Nevamar Company, LLC; Decorative Products Div.
 - h. Samsung; Cheil Industries Inc.
 - i. Swan Corporation (The).
 - j. Transolid, Inc.
 - k. Wilsonart International; Div. of Premark International, Inc.
 - l. Equivalent manufacturer.
3. Type: Standard type or Veneer type made from material complying with requirements for Standard type, as indicated, unless Special Purpose type is indicated.
4. Colors and Patterns: As selected by Architect from manufacturer's full range.

2.3 CABINET HARDWARE AND ACCESSORIES

- A. General: Provide cabinet hardware and accessory materials associated with architectural cabinets, except for items specified in Division 8 Section "Door Hardware (Scheduled by Describing Products)."
- B. Frameless Concealed Hinges (European Type): BHMA A156.9, B01602, 170 degrees of opening, self-closing.
- C. Wire Pulls: Back mounted, solid metal, 4 inches (100 mm) long, 5/16 inch (8 mm) in diameter.
- D. Catches: Magnetic catches, BHMA A156.9, B03141.
- E. Adjustable Shelf Standards and Supports: BHMA A156.9, B04071; with shelf rests, B04081.
- F. Shelf Rests: BHMA A156.9, B04013; metal.
- G. Drawer Slides: BHMA A156.9, B05091.
 1. Heavy Duty (Grade 1HD-100 and Grade 1HD-200): Side mounted; full-overtravel-extension type; zinc-plated steel ball-bearing slides.

- H. Grommets for Cable Passage through Countertops: 2-inch (51-mm) OD, black, molded-plastic grommets and matching plastic caps with slot for wire passage.
 - 1. Product: Subject to compliance with requirements, provide "OG series" by Doug Mockett & Company, Inc.
- I. Exposed Hardware Finishes: For exposed hardware, provide finish that complies with BHMA A156.18 for BHMA finish number indicated.
 - 1. Satin Stainless Steel: BHMA 630.
- J. For concealed hardware, provide manufacturer's standard finish that complies with product class requirements in BHMA A156.9.

2.4 MISCELLANEOUS MATERIALS

- A. Furring, Blocking, Shims, and Hanging Strips: Softwood or hardwood lumber, kiln dried to less than 15 percent moisture content.
- B. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage. Provide nonferrous-metal or hot-dip galvanized anchors and inserts on inside face of exterior walls and elsewhere as required for corrosion resistance. Provide toothed-steel or lead expansion sleeves for drilled-in-place anchors.
- C. Handrail Brackets: Stamped from stainless steel with wall flange drilled for exposed anchor and tapped for concealed hanger bolt and with support arm for screwing to underside of rail. Sized to provide 1-1/2-inch (38-mm) clearance between handrail and wall.
- D. Adhesives, General: Adhesives shall not contain urea formaldehyde.
- E. Low-Emitting Materials: Adhesives shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- F. VOC Limits for Installation Adhesives: Installation adhesives shall comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
 - 1. Wood Glues: 30 g/L.
 - 2. Multipurpose Construction Adhesives: 70 g/L.
 - 3. Contact Adhesive: 250 g/L.
- G. Adhesive for Bonding Plastic Laminate: Unpigmented contact cement.
 - 1. Adhesive for Bonding Edges: Adhesive specified above for faces.

2.5 FABRICATION, GENERAL

- A. Interior Woodwork Grade: Unless otherwise indicated, provide Custom-grade interior woodwork complying with referenced quality standard.
- B. Wood Moisture Content: Comply with requirements of referenced quality standard for wood moisture content in relation to ambient relative humidity during fabrication and in installation areas.
- C. Fabricate woodwork to dimensions, profiles, and details indicated.
- D. Complete fabrication, including assembly and hardware application, to maximum extent possible before shipment to Project site. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.
 - 1. Notify Architect seven days in advance of the dates and times woodwork fabrication will be complete.
 - 2. Trial fit assemblies at fabrication shop that cannot be shipped completely assembled. Install dowels, screws, bolted connectors, and other fastening devices that can be removed after trial fitting. Verify that various parts fit as intended and check measurements of assemblies against field measurements indicated on Shop Drawings before disassembling for shipment.
- E. Shop-cut openings to maximum extent possible to receive hardware, appliances, plumbing fixtures, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.
 - 1. Seal edges of openings in countertops with a coat of varnish.

2.6 PLASTIC-LAMINATE CABINETS

- A. Grade: Custom.
- B. AWI Type of Cabinet Construction: Flush overlay.
- C. Laminate Cladding for Exposed Surfaces: High-pressure decorative laminate complying with the following requirements:
 - 1. Horizontal Surfaces Other Than Tops: Grade HGS.
 - 2. Postformed Surfaces: Grade HGP.
 - 3. Vertical Surfaces: Grade VGS.
 - 4. Edges: Grade HGS.
- D. Materials for Semiexposed Surfaces:
 - 1. Surfaces Other Than Drawer Bodies: High-pressure decorative laminate, Grade VGS.
 - a. Edges of Plastic-Laminate Shelves: PVC edge banding, 0.12 inch (3 mm) thick, matching laminate in color, pattern, and finish.

- b. For semiexposed backs of panels with exposed plastic-laminate surfaces, provide surface of high-pressure decorative laminate, Grade VGS.
- 2. Drawer Sides and Backs: Thermoset decorative panels.
- 3. Drawer Bottoms: Thermoset decorative panels.

- E. Concealed Backs of Panels with Exposed Plastic Laminate Surfaces: High-pressure decorative laminate, Grade BKL.

- F. Colors, Patterns, and Finishes: Provide materials and products that result in colors and textures of exposed laminate surfaces complying with the following requirements:
 - 1. As selected by Architect from laminate manufacturer's full range in the following categories:
 - a. Solid colors, matte finish.
 - b. Patterns, matte finish.

- G. Provide dust panels of 1/4-inch (6.4-mm) plywood or tempered hardboard above compartments and drawers, unless located directly under tops.

2.7 SOLID-SURFACING-MATERIAL COUNTERTOPS

- A. Grade: Custom.

- B. Solid-Surfacing-Material Thickness: 3/4 inch (19 mm) counter, 1-1/2 inch (38 mm) nosing.

- C. Colors, Patterns, and Finishes: Provide materials and products that result in colors of solid-surfacing material complying with the following requirements:
 - 1. As selected by Architect from manufacturer's full range.

- D. Fabricate tops in one piece, unless otherwise indicated. Comply with solid-surfacing-material manufacturer's written recommendations for adhesives, sealers, fabrication, and finishing.
 - 1. Fabricate tops with shop-applied edges of materials and configuration indicated.
 - 2. Fabricate tops with shop-applied backsplashes.

- E. Drill holes in countertops for plumbing fittings and soap dispensers in shop.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Before installation, condition woodwork to average prevailing humidity conditions in installation areas.

- B. Before installing architectural woodwork, examine shop-fabricated work for completion and complete work as required, including removal of packing and backpriming.

3.2 INSTALLATION

- A. Grade: Install woodwork to comply with requirements for the same grade specified in Part 2 for fabrication of type of woodwork involved.
- B. Assemble woodwork and complete fabrication at Project site to comply with requirements for fabrication in Part 2, to extent that it was not completed in the shop.
- C. Install woodwork level, plumb, true, and straight. Shim as required with concealed shims. Install level and plumb (including tops) to a tolerance of 1/8 inch in 96 inches (3 mm in 2400 mm).
- D. Scribe and cut woodwork to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.
- E. Anchor woodwork to anchors or blocking built in or directly attached to substrates. Secure with countersunk, concealed fasteners and blind nailing as required for complete installation. Use fine finishing nails[or finishing screws] for exposed fastening, countersunk and filled flush with woodwork and matching final finish if transparent finish is indicated.
- F. Cabinets: Install without distortion so doors and drawers fit openings properly and are accurately aligned. Adjust hardware to center doors and drawers in openings and to provide unencumbered operation. Complete installation of hardware and accessory items as indicated.
 - 1. Install cabinets with no more than 1/8 inch in 96-inch (3 mm in 2400-mm) sag, bow, or other variation from a straight line.
 - 2. Maintain veneer sequence matching of cabinets with transparent finish.
 - 3. Fasten wall cabinets through back, near top and bottom, at ends and not more than 16 inches (400 mm) o.c. with No. 10 wafer-head screws sized for 1-inch (25-mm) penetration into blocking, or leave-in strips, or masonry.
- G. Countertops: Anchor securely by screwing through corner blocks of base cabinets or other supports into underside of countertop.
 - 1. Align adjacent solid-surfacing-material countertops and form seams to comply with manufacturer's written recommendations using adhesive in color to match countertop. Carefully dress joints smooth, remove surface scratches, and clean entire surface.
 - 2. Install countertops with no more than 1/8 inch in 96-inch (3 mm in 2400-mm) sag, bow, or other variation from a straight line.
 - 3. Secure backsplashes to tops with concealed metal brackets at 16 inches (400 mm) o.c. and to walls with adhesive.

4. Calk space between backsplash and wall with sealant specified in Division 7 Section "Joint Sealants."
- H. Touch up finishing work specified in this Section after installation of woodwork. Fill nail holes with matching filler where exposed.

3.3 ADJUSTING AND CLEANING

- A. Repair damaged and defective woodwork, where possible, to eliminate functional and visual defects; where not possible to repair, replace woodwork. Adjust joinery for uniform appearance.
- B. Clean, lubricate, and adjust hardware.
- C. Clean woodwork on exposed and semiexposed surfaces. Touch up shop-applied finishes to restore damaged or soiled areas.

+ + END OF SECTION + +

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SECTION 06600

FIBERGLASS REINFORCED PLASTIC PRODUCTS AND FABRICATIONS

PART 1 - GENERAL

1.1 DESCRIPTION

A. Scope:

1. Furnish all labor, materials, equipment and incidentals necessary to install the fiberglass reinforced plastic (FRP) grating, stair treads, handrail, ladders and structurals as shown on the drawings and as specified herein.

B. Coordination:

1. Review installation procedures under other Sections and coordinate the installation of items that must be installed with, or before, the Fiberglass Reinforced Plastic Products and Fabrications.

1.2 QUALITY ASSURANCE

A. Qualifications:

1. The material covered by these specifications shall be furnished by a reputable and qualified manufacturer of proven ability who has regularly engaged in the manufacture and installation of FRP systems.
2. Firm experienced in successfully producing FRP fabrications similar to that indicated for this project, with sufficient production capacity to produce required units without causing delay in the work.

B. General:

1. Substitution of any component or modification of system shall be made only when approved by the Engineer.
2. In addition to requirements of these specifications, comply with manufacturer's instructions and recommendations for work.

1.3 SUBMITTALS

A. Samples:

1. Samples of each type of grating proposed shall be submitted for approval prior to placement of purchase orders.

B. Shop Drawings:

1. Shop drawings of all FRP structural members, handrails, gratings, plate, ladders and appurtenances shall be submitted to the Engineer for approval in accordance with the requirements of Section 01330, Submittal Procedures.

2. Manufacturer's catalog data showing:
 - a. Dimensions, spacings, and construction of grating.
 - b. Design tables showing limits for span length and deflection under various uniform and concentrated loads.
 - c. Materials of construction.
 3. Detail shop drawings showing:
 - a. Dimensions of grating, ladders, handrail, and structural members.
 - b. Sectional assembly.
 - c. Location and identification mark.
 - d. Size and type of supporting frames required.
 - e. Anchorage and accessory items.
- C. Samples of each type of grating proposed shall be submitted for approval prior to placement of purchase orders.
- D. At the time of submission, the Contractor shall in writing, call the Engineer's attention to any deviations that the Drawings may vary from the requirements of the Engineer's Specifications. Comply with the requirements of Section 01330.

1.4 DELIVERY, STORAGE AND HANDLING

- A. Packing:
1. All systems, sub-systems and structures shall be shop fabricated and assembled into the largest practical size suitable for transporting.
 2. Identify and match-mark all materials, items, and fabrications for installation and field assembly.
- B. Storage and Protection:
1. All materials and equipment necessary for the fabrication and installation of the grating, plate, handrails, stair treads, and structural shapes shall be stored before, during, and after shipment in a manner to prevent cracking, twisting, bending, breaking, chipping or damage of any kind to the materials or equipment, including damage due to over exposure to the sun. Any material which, in the opinion of the Engineer, has become damaged as to be unfit for use, shall be promptly removed from the site of work, and the Contractor shall receive no compensation for the damaged material or its removal.

1.5 WARRANTY

- A. General Warranty:
1. The guaranty period shall be set forth in specification Section 00710, "General Conditions". In the event that the manufacturers guarantee period exceeds that as stated in the General Conditions, the manufacturers guarantee period will stay in effect and shall not be replaced by the previously stated.

PART 2 – PRODUCTS

2.1 SYSTEM PERFORMANCE

- A. System Performance Criteria:
1. Structural Performance:
 - a. Design, engineer, fabricate, and install the following FRP fabrications to withstand the following structural loads without exceeding the allowable design working stress of the materials involved, including anchors and connections. Apply each load to produce the maximum stress in each respective component of each FRP fabrication.
 2. Stair Tread Performance:
 - a. Capable of withstanding a uniform load of 100 lbs per sq. ft. or a concentrated load of 300 lbs on an area of 4 sq. inches located in the center of the tread, whichever produces the greater stress.
 3. Platforming And Stair Platform Performance:
 - a. Capable of withstanding a uniform load of 100 lbs per sq. ft.
 4. Handrails Systems Performance:
 - a. Capable of withstanding a concentrated load of 200 lbs applied at any point noncurrently, vertically downward, or horizontally.
- B. Design Criteria:
1. The design of FRP products including connections shall be in accordance with governing building codes and standards as applicable.
 2. Design of FRP live loads on grating shall not be less than 100 pounds per sq. ft. Grating deflection at the center of a simple span not to exceed 0.25 inch. Deflection in any direction shall not be more than L/180 of span for structural members. Connections shall be designed to transfer the above loads.

2.2 MANUFACTURERS

- A. Manufacturers: Provide product of one of the following:
1. Morrison Molded Fiber Glass Company (MMFG)
 2. Fibergrate
 3. Approved equal

2.3 MATERIALS

- A. General:
1. Materials used in the manufacture of the FRP products shall be new stock of the best quality and shall be free from all defects and imperfections that might affect the performance of the finished product.
 2. All materials shall be of the kind and quality specified, and where the quality is not specified, it shall be the best of the respective kinds and suitable for the purpose intended.

3. All FRP products noted in 1.02 shall be manufactured using a pultruded process utilizing either an isophthalic polyester or a vinyl ester resin with flame retardant and ultra-violet (UV) inhibitor additives. A synthetic surface veil shall be the outermost layer covering the exterior surface. The FRP shapes shall achieve a flame spread of 25 or less in accordance with ASTM test method E84. (Isophthalic polyester resin is available without flame retardant and UV inhibitor additives.)
4. After fabrication, all cut ends, holes and abrasions of FRP shapes shall be sealed with a compatible resin coating to prevent intrusion of moisture.
5. FRP products exposed to weather shall contain an ultraviolet inhibitor and shall additionally receive one mil thick IJ.V. coating to shield from ultra-violet light if specified or requested.
6. All exposed surfaces shall be smooth and true to form.

2.4 DETAILS OF CONSTRUCTION

A. Design:

1. The panels shall be 1-1/2" deep and sustain a deflection of no more than 0.25 inches under a uniform distributed load of 100 psf for the span lengths shown on the plans.
2. The bearing bars shall be joined into panels by passing continuous length fiberglass pultruded cross rods through the web of each bearing bars. The pultruded cross rod assembly shall consist of two cross rod spacers that have notches cut into them at 1-1/2" inches on center to fit the distance between the web of each bearing bar. A continuous fiberglass pultruded bar shaped section shall be wedged between the two cross rod spacers mechanically locking the notches in the cross rod spacers to the web of the bearing bars. Chemical bonding shall be achieved between the cross rod spacers and the bearing web and between the bar shaped wedge and the two cross rod spacers locking the entire panel together to give a panel that resists twist and prevents internal movement of the bearing bars.
3. The top surface of all panels shall have a nonskid grit affixed to the surface by a baked epoxy resin followed by a top coat of baked epoxy resin.
4. Panels shall be fabricated to the sizes shown on the drawings.
5. Hold down clamps shall be type 316L stainless steel. A minimum of 4 each per panel.
6. Color shall be gray (OSHA safety gray)
7. All bearing bars that are to be exposed to UV shall be coated (optional) with polyurethane coating of a minimum thickness of 1 mil if desired.

B. Fabrication:

1. The FRP grating and stair treads shall be fabricated from bearing bars and cross rod manufactured by the pultrusion process. The glass fiber reinforcement for the bearing bars shall be a core of continuous glass strand rovings wrapped with continuous strand glass mat. A synthetic surface veil shall be the outermost layer covering the exterior surfaces.

2. Fiberglass Grating and Stair Treads:
 - a. Fiberglass grating and stair treads shall be made from a premium grade chemical resistant, fire retardant isophthalic polyester or fire retardant vinyl ester resin system with antimony trioxide added to meet the flame rating of 25 or less in accordance with ASTM E-84 testing and meet the self-extinguishing requirements of ASTM D-635. U. V. inhibitors are added to the resin.
 3. Grating with Plate:
 - a. Grating shall be the same as described above in this section.
 - b. Plate shall be manufactured using a premium grade polyester or vinyl ester resin with fire retardant additive to meet Class I flame rating of 25 or less as tested by ASTM E-84 and meet the self extinguishing requirements of ASTM D-635. All plate shall contain a U. V. inhibitor.
 - c. Plate will be epoxy bonded to the grating, and a non-skid grit will be affixed to the top surface of the assembly by a baked epoxy resin, followed by a top coat of baked epoxy resin.
 4. All cut and machined edges, holes and abrasions shall be sealed with a resin compatible with the resin matrix used in the bearing bars and cross rods.
 5. All panels shall be fabricated to the sizes shown on the approved shop drawing.
- C. Structural Shapes:
1. Structural shapes shall be made from a premium grade polyester or vinyl ester resin with fire retardant additives to meet Class 1 flame rating of ASTM E-84 and meet the self-extinguishing requirements of ASTM D-635. All structural shapes shall contain a U.V. inhibitor.
 2. Manufactured by the pultrusion process.

Structural FRP members composition shall consist of a glass fiber reinforced polyester or vinyl ester resin matrix, approximately 50% resin to glass ratio. A synthetic surface veil shall be the outermost layer covering the exterior surfaces. Continuous glass strand rovings shall be used internally for longitudinal strength. Continuous strand glass mats shall be used internally for transverse strength.
 3. The following minimum mechanical properties shall apply:

**Table 1 – Fiberglass Pultruded Material Properties
Minimum Ultimate Coupon Properties (UN)**

<u>Material Properties</u>	<u>ASTM Test Method</u>	<u>PSI (Mpa)</u>
<u>Pultruded Fiberglass Structural Shapes</u>		
Ultimate tensile stress in longitudinal direction	D638	30,000 (207)
Ultimate compressive stress in longitudinal direction	D695	30,000 (207)
Ultimate flexural stress in longitudinal direction	D790	30,000 (207)
Ultimate short beam shear in longitudinal direction	D2344	4,500 (31)
Ultimate tensile stress in transverse direction	D638	7,000 (48)
Ultimate compressive stress in transverse direction	D695	15,000 (103)
Ultimate flexural stress in transverse direction	D790	10,000 (69)
Density (lb/in. ³ (kg/mm ³))	D792	.060-.070 (0.00166-00194)
Water absorption (24-h immersion)	D570	0.60 Max., % by Weight
Barcol Hardness	D2583	45
Coefficient of thermal expansion, 10 ⁻⁶ in/in/°C	D696	8
Expansion, LW10 ⁻⁶ in/in/°F	_____	4.4
Thermal conductivity BTU-in/FT ² /hr/°F	C177	4
<u>Flame Retardant Properties</u>		
Flame resistance	FTMS 406-2023	55/30 Ign.burn.sec.
Flammability test	D 635	Self Extinguishing
Surface burning characteristics	E 84	25 maximum
Flammability class	UL 94	VO
Temperature index	UL94	130°C

D. Handrails

1. Design:

- a. The FRP handrail system shall be designed to meet the configuration and loading requirements of OSHA 1910.23, with a minimum factor of safety on loading of 2.0.

2. Material:

- a. The rails and posts shall be 1.75”x1.75”x.156” square tube manufactured by the pultrusion process. The kickplate shall be 4”x1/2” (corrugated) x .125” thick pultruded fiberglass shape. The parts may be coated with an industrial grade polyurethane paint for additional U.V. protection and wear resistance. The pultruded parts shall be made with a fire retardant resin which meets the ASTM E-84 test for a flame spread of 25 or less. The resin matrix shall be {polyester} or {vinyl ester} and shall contain a UV inhibitor. The color shall be {OSHA safety yellow} or {gray}.
- b. The pultruded parts shall meeting the following minimum mechanical properties:

Properties	Test Method	Values
Tensile Stress	ASTM D638	30,000 psi
Tensile Modulus	ASTM D638	2.5 x 10 ⁶ psi
Compressive Stress	ASTM D695	30,000 psi
Compressive Modulus	ASTM D695	2.5 x 10 ⁶ psi
Flexural Stress	ASTM D790	30,000 psi
Flexural Modulus	ASTM D790	1.6 x 10 ⁶ psi
Shear Stress	ASTM D2344	4,500 psi
Density	ASTM D792	.060 - .070 lbs/in ³
24 Hr. Water Absorption	ASTM D570	0.6% max
Coef. of Thermal Expansion	ASTM D696	4.4 x 10 ⁻⁶ in/in°F
Flexural Stress	Full Section	36,000 psi
Flexural Modulus	Full Section	3.7 x 10 ⁶ psi

3. Fabrication Handrail System:

- a. The fiberglass handrail system shall be fabricated into finished sections by fabricating and joining together the pultruded square tube using molded or pultruded components; epoxy bonded and connected as shown in the fabrication details. Where required by OSHA, fiberglass kickplate shall be attached to the handrail posts with nylon rivets. Handrail sections shall be fabricated to the size shown on the

approved fabrication drawings and shall be piece marked with a waterproof tag.

4. For Side Mount:
 - a. Post shall be constructed with a square pultruded bottom plug. Length shall be sufficient to extend a minimum of one inch beyond the uppermost bolt hole to prevent cursing of post tubing. Bolt holes shall provide clearance of 1/16 inch for 1/2 inch diameter bolts/studs. Holes shall be on longitudinal center line of post, 1 inch from bottom of post (minimum) and not less than 3 inches apart on center. Posts shall be fastened with stainless steel anchor bolts or studs, 1/2 inch diameter extending no less than 2-1/4 inches into the concrete, or into a minimum thickness of 1/4 inch structural steel or pultruded fiberglass.
 - b. Post locations shall be no greater than 24 inches, nor less than 9 inches from horizontal or vertical change in handrail direction. Post centers shall be no greater than 72 inches apart on any straight run of rail or 48 inches apart on any inclined rail section.
5. Other Attachment Methods:
 - a. Base mount, embedded, and removable are also types of mounting procedures for handrail. Contact approved fabricator for detailed information on these connection types.
6. Installation of Handrail Sections:
 - a. The fabricated handrail sections shall be supplied complete with fittings by the FRP manufacturer. The components used to joint fabricated sections together may be shipped loose, to be exposed and riveted together in the filed by the Contractor, per the manufacturer's recommendations.
 - b. The fabricated handrail sections shall be installed as shown on the approved shop drawings. The handrail sections shall be accurately located, erected plumb and level. The sections shall be fastened to the structure as shown on the approved shop drawing.
7. Approved Fabricators:
 - a. Morrison Molded Fiber Glass Company (MMFG)
 - 1) AFC Division (Chatfield, MN)
 - 2) Bristol Division (Bristol, VA)
 - b. Approved equal.

PART 3 - EXECUTION

3.1 INSPECTION AND TESTING

A. FRP

1. The Engineer shall have the right to inspect and test all materials to be furnished under these specifications prior to their shipment from the point of manufacture.

2. All labor, power, materials, equipment, and appurtenances required for testing shall be furnished by the Contractor at no cost to the Owner.

3.2 PREPARATION

A. General:

1. Coordinate and furnish anchorages, setting drawings, diagrams, templates, instructions, and directions for installation of anchorages, including concrete inserts, sleeves, anchor bolts, and miscellaneous items having integral anchors that are to be embedded in concrete or masonry construction. Coordinate delivery of such items to project site.
2. Set sleeves in concrete with tops flush with finish surface elevations; protect sleeves from water and concrete entry.

3.3 INSTALLATION

A. Fastening to in-place construction:

1. Provide anchorage devices and fasteners where necessary for securing miscellaneous FRP fabrications to in-place construction; include threaded fasteners for concrete and masonry inserts, toggle bolts, through-bolts, lag bolts, and other connectors as required.

B. Cutting, fitting, and placement:

1. Perform cutting, drilling, and fitting required for installation of miscellaneous FRP fabrications. Set FRP fabrication accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.

C. General:

1. Provide temporary bracing or anchors in formwork for items that are to be built into concrete masonry or similar construction.
2. All field cut and drilled edges, holes and abrasions shall be sealed with a catalyzed resin compatible with the original resin as recommended by the manufacturer. The sealing of the edges shall prevent premature fraying at the field cut edges.
3. Install items specified as indicated and in accordance with manufacturer's instructions.

++ END OF SECTION ++

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SECTION 07115

BITUMINOUS DAMPPROOFING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Cold-applied, emulsified-asphalt dampproofing.
- B. Related Requirements:
 - 1. Division 3 Section "Cast-in-Place Concrete" for bituminous vapor retarders.
 - 2. Division 4 Section "Unit Masonry Assemblies".
 - 3. Division 7 Section "Hot Fluid-Applied Waterproofing" for waterproofing.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. LEED Submittals:
 - 1. Project will not be certified however shall meet intent.
 - 2. Product Data for Credit IEQ 4.2: For dampproofing, documentation including printed statement of VOC content.
 - 3. Laboratory Test Reports for Credit IEQ 4: For dampproofing, documentation indicating that products comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

1.4 FIELD CONDITIONS

- A. Weather Limitations: Proceed with application only when existing and forecasted weather conditions permit dampproofing to be performed according to manufacturers' written instructions.
- B. Ventilation: Provide adequate ventilation during application of dampproofing in enclosed spaces. Maintain ventilation until dampproofing has cured.

PART 2 – PRODUCTS

2.1 MATERIALS, GENERAL

- A. Source Limitations: Obtain primary dampproofing materials and primers from single source from single manufacturer. Provide[protection course] [molded-sheet drainage panels] [and]auxiliary materials recommended in writing by manufacturer of primary materials.
- B. VOC Content: Products shall comply with VOC content limits of authorities having jurisdiction unless otherwise required.

2.4 COLD-APPLIED, EMULSIFIED-ASPHALT DAMPPROOFING

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. APOC, Inc.; a division of Gardner-Gibson.
 - 2. BASF Construction Chemicals - Building Systems; Sonneborn Brand Products.
 - 3. Brewer Company (The).
 - 4. ChemMasters, Inc.
 - 5. Euclid Chemical Company (The); an RPM company.
 - 6. Gardner-Gibson, Inc.
 - 7. Henry Company.
 - 8. Karnak Corporation.
 - 9. Koppers Inc.
 - 10. Malarkey Roofing Products.
 - 11. Meadows, W. R., Inc.
 - 12. Equivalent by other manufacturer.
- C. Brush and Spray Coats: ASTM D 1227, Type III, Class 1.
- D. VOC Content: 0.25 lb/gal., 30 g/L or less.
- E. Low-Emitting Materials: Dampproofing shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.5 AUXILIARY MATERIALS

- A. General: Furnish auxiliary materials recommended in writing by dampproofing manufacturer for intended use and compatible with bituminous dampproofing.
- B. Cut-Back-Asphalt Primer: ASTM D 41.

- C. Emulsified-Asphalt Primer: ASTM D 1227, Type III, Class 1, except diluted with water as recommended in writing by manufacturer.
 - 1. Primer shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- D. Asphalt-Coated Glass Fabric: ASTM D 1668, Type I.
- E. Protection Course: Extruded-polystyrene board insulation, unfaced, ASTM C 578, Type X, 1/2 inch (13 mm) thick.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions with Applicator present, for compliance with requirements for surface smoothness, surface moisture, and other conditions affecting performance of bituminous damproofing work.
 - 1. Test for surface moisture according to ASTM D 4263.
- B. Proceed with application only after substrate construction and penetrating work have been completed and unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Mask or otherwise protect adjoining exposed surfaces from being stained, spotted, or coated with damproofing. Prevent damproofing materials from entering and clogging weep holes and drains.
- B. Clean substrates of projections and substances detrimental to the damproofing work; fill voids, seal joints, and remove bond breakers if any, as recommended in writing by prime material manufacturer.
- C. Apply patching compound to patch and fill tie holes, honeycombs, reveals, and other imperfections; cover with asphalt-coated glass fabric.

3.3 APPLICATION, GENERAL

- A. Comply with manufacturer's written instructions for damproofing application, cure time between coats, and drying time before backfilling unless more stringent requirements are indicated.
 - 1. Apply damproofing to provide continuous plane of protection.
 - 2. Apply additional coats if recommended in writing by manufacturer or to achieve a smooth surface and uninterrupted coverage.

- B. Where dampproofing footings and foundation walls, apply from finished-grade line to top of footing; extend over top of footing and down a minimum of 6 inches (150 mm) over outside face of footing.
 - 1. Extend dampproofing 12 inches (300 mm) onto intersecting walls and footings, but do not extend onto surfaces exposed to view when Project is completed.
 - 2. Install flashings and corner protection stripping at internal and external corners, changes in plane, construction joints, cracks, and where shown as "reinforced," by embedding an 8-inch- (200-mm-) wide strip of asphalt-coated glass fabric in a heavy coat of dampproofing. Dampproofing coat for embedding fabric is in addition to other coats required.

- C. Where dampproofing exterior face of inner wythe of exterior masonry cavity walls, lap dampproofing at least 1/4 inch (6 mm) onto flashing, masonry reinforcement, veneer ties, and other items that penetrate inner wythe.
 - 1. Extend dampproofing over outer face of structural members and concrete slabs that interrupt inner wythe.
 - 2. Lap dampproofing at least 1/4 inch (6 mm) onto shelf angles supporting veneer.

- D. Where dampproofing interior face of above-grade, exterior concrete and masonry [single-wythe masonry] walls, continue dampproofing through intersecting walls by keeping vertical mortar joints at intersection temporarily open or by dampproofing wall before constructing intersecting walls.

3.4 COLD-APPLIED, EMULSIFIED-ASPHALT DAMPPROOFING

- A. Concrete Foundations: Apply two brush or spray coats at not less than 1.5 gal./100 sq. ft. (0.6 L/sq. m) for first coat and 1 gal./100 sq. ft. (0.4 L/sq. m) for second coat, one fibered brush or spray coat at not less than 3 gal./100 sq. ft. (1.2 L/sq. m).

- B. Unparged Masonry Foundation Walls: Apply primer and two brush or spray coats at not less than 1.5 gal./100 sq. ft. (0.6 L/sq. m) for first coat and 1 gal./100 sq. ft. (0.4 L/sq. m) for second coat, primer and one fibered brush or spray coat at not less than 3 gal./100 sq. ft. (1.2 L/sq. m).

- C. Unexposed Face of Concrete Retaining Walls: Apply one brush or spray coat at not less than 1.25 gal./100 sq. ft. (0.5 L/sq. m).

- D. Unexposed Face of Masonry Retaining Walls: Apply primer and one brush or spray coat at not less than 1.25 gal./100 sq. ft. (0.5 L/sq. m).

- E. Concrete Backup for Brick Veneer Assemblies and Architectural Precast Concrete Cladding: Apply one brush or spray coat at not less than 1 gal./100 sq. ft. (0.4 L/sq. m).

- F. Masonry Backup for Brick Veneer Assemblies and Architectural Precast Concrete Cladding: Apply primer and one brush or spray coat at not less than 1 gal./100 sq. ft. (0.4 L/sq. m).
- G. Exterior Face of Inner Wythe of Cavity Walls: Apply primer and one brush or spray coat at not less than 1 gal./100 sq. ft. (0.4 L/sq. m).

3.5 INSTALLATION OF PROTECTION COURSE

- A. Where indicated, install protection course over completed-and-cured dampproofing. Comply with dampproofing-material and protection-course manufacturers' written instructions for attaching protection course.
 - 1. Support protection course over cured coating with spot application of adhesive type recommended in writing by protection-board manufacturer.
 - 2. Install protection course [on same day] [within 24 hours] of installation of dampproofing (while coating is tacky) to ensure adhesion.

3.6 CLEANING

- A. Clean spillage and soiling from adjacent construction using cleaning agents and procedures recommended in writing by manufacturer of affected construction.

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SECTION 07142

HOT FLUID-APPLIED RUBBERIZED ASPHALT WATERPROOFING

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. Rubberized-asphalt waterproofing membrane, unreinforced.
 - 2. Molded-sheet drainage panels.
 - 3. Insulation.
- B. Related Sections:
 - 1. Section 02940 "Vegetated Roof Assemblies" for vegetated roof system and roof pavers.
 - 2. Section 03400 "Precast Prestressed Concrete"

1.3 ACTION SUBMITTALS

- A. Hot Fluid-Applied Rubberized Asphalt Waterproofing Submittals of this section and Division 02 vegetated roof assemblies submittals shall be submitted simultaneously.
- B. Product Data: For each type of product indicated. Include manufacturer's written instructions for evaluating, preparing, and treating substrate, technical data, and tested physical and performance properties of waterproofing.
- C. Shop Drawings: Show locations and extent of waterproofing. Include details for substrate joints and cracks, sheet flashings, penetrations, inside and outside corners, tie-ins to adjoining waterproofing, and other termination conditions.
- D. Samples: For the following products in manufacturer's standard sizes unless otherwise indicated:
 - 1. Flashing sheet.
 - 2. Membrane-reinforcing fabric.
 - 3. Insulation.
 - 4. Drainage panel.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified Installer and testing agency.
- B. Product Test Reports: For waterproofing, based on evaluation of comprehensive tests performed by a qualified testing agency.
- C. Field quality-control reports.
- D. Warranties: Sample of special warranties.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: A firm that is acceptable to manufacturer for installation of waterproofing required for this Project and is eligible to receive special warranties specified.
- B. Source Limitations: Obtain waterproofing materials sheet flashings, protection course, molded-sheet drainage panels, and insulation from a single source.
- C. Preinstallation Conference: Conduct conference at Project site.
 - 1. Review waterproofing requirements including surface preparation, substrate condition and pretreatment, minimum curing period, forecasted weather conditions, special details and sheet flashings, installation procedures, testing and inspection procedures, and protection and repairs.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Store liquid materials in their original undamaged containers in a clean, dry, protected location and within the temperature range required by waterproofing manufacturer.
- B. Remove and replace liquid materials that cannot be applied within their stated shelf life.
- C. Protect stored materials from direct sunlight.

1.7 PROJECT CONDITIONS

- A. Environmental Limitations: Apply waterproofing within the range of ambient and substrate temperatures recommended by waterproofing manufacturer. Do not apply waterproofing to a damp or wet substrate, or when temperature is below 0 deg F (minus 18 deg C).
 - 1. Do not apply waterproofing in snow, rain, fog, or mist.
- B. Maintain adequate ventilation during application and curing of waterproofing materials.

- C. Waterproofing substrate will be precast concrete planks. Roofing manufacturer shall include surface preparation of all joints as required for proper installation of waterproofing. Some areas will be subject to high humidity at the interior of the building when the building is completed and in use. Coordinate plant curing time required and moisture testing for acceptable installation conditions.

1.8 WARRANTY

- A. The warranty for hot-fluid-applied rubberized asphalt waterproofing and 02940 vegetated roof assemblies shall have a single source (one manufacturer) of responsibility.
- B. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace waterproofing and sheet flashings that do not comply with requirements or that fail to remain watertight within specified warranty period.
 - 1. Warranty insulation will retain 80 percent of original published thermal value.
 - 2. Warranty includes removing and reinstalling protection board, drainage panels, and insulation.
 - 4. Warranty Period: Twenty (20) years from date of Substantial Completion.
- C. Special Installer's Warranty: Warranty period of two (2) years.
 - 1. Warranty includes removing and reinstalling protection board, drainage panels, and insulation.

PART 2 - PRODUCTS

2.1 WATERPROOFING MEMBRANE

- A. Hot Fluid-Applied, Rubberized-Asphalt Waterproofing Membrane: Single component; 100 percent solids; hot fluid-applied, rubberized asphalt.
 - 1. **Products:** Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. [American Hydrotech, Inc.](#); Monolithic Membrane 6125.
 - b. [American Permaquik Inc.](#); Permaquik 6100.
 - c. [Barrett Company](#); Ram-Tough 250.
 - d. [Carlisle Coatings & Waterproofing Inc.](#); CCW-500R.
 - e. [Henry Company](#); 790-11.
 - f. [Tamko Waterproofing](#); TW-Hot Melt.
 - g. [Tremco Incorporated](#); Tremproof 150.
 - h. Equivalent by other manufacturer.

2.2 FLASHING SHEET MATERIALS

- A. Elastomeric Flashing Sheet: 50-mil- (1.3-mm-) minimum, uncured sheet neoprene as follows:
 - 1. Tensile Strength: 1400 psi (9.6 MPa) minimum; ASTM D 412, Die C.
 - 2. Elongation: 300 percent minimum; ASTM D 412.
 - 3. Tear Resistance: 125 psi (860 kPa) minimum; ASTM D 624, Die C.
 - 4. Brittleness: Does not break at minus 30 deg F (34 deg C); ASTM D 2137.

2.3 AUXILIARY MATERIALS

- A. Primer: ASTM D 41, asphaltic primer.
- B. Elastomeric Sheet: 50-mil- (1.3-mm-) minimum, uncured sheet neoprene as follows:
 - 1. Tensile Strength: 1400 psi (9.6 MPa) minimum; ASTM D 412, Die C.
 - 2. Elongation: 300 percent minimum; ASTM D 412.
 - 3. Tear Resistance: 125 psi (860 kPa) minimum; ASTM D 624, Die C.
 - 4. Brittleness: Does not break at minus 30 deg F (34 deg C); ASTM D 2137.
- C. Metal Termination Bars: Manufacturer's standard, predrilled stainless-steel or aluminum termination bars; approximately 1 by 1/8 inch (25 by 3 mm) thick; with anchors.
- D. Sealants and Accessories: Manufacturer's recommended sealants and accessories.
- E. Reinforcing Fabric: Manufacturer's recommended, spun-bonded polyester fabric.
- F. Protection Course: Manufacturer's standard, 80- to 90-mil- (2.0- to 2.3-mm-) thick, fiberglass-reinforced rubberized asphalt or modified bituminous sheet.

2.4 MOLDED-SHEET DRAINAGE PANELS

- A. Nonwoven-Geotextile-Faced, Molded-Sheet Drainage Panel: Manufactured composite subsurface drainage panels consisting of a nonwoven, needle-punched geotextile facing with an apparent opening size not exceeding No. 70 (0.21-mm) sieve, laminated to one side [with] [or] [without] a polymeric film bonded to the other side of a studded, nonbiodegradable, molded-plastic-sheet drainage core, with a vertical flow rate of 9 to 15 gpm/ft. (112 to 188 L/min. per m).
- B. Woven-Geotextile-Faced, Molded-Sheet Drainage Panel: Manufactured composite subsurface drainage panels consisting of a woven-geotextile facing with an apparent opening size not exceeding No. 40 (0.43-mm) sieve, laminated to one side [with] [or] [without] a polymeric film bonded to the other side of a studded, nonbiodegradable, molded-plastic-sheet drainage core, with a horizontal flow rate not less than 2.8 gpm/ft. (35 L/min. per m).

2.5 INSULATION

- A. Unfaced Plaza Deck Insulation Drainage Panels: Extruded-polystyrene board insulation complying with ASTM C 578, Type VII, 60-psi (414-kPa) minimum compressive strength; unfaced; fabricated with shiplapped or channel edges and with one side having ribbed drainage channels.
 - 1. **Products:** Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. [DiversiFoam Products](#); CertiFoam Plaza Deck.
 - b. [Dow Chemical Company \(The\)](#); Styrofoam Ribbed Roofmate.
 - c. [Owens Corning](#); Foamular 604 RB.
 - d. Equivalent by other manufacturer.
- B. Geotextile-Faced Plaza Deck Insulation Drainage Panels: Extruded-polystyrene board insulation complying with ASTM C 578, Type VII, 60-psi (414-kPa) minimum compressive strength; fabricated with tongue-and-groove edges and with one side having grooved drainage channels faced with a nonwoven, geotextile filter fabric.
 - 1. **Products:** Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. [T. Clear Corporation](#); Thermadry 1750.
 - b. Equivalent by other manufacturer.

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.
 - 1. Verify that concrete has cured and aged for minimum time period recommended by waterproofing manufacturer.
 - 2. Verify that substrate is visibly dry and free of moisture. Test for capillary moisture by plastic sheet method according to ASTM D 4263.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean and prepare substrates according to manufacturer's written instructions. Provide clean, dust-free, and dry substrate for waterproofing application.
- B. Mask off adjoining surfaces not receiving waterproofing to prevent spillage and overspray affecting other construction.

- C. Close off deck drains and other deck penetrations to prevent spillage and migration of waterproofing fluids.
- D. Remove grease, oil, form-release agents, paints, curing compounds, and other penetrating contaminants or film-forming coatings from concrete.
 - 1. Abrasive blast clean concrete surfaces uniformly to expose top surface of fine aggregate according to ASTM D 4259 with a self-contained, recirculating, blast-cleaning apparatus. Remove material to provide a sound surface free of laitance, glaze, efflorescence, curing compounds, concrete hardeners, or form-release agents. Remove remaining loose material and clean surfaces according to ASTM D 4258.
- E. Remove fins, ridges, and other projections and fill honeycomb, aggregate pockets, and other voids.

3.3 JOINTS, CRACKS, AND TERMINATIONS

- A. Prepare and treat substrates to receive waterproofing membrane, including joints and cracks, deck drains, corners, and penetrations according to manufacturer's written instructions.
 - 1. Rout and fill joints and cracks in substrate. Before filling, remove dust and dirt according to ASTM D 4258.
 - 2. Adhere strip of elastomeric sheet to substrate in a layer of hot rubberized asphalt. Extend elastomeric sheet a minimum of 6 inches (150 mm) on each side of moving joints and cracks or joints and cracks exceeding 1/8 inch (3 mm) thick, and beyond deck drains and penetrations. Apply second layer of hot fluid-applied, rubberized asphalt over elastomeric sheet.
 - 3. Embed strip of reinforcing fabric into a layer of hot rubberized asphalt. Extend reinforcing fabric a minimum of 6 inches (150 mm) on each side of nonmoving joints and cracks not exceeding 1/8 inch (3 mm) thick, and beyond roof drains and penetrations.
 - a. Apply second layer of hot fluid-applied, rubberized asphalt over reinforcing fabric.
- B. At expansion joints and discontinuous deck-to-wall or deck-to-deck joints, bridge joints with elastomeric sheet extended a minimum of 6 inches (150 mm) on each side of joints and adhere to substrates in a layer of hot rubberized asphalt. Apply second layer of hot fluid-applied, rubberized asphalt over elastomeric sheet.

3.4 FLASHING INSTALLATION

- A. Install elastomeric flashing sheets at terminations of waterproofing membrane according to manufacturer's written instructions.
- B. Prime substrate with asphalt primer.

- C. Install elastomeric flashing sheet and adhere to deck and wall substrates in a layer of hot rubberized asphalt.
- D. Extend elastomeric flashing sheet up walls or parapets a minimum of 8 inches (200 mm) above plaza deck pavers and 6 inches (150 mm) onto deck to be water-proofed.
- E. Install termination bars and mechanically fasten to top of elastomeric flashing sheet at terminations and perimeter of roofing.

3.5 MEMBRANE APPLICATION

- A. Apply primer, at manufacturer's recommended rate, over prepared substrate and allow to dry.
- B. Heat and apply rubberized asphalt according to manufacturer's written instructions.
 - 1. Heat rubberized asphalt in an oil- or air-jacketed melter with mechanical agitator specifically designed for heating rubberized asphalt.
- C. Start application with manufacturer's authorized representative present.
- D. Unreinforced Membrane: Apply hot rubberized asphalt to substrates and adjoining surfaces indicated. Spread to form a uniform, unreinforced, seamless membrane, 180-mil (4.5-mm) minimum thickness.
- E. Reinforced Membrane: Apply hot rubberized asphalt to substrates and adjoining surfaces indicated. Spread to a thickness of 90 mils (2.3 mm); embed reinforcing fabric, overlapping sheets 2 inches (50 mm); spread another 125-mil- (3.2-mm-) thick layer to provide a uniform, reinforced, seamless membrane 215 mils (5.5 mm) thick.
- F. Apply waterproofing over prepared joints and up wall terminations and vertical surfaces to heights indicated or required by manufacturer.
- G. Cover waterproofing with protection course with overlapped joints before membrane is subject to backfilling or construction or vehicular traffic.

3.6 MOLDED-SHEET DRAINAGE PANEL INSTALLATION

- A. Place and secure molded-sheet drainage panels, with geotextile facing away from wall or deck substrate according to manufacturer's written instructions. Use methods that do not penetrate waterproofing. Lap edges and ends of geotextile to maintain continuity. Protect installed molded-sheet drainage panels during subsequent construction.

3.7 INSULATION INSTALLATION

- A. Install one or more layers of board insulation to achieve required thickness and insulation drainage panels over waterproofed surfaces. Cut and fit to within 3/4 inch (19 mm) of projections and penetrations.
- B. On horizontal surfaces, loosely lay insulation units according to manufacturer's written instructions. Stagger end joints and tightly abut insulation units.

3.8 FIELD QUALITY CONTROL

- A. Engage a full-time site representative qualified by waterproofing membrane manufacturer to inspect substrate conditions; surface preparation; and application of the membrane, flashings, protection, and drainage components, and vegetated roof assemblies specified in 02940; furnish daily reports to CCA.

3.9 CLEANING AND PROTECTION

- A. Protect waterproofing from damage and wear during remainder of construction period.
- B. Protect installed board insulation and insulation drainage panels from damage due to UV light, harmful weather exposures, physical abuse, and other causes. Provide temporary coverings where insulation will be subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.
- C. Clean spillage and soiling from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

++ END OF SECTION ++

SECTION 07412

METAL WALL PANELS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Concealed-fastener, lap-seam metal wall panels.
- B. Related Sections:
 - 1. Division 5 Section "Cold-Formed Metal Framing" for support framing, including girts, studs, and bracing.
 - 2. Division 7 Section "Sheet Metal Flashing and Trim" for flashing and other sheet metal work that is not part of metal wall panel assemblies.

1.3 DEFINITION

- A. Metal Wall Panel Assembly: Metal wall panels, attachment system components, miscellaneous metal framing, thermal insulation, and accessories necessary for a complete weathertight wall system.

1.4 PERFORMANCE REQUIREMENTS

- A. General Performance: Metal wall panel assemblies shall comply with performance requirements without failure due to defective manufacture, fabrication, installation, or other defects in construction.
- B. Delegated Design: Design metal wall panel assembly, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
- C. Air Infiltration: Air leakage through assembly of not more than 0.06 cfm/sq. ft. (0.3 L/s per sq. m) of wall area when tested according to ASTM E 283 at the following test-pressure difference:
 - 1. Test-Pressure Difference: 1.57 lbf/sq. ft. (75 Pa).
- D. Water Penetration under Static Pressure: No water penetration when tested according to ASTM E 331 at the following test-pressure difference:

1. Test-Pressure Difference: 6.24 lbf/sq. ft. (300 Pa).
- E. Structural Performance: Provide metal wall panel assemblies capable of withstanding the effects the following loads and stresses within limits and under conditions indicated, based on testing according to ASTM E 1592:
1. Wind Loads: Determine loads based on the following minimum design wind pressures:
 - a. Kentucky Building Code
 - b. As indicated on the Structural Drawings.
 2. Deflection Limits: Metal wall panel assemblies shall withstand wind loads with horizontal deflections no greater than 1/180 of the span.
- F. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
1. Temperature Change (Range): 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of wall panel and accessory.
- B. Shop Drawings: Show fabrication and installation layouts of metal wall panels; details of edge conditions, joints, panel profiles, corners, anchorages, attachment system, trim, flashings, closures, and accessories; and special details. Distinguish between factory-, shop- and field-assembled work.
1. Accessories: Include details of the following items, at a scale of not less than 1-1/2 inches per 12 inches (1:10):
 - a. Flashing and trim.
 - b. Anchorage systems.
- C. Samples for Initial Selection: For each type of metal wall panel indicated with factory-applied color finishes.
1. Include similar Samples of trim and accessories involving color selection.
 2. Include manufacturer's color charts consisting of strips of cured sealants showing the full range of colors available for each sealant exposed to view.
- D. Samples for Verification: For each type of exposed finish required, prepared on Samples of size indicated below.
1. Metal Wall Panels: 12 inches (305 mm) long by actual panel width. Include fasteners, closures, and other metal wall panel accessories.
 2. Trim and Closures: 12 inches (305 mm) long. Include fasteners and other exposed accessories.

3. Accessories: 12-inch- (305-mm-) long Samples for each type of accessory.
- E. Delegated-Design Submittal: For metal wall panel assembly indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.6 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Exterior elevations drawn to scale and coordinating penetrations and wall-mounted items. Show the following:
 1. Wall panels and attachments.
 2. Stud framing.
 3. Wall-mounted items including doors, windows, louvers, and lighting fixtures.
 4. Penetrations of wall by pipes and utilities.
- B. Qualification Data: For Installer.
- C. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for each product.
- D. Field quality-control reports.
- E. Warranties: Sample of special warranties.

1.7 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For metal wall panels to include in maintenance manuals.

1.8 QUALITY ASSURANCE

- A. Installer Qualifications: An employer of workers trained and approved by manufacturer.
- B. Testing Agency Qualifications: Qualified according to ASTM E 329 for testing indicated.
- C. Source Limitations: Obtain each type of metal wall panel from single source from single manufacturer.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Deliver components, sheets, metal wall panels, and other manufactured items so as not to be damaged or deformed. Package metal wall panels for protection during transportation and handling.

- B. Unload, store, and erect metal wall panels in a manner to prevent bending, warping, twisting, and surface damage.
- C. Stack metal wall panels horizontally on platforms or pallets, covered with suitable weathertight and ventilated covering. Store metal wall panels to ensure dryness, with positive slope for drainage of water. Do not store metal wall panels in contact with other materials that might cause staining, denting, or other surface damage.
- D. Retain strippable protective covering on metal wall panel for period of metal wall panel installation.
- E. Protect foam-plastic insulation as follows:
 - 1. Do not expose to sunlight, except to extent necessary for period of installation and concealment.
 - 2. Protect against ignition at all times. Do not deliver foam-plastic insulation materials to Project site before installation time.
 - 3. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

1.10 PROJECT CONDITIONS

- A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit assembly of metal wall panels to be performed according to manufacturers' written instructions and warranty requirements.
- B. Field Measurements: Verify locations of structural members and wall opening dimensions by field measurements before metal wall panel fabrication, and indicate measurements on Shop Drawings.

1.11 COORDINATION

- A. Coordinate metal wall panel assemblies with rain drainage work, flashing, trim, and construction of [girts,] [studs,] soffits, and other adjoining work to provide a leakproof, secure, and noncorrosive installation.

1.12 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of metal wall panel assemblies that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Structural failures including rupturing, cracking, or puncturing.
 - b. Deterioration of metals and other materials beyond normal weathering.
 - 2. Warranty Period: Two (2) years from date of Substantial Completion.
- B. Special Warranty on Panel Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace metal wall panels that show

evidence of deterioration of factory-applied finishes within specified warranty period.

1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:
 - a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
 - b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
 - c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
2. Finish Warranty Period: 20 twenty years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PANEL MATERIALS

- A. Metallic-Coated Steel Sheet: Restricted flatness steel sheet metallic coated by the hot-dip process and prepainted by the coil-coating process to comply with ASTM A 755/A 755M.
 1. Zinc-Coated (Galvanized) Steel Sheet: ASTM A 653/A 653M, G90 (Z275) coating designation; structural quality.
 2. Surface: Smooth, flat finish.
 3. Exposed Coil-Coated Finish:
 - a. 2-Coat Fluoropolymer: AAMA 621. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
 4. Concealed Finish: Apply pretreatment and manufacturer's standard white or light-colored acrylic or polyester backer finish consisting of prime coat and wash coat with a minimum total dry film thickness of 0.5 mil (0.013 mm).
- B. Panel Sealants:
 1. Sealant Tape: Pressure-sensitive, 100 percent solids, gray polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape 1/2 inch (13 mm) wide and 1/8 inch (3 mm) thick.
 2. Joint Sealant: ASTM C 920; elastomeric polyurethane, polysulfide, or silicone sealant; of type, grade, class, and use classifications required to seal joints in metal wall panels and remain weathertight; and as recommended in writing by metal wall panel manufacturer.
 3. Butyl-Rubber-Based, Solvent-Release Sealant: ASTM C 1311.

2.2 MISCELLANEOUS METAL FRAMING

- A. Miscellaneous Metal Framing, General: ASTM C 645, cold-formed metallic-coated steel sheet, ASTM A 653/A 653M, G60 (Z180) hot-dip galvanized or coating with equivalent corrosion resistance unless otherwise indicated.
- B. Subgirts: Manufacturer's standard C- or Z-shaped sections, 0.064-inch (1.63-mm) nominal thickness.
- C. Zee Clips: 0.079-inch (2.01-mm) nominal thickness.
- D. Base or Sill [Angles] [Channels]: 0.079-inch (2.01-mm) nominal thickness.
- E. Z-Shaped Furring: With slotted or nonslotted web, face flange of 1-1/4 inches (32 mm), wall attachment flange of 7/8 inch (22 mm), and depth required to fit insulation thickness indicated.
 - 1. Nominal Thickness: 0.025 inch (0.64 mm).
- F. Fasteners for Miscellaneous Metal Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten miscellaneous metal framing members to substrates.

2.3 MISCELLANEOUS MATERIALS

- A. Panel Fasteners: Self-tapping screws, bolts, nuts, self-locking rivets and bolts, end-welded studs, and other suitable fasteners designed to withstand design loads. Provide exposed fasteners with heads matching color of metal wall panels by means of plastic caps or factory-applied coating. Provide EPDM, PVC, or neoprene sealing washers.

2.4 CONCEALED-FASTENER, LAP-SEAM METAL WALL PANELS

- A. General: Provide factory-formed metal wall panels designed to be field assembled by lapping and interconnecting side edges of adjacent panels and mechanically attaching through panel to supports using concealed fasteners and factory-applied sealant in side laps. Include accessories required for weathertight installation.
- B. Flush-Profile, Concealed-Fastener Metal Wall Panels: Formed with vertical panel edges and flat pan with pencil ribs between panel edges; with flush joint between panels.
 - 1. Basis-of-Design Product: Subject to compliance with requirements, provide Firestone Una Clad UC-500; or comparable product by one of the following:
 - a. AEP-Span.
 - b. Alcoa Architectural Products (USA).
 - c. Architectural Building Components.
 - d. Architectural Metal Systems.
 - e. ATAS International, Inc.

- f. Berridge Manufacturing Company.
 - g. CENTRIA Architectural Systems.
 - h. Dimension Metals, Inc.
 - i. Fabral.
 - j. Flexospan Steel Buildings, Inc.
 - k. Industrial Building Panels.
 - l. MBCI; Div. of NCI Building Systems.
 - m. Metal-Fab Manufacturing, L.L.C.
 - n. Metecno-Morin.
 - o. Petersen Aluminum Corporation.
 - p. United Steel Deck, Inc.; Subsidiary of Bouras Industries Inc.
 - q. VICWEST; Div. of Jenisys Engineered Products.
 - r. Equivalent by other manufacturer.
- 3. Material: Zinc-coated (galvanized) steel sheet, 0.052-inch (1.32-mm) nominal thickness.
 - a. Exterior Finish: 2-coat fluoropolymer.
 - b. Color: As selected by Architect from manufacturer's full range.
 - 4. Panel Coverage: 20 inches.
 - 7. Panel Height: 1.0 inch (25 mm).

2.5 ACCESSORIES

- A. Wall Panel Accessories: Provide components required for a complete metal wall panel assembly including trim, copings, fasciae, mullions, sills, corner units, clips, flashings, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal wall panels, unless otherwise indicated.
 - 1. Closures: Provide closures at eaves and rakes, fabricated of same metal as metal wall panels.
 - 2. Backing Plates: Provide metal backing plates at panel end splices, fabricated from material recommended by manufacturer.
 - 3. Closure Strips: Closed-cell, expanded, cellular, rubber or crosslinked, polyolefin-foam or closed-cell laminated polyethylene; minimum 1-inch-(25-mm-) thick, flexible closure strips; cut or premolded to match metal wall panel profile. Provide closure strips where indicated or necessary to ensure weathertight construction.
- B. Flashing and Trim: Formed from 0.018-inch (0.46-mm) minimum thickness, zinc-coated (galvanized) steel sheet or aluminum-zinc alloy-coated steel sheet prepainted with coil coating. Provide flashing and trim as required to seal against weather and to provide finished appearance. Locations include, but are not limited to, bases, drips, sills, jambs, corners, endwalls, framed openings, rakes, fasciae, parapet caps, soffits, reveals, and fillers. Finish flashing and trim with same finish system as adjacent metal wall panels.

2.6 FABRICATION

- A. General: Fabricate and finish metal wall panels and accessories at the factory to greatest extent possible, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements demonstrated by laboratory testing. Comply with indicated profiles and with dimensional and structural requirements.
- B. Fabricate metal wall panels in a manner that eliminates condensation on interior side of panel and with joints between panels designed to form weathertight seals.
- C. Provide panel profile, including major ribs and intermediate stiffening ribs, if any, for full length of panel.
- D. Fabricate metal wall panel joints with factory-installed captive gaskets or separator strips that provide a tight seal and prevent metal-to-metal contact, and that will minimize noise from movements within panel assembly.
- E. Sheet Metal Accessories: Fabricate flashing and trim to comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to the design, dimensions, metal, and other characteristics of item indicated.
 - 1. Form exposed sheet metal accessories that are without excessive oil canning, buckling, and tool marks and that are true to line and levels indicated, with exposed edges folded back to form hems.
 - 2. Seams for Other Than Aluminum: Fabricate nonmoving seams in accessories with flat-lock seams. Tin edges to be seamed, form seams, and solder.
 - 3. Sealed Joints: Form nonexpansion but movable joints in metal to accommodate elastomeric sealant to comply with SMACNA standards.
 - 4. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces of accessories exposed to view.
 - 5. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal recommended by metal wall panel manufacturer.
 - a. Size: As recommended by SMACNA's "Architectural Sheet Metal Manual" or metal wall panel manufacturer for application but not less than thickness of metal being secured.

2.7 GENERAL FINISH REQUIREMENTS

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations

in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, metal wall panel supports, and other conditions affecting performance of work.
 - 1. Examine wall framing to verify that girts, angles, channels, studs, and other structural panel support members and anchorage have been installed within alignment tolerances required by metal wall panel manufacturer.
 - 2. Examine wall sheathing to verify that sheathing joints are supported by framing or blocking and that installation is within flatness tolerances required by metal wall panel manufacturer.
 - 3. Verify that weather-resistant sheathing paper has been installed over sheathing or backing substrate to prevent air infiltration or water penetration.
 - 4. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of work.

- B. Examine roughing-in for components and systems penetrating metal wall panels to verify actual locations of penetrations relative to seam locations of metal wall panels before metal wall panel installation.

- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Miscellaneous Framing: Install subgirts, base angles, sills, furring, and other miscellaneous wall panel support members and anchorages according to ASTM C 754 and metal wall panel manufacturer's written recommendations.

3.3 METAL WALL PANEL INSTALLATION

- A. General: Install metal wall panels according to manufacturer's written instructions in orientation, sizes, and locations indicated on Drawings. Install panels perpendicular to girts and subgirts unless otherwise indicated. Anchor metal wall panels and other components of the Work securely in place, with provisions for thermal and structural movement.
 - 1. Commence metal wall panel installation and install minimum of 300 sq. ft. (27.8 sq. m.) in presence of factory-authorized representative.
 - 2. Shim or otherwise plumb substrates receiving metal wall panels.

3. Flash and seal metal wall panels at perimeter of all openings. Fasten with self-tapping screws. Do not begin installation until weather barrier and flashings that will be concealed by metal wall panels are installed.
 4. Install screw fasteners in predrilled holes.
 5. Locate and space fastenings in uniform vertical and horizontal alignment.
 6. Install flashing and trim as metal wall panel work proceeds.
 7. Locate panel splices over, but not attached to, structural supports. Stagger panel splices and end laps to avoid a four-panel lap splice condition.
 8. Apply elastomeric sealant continuously between metal base channel (sill angle) and concrete and elsewhere as indicated or, if not indicated, as necessary for waterproofing.
 9. Align bottom of metal wall panels and fasten with blind rivets, bolts, or self-tapping screws. Fasten flashings and trim around openings and similar elements with self-tapping screws.
 10. Provide weathertight escutcheons for pipe and conduit penetrating exterior walls.
- B. Fasteners:
1. Steel Wall Panels: Use stainless-steel fasteners for surfaces exposed to the exterior; use galvanized steel fasteners for surfaces exposed to the interior.
- C. Metal Protection: Where dissimilar metals will contact each other or corrosive substrates, protect against galvanic action as recommended by metal wall panel manufacturer.
- D. Joint Sealers: Install gaskets, joint fillers, and sealants where indicated and where required for weathertight performance of metal wall panel assemblies. Provide types of gaskets, fillers, and sealants indicated or, if not indicated, types recommended by metal wall panel manufacturer.
1. Seal metal wall panel end laps with double beads of tape or sealant, full width of panel. Seal side joints where recommended by metal wall panel manufacturer.
 2. Prepare joints and apply sealants to comply with requirements in Division 7 Section "Joint Sealants."
- E. Lap-Seam Metal Wall Panels: Fasten metal wall panels to supports with fasteners at each lapped joint at location and spacing recommended by manufacturer.
1. Install screw fasteners with power tools having controlled torque adjusted to compress washer tightly without damage to washer, screw threads, or panels. Install screws in predrilled holes.
 2. Provide sealant tape at lapped joints of metal wall panels and between panels and protruding equipment, vents, and accessories.
- F. Zee Clips: Provide Zee clips of size indicated or, if not indicated, as required to act as standoff from subgirts for thickness of insulation indicated. Attach to subgirts with fasteners.

3.4 ACCESSORY INSTALLATION

- A. General: Install accessories with positive anchorage to building and weathertight mounting, and provide for thermal expansion. Coordinate installation with flashings and other components.
 - 1. Install components required for a complete metal wall panel assembly including trim, copings, corners, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items.
- B. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints, and seams that will be permanently watertight and weather resistant.
 - 1. Install exposed flashing and trim that is without excessive oil canning, buckling, and tool marks and that is true to line and levels indicated, with exposed edges folded back to form hems. Install sheet metal flashing and trim to fit substrates and to result in waterproof and weather-resistant performance.
 - 2. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet (3 m) with no joints allowed within 24 inches (605 mm) of corner or intersection. Where lapped expansion provisions cannot be used or would not be sufficiently weather resistant and waterproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch (25 mm) deep, filled with mastic sealant (concealed within joints).

3.5 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.
- B. Water Penetration: Test areas of installed system indicated on Drawings for compliance with system performance requirements according to ASTM E 1105 at minimum differential pressure of 20 percent of inward-acting, wind-load design pressure as defined by SEI/ASCE 7, but not less than 6.24 lbf/sq. ft. (300 Pa).
- C. Water-Spray Test: After completing the installation of 75-foot- (23-m-) by-2-story minimum area of metal wall panel assembly, test assembly for water penetration according to AAMA 501.2 in a 2-bay area directed by Architect.
- D. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect and test completed metal wall panel installation, including accessories.
- E. Remove and replace metal wall panels where tests and inspections indicate that they do not comply with specified requirements.

- F. Additional tests and inspections, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.6 CLEANING AND PROTECTION

- A. Remove temporary protective coverings and strippable films, if any, as metal wall panels are installed, unless otherwise indicated in manufacturer's written installation instructions. On completion of metal wall panel installation, clean finished surfaces as recommended by metal wall panel manufacturer. Maintain in a clean condition during construction.
- B. After metal wall panel installation, clear weep holes and drainage channels of obstructions, dirt, and sealant.
- C. Replace metal wall panels that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

+ + END OF SECTION + +

SECTION 07610

SHEET METAL ROOFING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 2. Standing-seam metal roofing, on-site, roll formed.
- B. Related Sections:
 - 1. Division 7 Section "Building Insulation" for roof insulation and sheet vapor retarders separate from self-adhering underlayments.
 - 2. Division 7 Section "Metal Roof Panels" for factory-formed metal roof panels and metal soffit panels.
 - 3. Division 7 Section "Sheet Metal Flashing and Trim" for gutters, downspouts, fasciae, copings, and flashings that are not part of sheet metal roofing.
 - 4. Division 7 Section "Manufactured Roof Specialties" for manufactured fasciae and copings that are not part of sheet metal roofing.
 - 5. Division 7 Section "Roof Accessories" for manufactured roof accessories.
 - 6. Division 7 Section "Joint Sealants" for field-applied sealants adjoining sheet metal roofing.

1.3 PERFORMANCE REQUIREMENTS

- A. General Performance: Sheet metal roofing system including, but not limited to, metal roof panels, cleats, clips, anchors and fasteners, sheet metal flashing integral with sheet metal roofing, fascia panels, trim, battens, underlayment, and accessories shall comply with requirements indicated without failure due to defective manufacture, fabrication, installation, or other defects in construction. Sheet metal roofing shall remain watertight.
- B. Thermal Movements: Provide sheet metal roofing that allows for thermal movements from ambient and surface temperature changes. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
 - 1. Temperature Change (Range): 120 deg F (67 deg C), ambient; 180 deg F (100 deg C) material surfaces.

- C. Solar Reflectance Index: Not less than 78 when calculated according to ASTM E 1980 based on testing identical products by a qualified testing agency.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each manufactured product and accessory.
- B. LEED Submittals:
 - 1. Project will not be certified however shall meet the intent.
 - 2. Product Test Reports for Credit SS 7.2: For roof panels, documentation indicating that panels comply with Solar Reflectance Index requirement.
 - 3. Product Data for Credit MR 4.1 and MR 4.2: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content.
 - a. Include statement indicating material costs for each product having recycled content.
 - 4. Product Data for Credit MR 5.1 and MR 5.2: For products extracted, harvested or recovered, as well as manufactured locally (within 500 mile radius of project jobsite).
 - a. Include statement indicating material costs for each product manufactured locally.
 - b. Include statement indicating percentage of product, by weight that meets both the extraction and manufacture criteria.
 - c. Include statement indicating distance between the project site and the final manufacturing location.
- C. Shop Drawings: Show fabrication and installation layouts of sheet metal roofing, including plans, elevations, expansion joint locations, and keyed details. Distinguish between shop- and field-assembled work. Include the following:
 - 1. Details for forming sheet metal roofing, including seams and dimensions.
 - 2. Details for joining and securing sheet metal roofing, including layout of fasteners, cleats, clips, and other attachments. Include pattern of seams.
 - 3. Details of termination points and assemblies, including fixed points.
 - 4. Details of expansion joints, including showing direction of expansion and contraction.
 - 5. Details of roof penetrations.
 - 6. Details of edge conditions, including eaves, ridges, valleys, rakes, crickets, and counterflashings.
 - 7. Details of special conditions.
 - 8. Details of connections to adjoining work.
 - 9. Detail the following accessory items, at a scale of not less than 1-1/2 inches per 12 inches (1:10) or 3 inches per 12 inches (1:5):
 - a. Flashing and trim.
 - b. Gutters and downspouts as they relate to adjacent sheet metal roofing.
 - c. Roof curbs.

- d. Snow guards.
- D. Samples for Initial Selection: For each type of sheet metal roofing indicated, with factory-applied color finishes.
 - 1. Include similar Samples of trim and accessories involving color selection.
- E. Samples for Verification: For each type of exposed finish required, prepared on Samples of size indicated below:
 - 1. Sheet Metal Roofing: 12 inches (300 mm) long by actual width of unit, including finished seam and in required profile. Include fasteners, cleats, clips, battens, and other attachments.
 - 2. Trim and Metal Closures: 12 inches (300 mm) long and in required profile. Include fasteners and other exposed accessories.
 - 3. Snow Guards: Full-size Sample.
 - 4. Other Accessories: 12-inch- (300-mm-) long Samples for each type of other accessory.

1.5 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Roof plans drawn to scale with coordinated details for penetrations and roof-mounted items. Show the following:
 - 1. Sheet metal roofing and attachments.
 - 2. Roof-mounted items including roof hatches, equipment supports, pipe supports and penetrations, lighting fixtures, snow guards, and items mounted on roof curbs.
- B. Portable Roll-Forming Equipment Certificate: Issued by UL for equipment manufacturer's portable roll-forming equipment capable of producing panels that comply with UL requirements. Show expiration date no earlier than two months after scheduled completion of sheet metal roofing.
 - 1. Submit certificates indicating recertification of equipment whose certification has expired during the construction period.
- C. Qualification Data: For qualified Installer and fabricator.
- D. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for each product.
- E. Warranties: Sample of special warranties.

1.6 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For roofing sheet metals and accessories to include in maintenance manuals.

1.7 QUALITY ASSURANCE

- A. Custom-Fabricated Sheet Metal Roofing Fabricator Qualifications: Shop that employs skilled workers who custom fabricate sheet metal roofing similar to that required for this Project and whose products have a record of successful in-service performance.
- B. Roll-Formed Sheet Metal Roofing Fabricator Qualifications: Fabricator authorized by portable roll-forming equipment manufacturer to fabricate and install sheet metal roofing units required for this Project, and who maintains current UL certification of its portable roll-forming equipment.
- C. UL-Certified, Portable Roll-Forming Equipment: UL-certified, portable roll-forming equipment capable of producing roofing panels for sheet metal roofing assemblies that comply with UL 580 for Class 90 wind-uplift resistance. Maintain UL certification of portable roll-forming equipment for duration of sheet metal roofing work.
- D. Sheet Metal Roofing Standard: Comply with SMACNA's "Architectural Sheet Metal Manual" unless more stringent requirements are specified or shown on Drawings.
- E. Preinstallation Conference: Conduct conference at Project site.
 - 1. Meet with Owner, Architect, Owner's insurer if applicable, sheet metal roofing Installer, portable roll-forming equipment manufacturer's representative for sheet metal roofing, and metal deck sheathing Installer, and installers whose work interfaces with or affects sheet metal roofing including installers of roof accessories and roof-mounted equipment.
 - 2. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
 - 3. Review methods and procedures related to sheet metal roofing installation, including portable roll-forming equipment manufacturer's written instructions.
 - 4. Examine precast concrete deck sheathing conditions for compliance with requirements, including flatness and attachment to structural members.
 - 5. Review structural loading limitations of precast concrete deck during and after roofing installation.
 - 6. Review flashings, special roofing details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that will affect sheet metal roofing.
 - 7. Review governing regulations and requirements for insurance, certificates, and testing and inspecting if applicable.
 - 8. Review temporary protection requirements for sheet metal roofing during and after roofing installation.
 - 9. Review roof observation and repair procedures after sheet metal roofing installation.

10. Document proceedings, including corrective measures and actions required, and furnish copy of record to each participant.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Do not store sheet metal roofing materials in contact with other materials that might cause staining, denting, or other surface damage. Store sheet metal roofing materials away from uncured concrete and masonry. Do not overload roof structure.
- B. Protect strippable protective covering on sheet metal roofing from exposure to sunlight and high humidity, except to the extent necessary for the period of sheet metal roofing installation.

1.9 COORDINATION

- A. Coordinate installation of roof curbs, equipment supports, and roof penetrations, which are specified in other Sections.
- B. Coordinate sheet metal roofing with rain drainage work, flashing, trim, and construction of precast concrete metal decks, parapets, walls, and other adjoining work to provide a leakproof, secure, and noncorrosive installation.

1.10 WARRANTY

- A. Special Warranty: Warranty form at the end of this Section in which Installer agrees to repair or replace components of sheet metal roofing that fail in materials or workmanship within specified warranty period.
 1. Failures include, but are not limited to, the following:
 - a. Structural failures, including but not limited to rupturing, cracking, or puncturing.
 - b. Wrinkling or buckling.
 - c. Loose parts.
 - d. Failure to remain weathertight, including uncontrolled water leakage.
 - e. Deterioration of metals, metal finishes, and other materials beyond normal weathering, including non-uniformity of color or finish.
 - f. Galvanic action between sheet metal roofing and dissimilar materials.
 2. Warranty Period: Twenty (20) years from date of Substantial Completion.
 3. Manufacturer's liability requirements: no monetary limit. Warranty coverage to include all system panels, insulations, system components and accessories including those specified in divisions 074212 and 076200. Roof system must be inspected at completion of installation and must be installed in compliance with manufacturer's application requirements and standards.
- B. Special Warranty on Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace sheet metal roofing that shows evidence of deterioration of factory-applied finishes within specified warranty period.

1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:
 - a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
 - b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
 - c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
2. Finish Warranty Period: Twenty (20) years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 ROOFING SHEET METALS

- A. Basis of Design: Firestone metal products: Una Clad UC-6 double lock standing seam metal roof.
 1. Equivalent by other manufacturer.
- B. General: Protect mechanical and other finishes on exposed surfaces from damage by applying a strippable, temporary protective film before shipping.
- C. Metallic-Coated Steel Sheet: Restricted flatness steel sheet, metallic coated by the hot-dip process and prepainted by the coil-coating process to comply with ASTM A 755/A 755M.
 1. Zinc-Coated (Galvanized) Steel Sheet: ASTM A 653/A 653M, G90 (Z275) coating designation; structural quality.
 2. Thickness: Nominal 24 gauge.
 3. Surface: Smooth, flat with pencil ribs.
 4. Form roofing panels as single lengths, no horizontal joints true to shape, accurate in size, square, and free from distribution or manufacturing defects.
 - a. Seam Height: Minimum of 1.5 inches.
 - b. Seam Spacing: 18 inches.
 - c. Seams shall be mechanically locked in the field with a mechanical seamer.
 - d. Seams shall have a factory applied integral seam sealant in leg of panel.
 5. Exposed Coil-Coated Finish:
 - a. Two-Coat Fluoropolymer: AAMA 621, Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
 6. Color: As selected by Architect from manufacturer's full range.
 7. Concealed Finish: Pretreat with manufacturer's standard white or light-colored acrylic or polyester-backer finish, consisting of prime coat and wash coat with a minimum total dry film thickness of 0.5 mil (0.013 mm).

2.2 UNDERLAYMENT MATERIALS

- A. Self-Adhering, High-Temperature Sheet: Minimum 40 mils (1.0 mm) thick, consisting of slip-resisting polyethylene-film top surface laminated to layer of butyl or SBS-modified asphalt adhesive, with release-paper backing; cold applied. Provide primer when recommended by underlayment manufacturer.
 - 1. Thermal Stability: ASTM D 1970; stable after testing at 240 deg F (116 deg C).
 - 2. Low-Temperature Flexibility: ASTM D 1970; passes after testing at minus 20 deg F (29 deg C).
 - 3. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Carlisle Coatings & Waterproofing Inc.; CCW WIP 300HT.
 - b. Grace Construction Products, a unit of W. R. Grace & Co.; Ultra.
 - c. Henry Company; Blueskin PE200 HT.
 - d. Metal-Fab Manufacturing, LLC; MetShield.
 - e. Owens Corning; WeatherLock Metal High-Temperature Underlayment.
 - f. Equivalent by other manufacturer.

- B. Slip Sheet: Building paper, 3-lb/100 sq. ft. (0.16-kg/sq. m) minimum, rosin sized.

2.3 MISCELLANEOUS MATERIALS

- A. General: Provide materials and types of fasteners, solder, welding rods, protective coatings, separators, sealants, and other miscellaneous items as required for a complete roofing system and as recommended by fabricator for sheet metal roofing.

- B. Fasteners: Wood screws, annular-threaded nails, self-tapping screws, self-locking rivets and bolts, and other suitable fasteners designed to withstand design loads.
 - 1. General:
 - a. Exposed Fasteners: Heads matching color of sheet metal roofing using plastic caps or factory-applied coating.
 - b. Fasteners for Flashing and Trim: Blind fasteners or self-drilling screws, gasketed, with hex-washer head.
 - c. Blind Fasteners: High-strength aluminum or stainless-steel rivets suitable for metal being fastened.
 - 2. Fasteners for Zinc-Coated Steel Sheet: Hot-dip galvanized steel according to ASTM A 153/A 153M, ASTM F 2329, or Series 300 stainless steel.
 - 5. Fasteners for Stainless-Steel Sheet: Series 300 stainless steel.
 - 6. Fasteners for Zinc-Tin Alloy-Coated Steel or Stainless-Steel Sheet: Series 300 stainless steel.
 - 7. Fasteners for Zinc Sheet: Hot-dip galvanized steel according to ASTM A 153/A 153M, ASTM F 2329, or Series 300 stainless steel.

- C. Sealant Tape: Pressure-sensitive, 100 percent solids, gray polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, non-sag, nontoxic, nonstaining tape 1/2 inch (13 mm) wide and 1/8 inch (3 mm) thick.
- D. Elastomeric Sealant: ASTM C 920, elastomeric polymer sealant as recommended by portable roll-forming equipment manufacturer for installation indicated; low modulus; of type, grade, class, and use classifications required to seal joints in sheet metal roofing and remain watertight.
- E. Butyl Sealant: ASTM C 1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for hooked-type expansion joints with limited movement.
- F. Bituminous Coating: Cold-applied asphalt emulsion complying with ASTM D 1187.

2.4 ACCESSORIES

- A. Sheet Metal Accessories: Provide components required for a complete sheet metal roofing assembly including trim, copings, fasciae, corner units, clips, flashings, sealants, gaskets, fillers, metal closures, closure strips, and similar items. Match material and finish of sheet metal roofing unless otherwise indicated.
 - 1. Provide accessories as recommended by portable roll-forming equipment manufacturer to produce sheet metal roofing assemblies that comply with UL 580 for wind-uplift resistance classification specified in "Quality Assurance" Article.
 - 2. Cleats: For mechanically seaming into joints and formed from the following materials:
 - a. Metallic-Coated Steel Roofing: [0.0250-inch- (0.64-mm-)] <Insert thickness> thick stainless steel.
 - 3. Clips: Minimum 0.0625-inch- (1.6-mm-) thick, stainless-steel panel clips designed to withstand negative-load requirements.
 - 4. Backing Plates: Plates at roofing splices, fabricated from material recommended by SMACNA.
 - 5. Closure Strips: Closed-cell, expanded, cellular, rubber or crosslinked, polyolefin foam or closed-cell laminated polyethylene; minimum 1-inch- (25-mm-) thick, flexible-closure strips; cut or premolded to match sheet metal roofing profile. Provide closure strips where indicated or necessary to ensure weathertight construction.
 - 6. Flashing and Trim: Formed from same material and with same finish as sheet metal roofing, minimum 0.018 inch (0.46 mm) thick.
- B. Pipe Flashing: Premolded, EPDM pipe collar with flexible aluminum ring bonded to base.
- C. Roof Curbs: Fabricated from same material and finish as sheet metal roofing, minimum thickness matching the sheet metal roofing; with bottom of skirt pro-

filed to match roof panel profiles; with weatherproof top box and integral full-length cricket. Fabricate curb subframing of nominal 0.062-inch- (1.59-mm-) thick, angle-, C-, or Z-shaped galvanized steel or stainless-steel sheet. Fabricate curb and subframing to withstand indicated loads of size and height indicated. Coordinate dimensions with rough-in information or Shop Drawings of equipment to be supported.

1. Insulate curbs with 1-inch- (25-mm-) thick, rigid insulation.
2. Install wood nailers at tops of curbs.

2.5 SNOW GUARDS

- A. Snow Guards, General: Prefabricated, noncorrosive units designed to be installed without penetrating sheet metal roofing; complete with predrilled holes, clamps, or hooks for anchoring.
1. Manufacturer's design shall meet the structural requirement of the Kentucky Building Code.
- B. Seam-Mounted, Bar-Type Snow Guards: Rail- or fence-type assembly consisting stainless-steel rods, bars, or pipe held in place by stainless-steel clamps attached to vertical ribs of standing-seam sheet metal roofing.
1. Stainless-Steel Finish: Mill.
 3. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Alpine SnowGuards; a division of Vermont Slate & Copper Services, Inc.;
 - b. LMCurbs;
 - c. Metal Roof Innovations, Ltd.;
 - d. Riddell & Company, Inc.;
 - e. Snow Management Systems; a division of Contek, Inc.;
 - f. TRA Mage Inc.;
 - g. Equivalent by other manufacturer.

2.6 FABRICATION

- A. General: Custom fabricate sheet metal roofing to comply with details shown and recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to the design, dimensions (panel width and seam height), geometry, metal thickness, and other characteristics of installation indicated. Fabricate sheet metal roofing and accessories at the shop to greatest extent possible.
1. Standing-Seam Roofing: Form standing-seam panels with finished seam height of 1-1/2 inches (38 mm).
- B. General: Fabricate roll-formed sheet metal roofing panels with UL-certified, portable roll-forming equipment capable of producing roofing panels for sheet metal roofing assemblies that comply with UL 580 for wind-uplift resistance classification specified in "Quality Assurance" Article. Fabricate roll-formed sheet

metal according to equipment manufacturer's written instructions and to comply with details shown.

- C. Fabrication Tolerances: Fabricate sheet metal roofing that is capable of installation to a tolerance of 1/4 inch in 20 feet (6 mm in 6 m) on slope and location lines as indicated and within 1/8-inch (3-mm) offset of adjoining faces and of alignment of matching profiles.
- D. Fabrication Tolerances: Fabricate sheet metal roofing that is capable of installation to tolerances specified in MCA's "Guide Specification for Residential Metal Roofing."
- E. Form exposed sheet metal work to fit substrates without excessive oil canning, buckling, and tool marks; true to line and levels indicated; and with exposed edges folded back to form hems.
 - 1. Lay out sheet metal roofing so transverse seams, if required, are made in direction of flow with higher panels overlapping lower panels.
 - 2. No transverse seams.
 - 3. Fold and cleat eaves and transverse seams in the shop.
 - 4. Form and fabricate sheets, seams, strips, cleats, valleys, ridges, edge treatments, integral flashings, and other components of metal roofing to profiles, patterns, and drainage arrangements shown on Drawings and as required for leakproof construction.
- F. Expansion Provisions: Fabricate sheet metal roofing to allow for expansion in running work sufficient to prevent leakage, damage, and deterioration of the Work. Where lapped expansion provisions cannot be used, form expansion joints of intermeshing hooked flanges, not less than 1 inch (25 mm) deep, filled with butyl sealant concealed within joints.
- G. Sealant Joints: Where movable, nonexpansion-type joints are indicated or required to produce weathertight seams, form metal to provide for proper installation of elastomeric sealant in compliance with SMACNA standards.
- H. Metal Protection: Where dissimilar metals will contact each other, protect against galvanic action by painting contact surfaces with bituminous coating, by applying self-adhering sheet underlayment to each contact surface, or by other permanent separation as recommended by fabricator of sheet metal roofing or manufacturers of the metals in contact.
- I. Sheet Metal Accessories: Custom fabricate flashings and trim to comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and other characteristics of item indicated. Obtain field measurements for accurate fit before shop fabrication.
 - 1. Form exposed sheet metal accessories without excessive oil canning, buckling, and tool marks and true to line and levels indicated, with exposed edges folded back to form hems.

2. Seams: Fabricate nonmoving seams with flat-lock seams. Tin edges to be seamed, form seams, and solder.
 3. Seams: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with elastomeric sealant unless otherwise recommended by sealant manufacturer for intended use. Rivet joints where necessary for strength.
 4. Sealed Joints: Form nonexpansion but movable joints in metal to accommodate elastomeric sealant.
 5. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces of accessories exposed to view.
 6. Fabricate cleats and attachment devices of sizes as recommended by SMACNA's "Architectural Sheet Metal Manual" for application, but not less than thickness of metal being secured.
- J. Do not use graphite pencils to mark metal surfaces.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, substrate, and other conditions affecting performance of the Work.
 1. Examine solid roof sheathing to verify that sheathing joints are supported by framing or blocking, that tops of fasteners are flush with surface, and that installation is within flatness tolerances required for finished roofing installation.
 2. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and completely anchored, and that provision has been made for drainage, flashings, and penetrations through sheet metal roofing.
- B. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
- C. Examine roughing-in for components and systems penetrating sheet metal roofing to verify actual locations of penetrations relative to seam locations of sheet metal roofing before installation.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Lay out and clip connections to precast concrete deck before installation of sheet metal roofing.
 1. Space fasteners not more than 18 inches (457 mm) minimum.
 2. Space fasteners as required by portable roll-forming equipment manufacturer for specified UL classification for wind-uplift resistance.

- B. Zinc-Tin Alloy-Coated Steel Roofing: For roofing with 3:12 slopes or less, paint underside of shop-coated, zinc-tin alloy-coated steel, before installation, with zinc-tin alloy-coated steel primer, applied at a dry film thickness of not less than 2.5 mils (0.06 mm). Comply with manufacturer's written instructions. This is in addition to the shop coating.

3.3 UNDERLAYMENT INSTALLATION

- A. Self-Adhering Sheet Underlayment: Install self-adhering sheet underlayment, wrinkle free, on roof sheathing under sheet metal roofing. Apply primer if required by underlayment manufacturer. Comply with temperature restrictions of underlayment manufacturer for installation; use primer rather than nails for installing underlayment at low temperatures. Apply over entire roof, in shingle fashion to shed water, with end laps of not less than 6 inches (150 mm) staggered 24 inches (600 mm) between courses. Overlap side edges not less than 3-1/2 inches (90 mm). Roll laps with roller. Cover underlayment within 14 days.
 - 1. Roof perimeter for a distance up from eaves of 36 inches (900 mm) beyond interior wall line.
 - 2. Valleys, from lowest to highest point, for a distance on each side of 18 inches (460 mm). Overlap ends of sheets not less than 6 inches (150 mm).
 - 3. Rake edges for a distance of 18 inches (460 mm).
 - 4. Hips and ridges for a distance on each side of 12 inches (300 mm).
 - 5. Roof to wall intersections for a distance from wall of 18 inches (460 mm).
 - 6. Around dormers, chimneys, skylights, and other penetrating elements for a distance from element of 18 inches (460 mm).
- B. Install flashings to cover underlayment to comply with requirements in Division 7 Section "Sheet Metal Flashing and Trim."
- C. Apply slip sheet before installing sheet metal roofing.

3.4 INSTALLATION, GENERAL

- A. General: Anchor sheet metal roofing and other components of the Work securely in place, with provisions for thermal and structural movement. Install fasteners, solder, welding rods, protective coatings, separators, sealants, and other miscellaneous items as required for a complete roofing system and as recommended by fabricator for sheet metal roofing.
 - 1. Field cutting of sheet metal roofing by torch is not permitted.
 - 2. Provide metal closures at peaks, rake edges, rake walls, eaves, and each side of ridge and hip caps.
 - 3. Flash and seal sheet metal roofing with closure strips at eaves, rakes, and perimeter of all openings. Fasten with self-tapping screws.
 - 4. Locate and space fastenings in uniform vertical and horizontal alignment. Pre-drill panels for fasteners.
 - 5. Install ridge and hip caps as sheet metal roofing work proceeds.

6. Locate roofing splices over, but not attached to, structural supports. Stagger roofing splices and end laps to avoid a four-panel lap splice condition. Install backing plates at roofing splices.
 7. Install sealant tape where indicated.
 8. Lap metal flashing over sheet metal roofing to allow moisture to run over and off the material.
 9. Do not use graphite pencils to mark metal surfaces.
- B. Thermal Movement. Rigidly fasten metal roof panels to structure at only one location for each panel. Allow remainder of panel to move freely for thermal expansion and contraction.
1. Point of Fixity: Fasten each panel along a single line of fixing located at eave, ridge, or center of panel length as recommended by roofing manufacturer.
 2. Avoid attaching accessories through roof panels in a manner that will inhibit thermal movement.
- C. Fasteners: Use fasteners of sizes that will penetrate precast concrete deck not less than recommended by fastener manufacturer to achieve maximum pull-out resistance.
- D. Metal Protection: Where dissimilar metals will contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with bituminous coating, by applying self-adhering sheet underlayment to each contact surface, or by other permanent separation as recommended by SMACNA.
- E. Conceal fasteners and expansion provisions where possible in exposed work and locate to minimize possibility of leakage. Cover and seal fasteners and anchors as required for a tight installation.
- F. Fascia: Align bottom of sheet metal roofing and fasten with blind rivets, bolts, or self-tapping screws. Flash and seal sheet metal roofing with closure strips where fascia meet soffits, along lower panel edges, and at perimeter of all openings.

3.5 CUSTOM-FABRICATED SHEET METAL ROOFING INSTALLATION

- A. Fabricate and install work with lines and corners of exposed units true and accurate. Form exposed faces flat and free of buckles, excessive waves, and avoidable tool marks, considering temper and reflectivity of metal. Provide uniform, neat seams with minimum exposure of solder, welds, and sealant. Fold back sheet metal to form a hem on concealed side of exposed edges unless otherwise indicated.
1. Install cleats to hold sheet metal panels in position. Attach each cleat with two fasteners to prevent rotation.
 2. Fasten cleats not more than 12 inches (300 mm) o.c. Bend tabs over fastener head.

3. Provide expansion-type cleats and clips for roof panels that exceed 30 feet (9.1 m) in length.
- B. Seal joints as shown and as required for watertight construction.
1. Where sealant-filled joints are used, embed hooked flanges of joint members not less than 1 inch (25 mm) into sealant. Form joints to completely conceal sealant. When ambient temperature at time of installation is moderate, between 40 and 70 deg F (4 and 21 deg C), set joint members for 50 percent movement each way. Adjust setting proportionately for installation at higher ambient temperatures. Do not install sealant-type joints at temperatures below 40 deg F (4 deg C).
 2. Prepare joints and apply sealants to comply with requirements in Division 7 Section "Joint Sealants."
- C. Standing-Seam Roofing: Attach standing-seam metal panels to substrate with cleats, double fastened at 12 inches (305 mm) minimum. Install panels reaching from eave to ridge before moving to adjacent panels. Before panels are interlocked, apply continuous bead of sealant to top of flange of lower panel. Lock standing seams by folding over twice so cleat and panel edges are completely engaged.
1. Loose-lock panels at eave edges to continuous cleats and flanges at roof edge at gutters.
 2. Loose-lock panels at eave edges to continuous edge flashing exposed 24 inches (610 mm) from roof edge. Attach edge flashing to face of roof edge with continuous cleat fastened to roof substrate at 12 inches (305 mm) minimum. Lock panels to edge flashing.
 3. Leave seams upright after locking at ridges and hips.
- D. Field Painting: Paint exposed surfaces of zinc-tin alloy-coated steel with one coat of zinc-tin alloy-coated steel primer and one coat of zinc-tin alloy-coated steel finish coat as soon as possible after installation; apply each coat at a dry film thickness of not less than 2.5 mils (0.06 mm). Comply with manufacturer's written instructions.

3.6 ON-SITE, ROLL-FORMED SHEET METAL ROOFING INSTALLATION

- A. General: Install on-site, roll-formed sheet metal roofing fabricated from UL-certified equipment to comply with equipment manufacturer's written instructions for UL wind-uplift resistance class indicated. Provide sheet metal roofing of full length from eave to ridge unless otherwise restricted by on-site or shipping limitations.
- B. Standing-Seam Sheet Metal Roofing: Fasten sheet metal roofing to supports with concealed clips at each standing-seam joint at location, at spacing, and with fasteners recommended by manufacturer of portable roll-forming equipment.
1. Install clips to substrate with self-tapping fasteners.

2. Install pressure plates at locations indicated in equipment manufacturer's written installation instructions.
 3. Before panels are joined, apply continuous bead of sealant to top of flange of lower panel.
 4. Snap-On Seam: Nest standing seams and fasten together by interlocking and completely engaging field-applied sealant.
 5. Seamed Joint: Crimp standing seams with manufacturer-approved motorized seamer tool so cleat, sheet metal roofing, and field-applied sealant are completely engaged.
- C. Seal joints as shown and as required for watertight construction. For roofing with 3:12 slopes or less, use cleats at transverse seams.
1. Where sealant-filled joints are used, embed hooked flanges of joint members not less than 1 inch (25 mm) into sealant. Form joints to completely conceal sealant. When ambient temperature at time of installation is moderate, between 40 and 70 deg F (4 and 21 deg C), set joint members for 50 percent movement either way. Adjust setting proportionately for installation at higher ambient temperatures. Do not install sealant-type joints at temperatures below 40 deg F (4 deg C).
 2. Prepare joints and apply sealants to comply with requirements in Division 7 Section "Joint Sealants."

3.7 ACCESSORY INSTALLATION

- A. General: Install accessories with positive anchorage to building and weathertight mounting and provide for thermal expansion. Coordinate installation with flashings and other components.
1. Install components required for a complete sheet metal roofing assembly including trim, copings, seam covers, flashings, sealants, gaskets, fillers, metal closures, closure strips, and similar items.
 2. Install accessories integral to sheet metal roofing that are specified in Division 7 Section "Sheet Metal Flashing and Trim" to comply with that Section's requirements.
- B. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints, and seams that will be permanently watertight and weather resistant.
1. Install flashing and trim as required to seal against weather and to provide finished appearance. Locations include, but are not limited to, eaves, rakes, corners, bases, framed openings, ridges, fasciae, and fillers.
 2. Install continuous strip of self-adhering underlayment at edge of continuous flashing overlapping self-adhering underlayment, where "continuous seal strip" is indicated in SMACNA's "Architectural Sheet Metal Manual," and where indicated on Drawings.

3. Install exposed flashing and trim without excessive oil canning, buckling, and tool marks and true to line and levels indicated, with exposed edges folded back to form hems. Install sheet metal flashing and trim to fit substrates and to result in waterproof and weather-resistant performance.
 4. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet (3 m) with no joints allowed within 24 inches (600 mm) of corner or intersection. Where lapped expansion provisions cannot be used or would not be sufficiently weather resistant and waterproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch (25 mm) deep, and filled with butyl sealant concealed within joints.
- C. Pipe Flashing: Form flashing around pipe penetration and sheet metal roofing. Fasten and seal to sheet metal roofing as recommended by SMACNA.
- D. Roof Curbs: Install curbs at locations indicated on Drawings. Install flashing around bases where they meet sheet metal roofing.
- E. Bar-Type Snow Guards: Attach bar supports to vertical ribs of standing-seam sheet metal roofing with clamps or set screws. Do not use fasteners that will penetrate sheet metal roofing.
1. Provide two (2) rows of snow guards, at locations indicated on Drawings, spaced as recommended by the roofing manufacturer.

3.8 ERECTION TOLERANCES

- A. Installation Tolerances: Shim and align sheet metal roofing within installed tolerance of 1/4 inch in 20 feet (6 mm in 6 m) on slope and location lines as indicated and within 1/8-inch (3-mm) offset of adjoining faces and of alignment of matching profiles.
- B. Installation Tolerances: Shim and align sheet metal roofing within installed tolerances specified in MCA's "Guide Specification for Residential Metal Roofing."

3.9 CLEANING AND PROTECTION

- A. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.
- B. Clean and neutralize flux materials. Clean off excess solder.
- C. Clean off excess sealants.
- D. Remove temporary protective coverings and strippable films as sheet metal roofing is installed unless otherwise indicated in manufacturer's written installation instructions. On completion of sheet metal roofing installation, clean finished

surfaces as recommended by sheet metal roofing manufacturer. Maintain sheet metal roofing in a clean condition during construction.

- E. Replace sheet metal roofing components that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

3.10 ROOFING INSTALLER'S WARRANTY

- A. WHEREAS <Insert name> of <Insert address>, herein called the "Roofing Installer," has performed roofing and associated work ("work") on the following project:
 - 1. Owner: <Insert name of Owner>.
 - 2. Address: <Insert address>.
 - 3. Building Name/Type: <Insert information>.
 - 4. Address: <Insert address>.
 - 5. Area of Work: <Insert information>.
 - 6. Acceptance Date: <Insert date>.
 - 7. Warranty Period: <Insert time>.
 - 8. Expiration Date: <Insert date>.

- B. AND WHEREAS Roofing Installer has contracted (either directly with Owner or indirectly as a subcontractor) to warrant said work against leaks and faulty or defective materials and workmanship for designated Warranty Period,

- C. NOW THEREFORE Roofing Installer hereby warrants, subject to terms and conditions herein set forth, that during Warranty Period he will, at his own cost and expense, make or cause to be made such repairs to or replacements of said work as are necessary to correct faulty and defective work and as are necessary to maintain said work in a watertight condition.

- D. This Warranty is made subject to the following terms and conditions:
 - 1. Specifically excluded from this Warranty are damages to work and other parts of the building, and to building contents, caused by:
 - a. Lightning;
 - b. Peak gust wind speed exceeding <Insert wind speed> mph (m/sec);
 - c. Fire;
 - d. Failure of roofing system substrate, including cracking, settlement, excessive deflection, deterioration, and decomposition;
 - e. Faulty construction of parapet walls, copings, chimneys, skylights, vents, equipment supports, and other edge conditions and penetrations of the work;
 - f. Vapor condensation on bottom of roofing; and
 - g. Activity on roofing by others, including construction contractors, maintenance personnel, other persons, and animals, whether authorized or unauthorized by Owner.

2. When work has been damaged by any of foregoing causes, Warranty shall be null and void until such damage has been repaired by Roofing Installer and until cost and expense thereof have been paid by Owner or by another responsible party so designated.
3. Roofing Installer is responsible for damage to work covered by this Warranty but is not liable for consequential damages to building or building contents resulting from leaks or faults or defects of work.
4. During Warranty Period, if Owner allows alteration of work by anyone other than Roofing Installer, including cutting, patching, and maintenance in connection with penetrations, attachment of other work, and positioning of anything on roof, this Warranty shall become null and void on date of said alterations, but only to the extent said alterations affect work covered by this Warranty. If Owner engages Roofing Installer to perform said alterations, Warranty shall not become null and void unless Roofing Installer, before starting said work, shall have notified Owner in writing, showing reasonable cause for claim, that said alterations would likely damage or deteriorate work, thereby reasonably justifying a limitation or termination of this Warranty.
5. During Warranty Period, if original use of roof is changed and it becomes used for, but was not originally specified for, a promenade, work deck, spray-cooled surface, flooded basin, or other use or service more severe than originally specified, this Warranty shall become null and void on date of said change, but only to the extent said change affects work covered by this Warranty.
6. Owner shall promptly notify Roofing Installer of observed, known, or suspected leaks, defects, or deterioration and shall afford reasonable opportunity for Roofing Installer to inspect work and to examine evidence of such leaks, defects, or deterioration.
7. This Warranty is recognized to be the only warranty of Roofing Installer on said work and shall not operate to restrict or cut off Owner from other remedies and resources lawfully available to Owner in cases of roofing failure. Specifically, this Warranty shall not operate to relieve Roofing Installer of responsibility for performance of original work according to requirements of the Contract Documents, regardless of whether Contract was a contract directly with Owner or a subcontract with Owner's General Contractor.

E. IN WITNESS THEREOF, this instrument has been duly executed this <Insert day> day of <Insert month>, <Insert year>.

1. Authorized Signature: <Insert signature>.
2. Name: <Insert name>.
3. Title: <Insert title>.

+ + END OF SECTION + +

SECTION 07620

SHEET METAL FLASHING AND TRIM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Formed Products:
 - a. Formed roof drainage sheet metal fabrications.
 - b. Formed low-slope roof sheet metal fabrications.
- B. Related Sections:
 - 1. Division 5 Section "Architectural Joint Systems" for manufactured sheet metal expansion-joint covers.
 - 2. Division 6 Section "[Rough Carpentry] [Miscellaneous Carpentry]" for wood nailers, curbs, and blocking.
 - 3. Division 7 Section "<Insert Section title for type of membrane roofing>" for installing sheet metal flashing and trim integral with membrane roofing.
 - 4. Division 7 Section "Sheet Metal Roofing" for custom-formed sheet metal flashing and trim integral with sheet metal roofing.

1.3 PERFORMANCE REQUIREMENTS

- A. General: Sheet metal flashing and trim assemblies as indicated shall withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Completed sheet metal flashing and trim shall not rattle, leak, or loosen, and shall remain watertight.
- B. Thermal Movements: Provide sheet metal flashing and trim that allows for thermal movements from ambient and surface temperature changes.
 - 1. Temperature Change (Range): 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each manufactured product and accessory.

- B. Shop Drawings: Show fabrication and installation layouts of sheet metal flashing and trim, including plans, elevations, expansion-joint locations, and keyed details. Distinguish between shop- and field-assembled work. Include the following:
1. Identification of material, thickness, weight, and finish for each item and location in Project.
 2. Details for forming sheet metal flashing and trim, including profiles, shapes, seams, and dimensions.
 3. Details for joining, supporting, and securing sheet metal flashing and trim, including layout of fasteners, cleats, clips, and other attachments. Include pattern of seams.
 4. Details of termination points and assemblies, including fixed points.
 5. Details of expansion joints and expansion-joint covers, including showing direction of expansion and contraction.
 6. Details of edge conditions, including eaves, ridges, valleys, rakes, crickets, and counterflashings as applicable.
 7. Details of special conditions.
 8. Details of connections to adjoining work.
 9. Detail formed flashing and trim at a scale of not less than 3 inches per 12 inches (1:5).
- C. Samples for Initial Selection: For each type of sheet metal flashing, trim, and accessory indicated with factory-applied color finishes involving color selection.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified fabricator.
- B. Warranty: Sample of special warranty.

1.6 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For sheet metal flashing, trim, and accessories to include in maintenance manuals.

1.7 QUALITY ASSURANCE

- A. Fabricator Qualifications: Shop that employs skilled workers who custom fabricate sheet metal flashing and trim similar to that required for this Project and whose products have a record of successful in-service performance.
- B. Sheet Metal Flashing and Trim Standard: Comply with SMACNA's "Architectural Sheet Metal Manual" unless more stringent requirements are specified or shown on Drawings.

- C. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.
 - 1. Build mockup of typical roof eave, including [built-in gutter] [fascia] [fascia trim] [apron flashing] <Insert item>, approximately [10 feet (3.0 m)] <Insert dimension> long, including supporting construction cleats, seams, attachments[, underlayment,] and accessories.
 - 2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
 - 3. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

- D. Preinstallation Conference: Conduct conference at Project site.
 - 1. Meet with Owner, Architect, Owner's insurer if applicable, Installer, and installers whose work interfaces with or affects sheet metal flashing and trim including installers of roofing materials, roof accessories, unit skylights, and roof-mounted equipment.
 - 2. Review methods and procedures related to sheet metal flashing and trim.
 - 3. Examine substrate conditions for compliance with requirements, including flatness and attachment to structural members.
 - 4. Review special roof details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that will affect sheet metal flashing.
 - 5. Document proceedings, including corrective measures and actions required, and furnish copy of record to each participant.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Do not store sheet metal flashing and trim materials in contact with other materials that might cause staining, denting, or other surface damage. Store sheet metal flashing and trim materials away from uncured concrete and masonry.

- B. Protect strippable protective covering on sheet metal flashing and trim from exposure to sunlight and high humidity, except to the extent necessary for the period of sheet metal flashing and trim installation.

1.9 WARRANTY

- A. Special Warranty on Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace sheet metal flashing and trim that shows evidence of deterioration of factory-applied finishes within specified warranty period.
 - 1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:
 - a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.

- b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
 - c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
2. Finish Warranty Period: (20) twenty years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 SHEET METALS

- A. General: Protect mechanical and other finishes on exposed surfaces from damage by applying a strippable, temporary protective film before shipping.
- 1. Exposed Coil-Coated Finishes:
 - a. Two-Coat Fluoropolymer: AAMA 620. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
 - 2. Color: As selected by Architect from manufacturer's full range.
 - 3. Concealed Finish: Pretreat with manufacturer's standard white or light-colored acrylic or polyester backer finish, consisting of prime coat and wash coat with a minimum total dry film thickness of 0.5 mil (0.013 mm).

2.2 MISCELLANEOUS MATERIALS

- A. General: Provide materials and types of fasteners, solder, welding rods, protective coatings, separators, sealants, and other miscellaneous items as required for complete sheet metal flashing and trim installation and recommended by manufacturer of primary sheet metal[or manufactured item] unless otherwise indicated.
- B. Fasteners: Wood screws, annular threaded nails, self-tapping screws, self-locking rivets and bolts, and other suitable fasteners designed to withstand design loads and recommended by manufacturer of primary sheet metal[or manufactured item].
- 1. General: Blind fasteners or self-drilling screws, gasketed, with hex-washer head.
 - a. Exposed Fasteners: Heads matching color of sheet metal using plastic caps or factory-applied coating.
 - b. Blind Fasteners: High-strength aluminum or stainless-steel rivets suitable for metal being fastened.
 - c. Gutter Straps: Same material as gutter; with fasteners matching internal gutter width.
- C. Sealant Tape: Pressure-sensitive, 100 percent solids, gray polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, non-sag, nontoxic, nonstaining tape 1/2 inch (13 mm) wide and 1/8 inch (3 mm) thick.

- D. Elastomeric Sealant: ASTM C 920, elastomeric [polyurethane] [polysulfide] [silicone] polymer sealant; low modulus; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.
- E. Butyl Sealant: ASTM C 1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for hooked-type expansion joints with limited movement.
- F. Epoxy Seam Sealer: Two-part, noncorrosive, aluminum seam-cementing compound, recommended by aluminum manufacturer for exterior nonmoving joints, including riveted joints.

2.3 FABRICATION, GENERAL

- A. General: Custom fabricate sheet metal flashing and trim to comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, geometry, metal thickness, and other characteristics of item indicated. Fabricate items at the shop to greatest extent possible.
 - 1. Fabricate sheet metal flashing and trim in thickness or weight needed to comply with performance requirements, but not less than that specified for each application and metal.
 - 2. Obtain field measurements for accurate fit before shop fabrication.
 - 3. Form sheet metal flashing and trim without excessive oil canning, buckling, and tool marks and true to line and levels indicated, with exposed edges folded back to form hems.
 - 4. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces exposed to view.
- B. Fabrication Tolerances: Fabricate sheet metal flashing and trim that is capable of installation to a tolerance of 1/4 inch in 20 feet (6 mm in 6 m) on slope and location lines as indicated and within 1/8-inch (3-mm) offset of adjoining faces and of alignment of matching profiles.
- C. Fabrication Tolerances: Fabricate sheet metal flashing and trim that is capable of installation to tolerances specified in MCA's "Guide Specification for Residential Metal Roofing."
- D. Sealed Joints: Form nonexpansion but movable joints in metal to accommodate elastomeric sealant.
- E. Expansion Provisions: Where lapped expansion provisions cannot be used, form expansion joints of intermeshing hooked flanges, not less than 1 inch (25 mm) deep, filled with butyl sealant concealed within joints.
- F. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal.

- G. Fabricate cleats and attachment devices of sizes as recommended by SMACNA's "Architectural Sheet Metal Manual"[and by FMG Loss Prevention Data Sheet 1-49] for application, but not less than thickness of metal being secured.
- H. Seams: Fabricate nonmoving seams with flat-lock seams. Tin edges to be seamed, form seams, and solder.
- I. Seams: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with elastomeric sealant unless otherwise recommended by sealant manufacturer for intended use.[Rivet joints where necessary for strength.]
- J. Seams for Aluminum: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with epoxy seam sealer.[Rivet joints where necessary for strength.]
- K. Do not use graphite pencils to mark metal surfaces.

2.4 ROOF DRAINAGE SHEET METAL FABRICATIONS

- A. Hanging Gutters: Fabricate to cross section indicated, complete with end pieces, outlet tubes, and other accessories as required. Fabricate in minimum 96-inch- (2400-mm-) long sections. Furnish flat-stock gutter spacers and gutter brackets/straps fabricated from same metal as gutters, of size recommended by SMACNA but not less than twice the gutter thickness. Fabricate expansion joints, expansion-joint covers,[gutter bead reinforcing bars,] and gutter accessories from same metal as gutters.
 - 1. Gutter Style: SMACNA designation A.
 - 2. Expansion Joints: Lap type.
 - 3. Accessories: Wire ball downspout strainer.
 - 4. Gutters with Girth up to 15 Inches (380 mm): Fabricate from the following materials:
 - a. Galvanized Steel: 0.022 inch (0.56 mm).
- B. Downspouts: Fabricate rectangular downspouts complete with mitered elbows. Furnish with metal hangers, from same material as downspouts, and anchors.
 - 1. Fabricated Hanger Style: SMACNA figure designation 1-35B.
 - 2. Fabricate from the following materials:
 - a. Galvanized Steel: 0.022 inch (0.56 mm) thick.

2.5 LOW-SLOPE ROOF SHEET METAL FABRICATIONS

- A. Roof-Edge Flashing / Drip Edge: Fabricate in minimum 96-inch- (2400-mm-) long, but not exceeding 10-foot- (3-m-) long, sections. Furnish with 6-inch- (150-mm-) wide, joint cover plates.
 - 1. Joint Style: Lap, 4 inches (100 mm) wide.
 - 2. Fabricate from the following materials:
 - a. Galvanized Steel: 0.028 inch (0.71 mm) thick.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, to verify actual locations, dimensions and other conditions affecting performance of the Work.
 - 1. Verify compliance with requirements for installation tolerances of substrates.
 - 2. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.
- B. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 UNDERLAYMENT INSTALLATION

- A. General: Install underlayment as indicated on Drawings.
- B. Polyethylene Sheet: Install polyethylene sheet with adhesive for anchorage to minimize use of mechanical fasteners under sheet metal flashing and trim. Apply in shingle fashion to shed water, with lapped and taped joints of not less than 2 inches (50 mm).
- C. Felt Underlayment: Install felt underlayment with adhesive for temporary anchorage to minimize use of mechanical fasteners under sheet metal flashing and trim. Apply in shingle fashion to shed water, with lapped joints of not less than 2 inches (50 mm).
- D. Self-Adhering Sheet Underlayment: Install self-adhering sheet underlayment, wrinkle free. Apply primer if required by underlayment manufacturer. Comply with temperature restrictions of underlayment manufacturer for installation; use primer rather than nails for installing underlayment at low temperatures. Apply in shingle fashion to shed water, with end laps of not less than 6 inches (150 mm) staggered 24 inches (600 mm) between courses. Overlap side edges not less than 3-1/2 inches (90 mm). Roll laps with roller. Cover underlayment within 14 days.

3.3 INSTALLATION, GENERAL

- A. General: Anchor sheet metal flashing and trim and other components of the Work securely in place, with provisions for thermal and structural movement. Use fasteners, solder, welding rods, protective coatings, separators, sealants, and other miscellaneous items as required to complete sheet metal flashing and trim system.
 - 1. Install sheet metal flashing and trim true to line and levels indicated. Provide uniform, neat seams with minimum exposure of solder, welds, and sealant.

2. Install sheet metal flashing and trim to fit substrates and to result in watertight performance. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.
 3. Space cleats not more than 12 inches (300 mm) apart. Anchor each cleat with two fasteners. Bend tabs over fasteners.
 4. Install exposed sheet metal flashing and trim without excessive oil canning, buckling, and tool marks.
 5. Install sealant tape where indicated.
 6. Torch cutting of sheet metal flashing and trim is not permitted.
 7. Do not use graphite pencils to mark metal surfaces.
- B. Metal Protection: Where dissimilar metals will contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with bituminous coating or by other permanent separation as recommended by SMACNA.
1. Coat back side of [uncoated aluminum] [and] [stainless-steel] sheet metal flashing and trim with bituminous coating where flashing and trim will contact wood, ferrous metal, or cementitious construction.
 2. Underlayment: Where installing metal flashing directly on cementitious or wood substrates, install a course of felt underlayment and cover with a slip sheet or install a course of polyethylene sheet.
- C. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of [10 feet (3 m)] <Insert dimension> with no joints allowed within 24 inches (600 mm) of corner or intersection. Where lapped expansion provisions cannot be used or would not be sufficiently watertight, form expansion joints of intermeshing hooked flanges, not less than 1 inch (25 mm) deep, filled with sealant concealed within joints.
- D. Fastener Sizes: Use fasteners of sizes that will penetrate [wood sheathing not less than 1-1/4 inches (32 mm) for nails and not less than 3/4 inch (19 mm) for wood screws] [metal decking not less than recommended by fastener manufacturer to achieve maximum pull-out resistance] <Insert size requirement>.
- E. Seal joints as shown and as required for watertight construction.
1. Where sealant-filled joints are used, embed hooked flanges of joint members not less than 1 inch (25 mm) into sealant. Form joints to completely conceal sealant. When ambient temperature at time of installation is moderate, between 40 and 70 deg F (4 and 21 deg C), set joint members for 50 percent movement each way. Adjust setting proportionately for installation at higher ambient temperatures. Do not install sealant-type joints at temperatures below 40 deg F (4 deg C).
 2. Prepare joints and apply sealants to comply with requirements in Division 7 Section "Joint Sealants."
- F. Rivets: Rivet joints in uncoated aluminum where indicated and where necessary for strength.

3.4 ROOF DRAINAGE SYSTEM INSTALLATION

- A. General: Install sheet metal roof drainage items to produce complete roof drainage system according to SMACNA recommendations and as indicated. Coordinate installation of roof perimeter flashing with installation of roof drainage system.

- B. Hanging Gutters: Join sections with riveted and soldered joints or with lapped joints sealed with sealant. Provide for thermal expansion. Attach gutters at eave or fascia to firmly anchored gutter brackets or straps spaced not more than 36 inches (900 mm) apart. Provide end closures and seal watertight with sealant. Slope to downspouts.
 - 1. Fasten gutter spacers to front and back of gutter.
 - 2. Loosely lock straps to front gutter bead and anchor to roof deck.
 - 3. Anchor and loosely lock back edge of gutter to continuous [cleat] [eave or apron flashing].
 - 4. Anchor back of gutter that extends onto roof deck with cleats spaced not more than 24 inches (600 mm) apart.
 - 5. Install gutter with expansion joints at locations indicated, but not exceeding, 50 feet (15.24 m) apart. Install expansion-joint caps.

- D. Downspouts: Join sections with 1-1/2-inch (38-mm) telescoping joints.
 - 1. Provide hangers with fasteners designed to hold downspouts securely to walls. Locate hangers at top and bottom and at approximately 60 inches (1500 mm) o.c. in between.
 - 2. Provide elbows at base of downspout to direct water away from building.
 - 3. Connect downspouts to underground drainage system indicated.

3.5 MISCELLANEOUS FLASHING INSTALLATION

- A. Overhead-Piping Safety Pans: Suspend pans independent from structure above as indicated on Drawings. Pipe and install drain line to plumbing waste or drainage system.

- B. Equipment Support Flashing: Coordinate installation of equipment support flashing with installation of roofing and equipment. Weld or seal flashing with elastomeric sealant to equipment support member.

3.6 ERECTION TOLERANCES

- A. Installation Tolerances: Shim and align sheet metal flashing and trim within installed tolerance of 1/4 inch in 20 feet (6 mm in 6 m) on slope and location lines as indicated and within 1/8-inch (3-mm) offset of adjoining faces and of alignment of matching profiles.

- B. Installation Tolerances: Shim and align sheet metal flashing and trim within installed tolerances specified in MCA's "Guide Specification for Residential Metal Roofing."

3.7 CLEANING AND PROTECTION

- A. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.
- B. Clean and neutralize flux materials. Clean off excess solder.
- C. Clean off excess sealants.
- D. Remove temporary protective coverings and strippable films as sheet metal flashing and trim are installed unless otherwise indicated in manufacturer's written installation instructions. On completion of installation, remove unused materials and clean finished surfaces. Maintain in a clean condition during construction.
- E. Replace sheet metal flashing and trim that have been damaged or that have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

+ + END OF SECTION + +

SECTION 07920

JOINT SEALANTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Urethane joint sealants.
- B. Related Sections:
 - 1. Division 2 Section "Pavement Joint Sealants" for sealing joints in pavements, walkways, and curbing.
 - 2. Division 4 Section "Unit Masonry Assemblies" for masonry control and expansion joint fillers and gaskets.
 - 3. Division 5 Section "Architectural Joint Systems" for building expansion joints.
 - 4. Division 8 Section "Glazing" for glazing sealants.

1.3 PRECONSTRUCTION TESTING

- A. Preconstruction Compatibility and Adhesion Testing: Submit to joint-sealant manufacturers, for testing indicated below, samples of materials that will contact or affect joint sealants.
 - 1. Use ASTM C 1087 manufacturer's standard test method to determine whether priming and other specific joint preparation techniques are required to obtain rapid, optimum adhesion of joint sealants to joint substrates.
 - 2. Submit not fewer than eight (8) pieces of each kind of material, including joint substrates, shims, joint-sealant backings, secondary seals, and miscellaneous materials.
 - 3. Schedule sufficient time for testing and analyzing results to prevent delaying the Work.
 - 4. For materials failing tests, obtain joint-sealant manufacturer's written instructions for corrective measures including use of specially formulated primers.
 - 5. Testing will not be required if joint-sealant manufacturers submit joint preparation data that are based on previous testing, not older than 24 months, of sealant products for adhesion to, and compatibility with, joint substrates and other materials matching those submitted.

- B. Preconstruction Field-Adhesion Testing: Before installing sealants, field test their adhesion to Project joint substrates as follows:
1. Locate test joints where indicated on Project or, if not indicated, as directed by Architect.
 2. Conduct field tests for each application indicated below:
 - a. Each kind of sealant and joint substrate indicated.
 3. Notify Architect seven days in advance of dates and times when test joints will be erected.
 4. Arrange for tests to take place with joint-sealant manufacturer's technical representative present.
 - a. Test Method: Test joint sealants according to Method A, Field-Applied Sealant Joint Hand Pull Tab, in Appendix X1 in ASTM C 1193 or Method A, Tail Procedure, in ASTM C 1521.
 - 1) For joints with dissimilar substrates, verify adhesion to each substrate separately; extend cut along one side, verifying adhesion to opposite side. Repeat procedure for opposite side.
 5. Report whether sealant failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each kind 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 noncompliance with requirements, will be considered satisfactory. Do not use sealants that fail to adhere to joint substrates during testing.

1.4 ACTION SUBMITTALS

- A. Product Data: For each joint-sealant product indicated.
- B. LEED Submittals:
1. Project will not be certified however shall meet the intent.
 2. Product Data for Credit IEQ 4.1: For sealants and sealant primers used inside the weatherproofing system, documentation including printed statement of VOC content.
 3. Laboratory Test Reports for Credit IEQ 4: For sealants and sealant primers used inside the weatherproofing system, documentation indicating that products comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- 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. Samples for Verification: For each kind and color of joint sealant required, provide Samples with joint sealants in 1/2-inch- (13-mm-) wide joints formed between two 6-inch- (150-mm-) long strips of material matching the appearance of exposed surfaces adjacent to joint sealants.
- E. 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.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified Installer.
- B. Product Certificates: For each kind of joint sealant and accessory, from manufacturer.
- C. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, indicating that sealants comply with requirements.
- D. Preconstruction Compatibility and Adhesion Test Reports: From sealant manufacturer, indicating the following:
 - 1. Materials forming joint substrates and joint-sealant backings have been tested for compatibility and adhesion with joint sealants.
 - 2. Interpretation of test results and written recommendations for primers and substrate preparation needed for adhesion.
- E. Preconstruction Field-Adhesion Test Reports: Indicate which sealants and joint preparation methods resulted in optimum adhesion to joint substrates based on testing specified in "Preconstruction Testing" Article.
- F. Field-Adhesion Test Reports: For each sealant application tested.
- G. Warranties: Sample of special warranties.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.
- B. Source Limitations: Obtain each kind of joint sealant from single source from single manufacturer.
- C. Product Testing: Test joint sealants using a qualified testing agency.

1. Testing Agency Qualifications: An independent testing agency qualified according to ASTM C 1021 to conduct the testing indicated.
 2. Test according to SWRI's Sealant Validation Program for compliance with requirements specified by reference to ASTM C 920 for adhesion and cohesion under cyclic movement, adhesion-in-peel, and indentation hardness.
- D. Mockups: Install sealant in mockups of assemblies specified in other Sections that are indicated to receive joint sealants specified in this Section. Use materials and installation methods specified in this Section.
- E. Preinstallation Conference: Conduct conference at Project site.

1.7 PROJECT CONDITIONS

- A. 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 or are below 40 deg F (5 deg C).
 2. When joint substrates are wet.
 3. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.
 4. Where contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

1.8 WARRANTY

- A. Special Installer's Warranty: Manufacturer's standard form in which Installer agrees to repair or replace joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.
1. Warranty Period: (2) Two years from date of Substantial Completion.
- B. Special Manufacturer's Warranty: Manufacturer's standard form in which joint-sealant manufacturer agrees to furnish 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: (5) Five years from date of Substantial Completion.
- C. Special warranties specified in this article exclude deterioration or failure of joint sealants from the following:
1. Movement of the structure caused by structural settlement or errors attributable to design or construction resulting in stresses on the sealant exceeding sealant manufacturer's written specifications for sealant elongation and compression.
 2. Disintegration of joint substrates from natural causes exceeding design specifications.
 3. Mechanical damage caused by individuals, tools, or other outside agents.

4. Changes in sealant appearance caused by accumulation of dirt or other atmospheric contaminants.

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 joint-sealant manufacturer, based on testing and field experience.
- B. VOC Content of Interior Sealants: Sealants and sealant primers used inside the weatherproofing system shall comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
 1. Architectural Sealants: 250 g/L.
 2. Sealant Primers for Nonporous Substrates: 250 g/L.
 3. Sealant Primers for Porous Substrates: 775 g/L.
- C. Low-Emitting Interior Sealants: Sealants and sealant primers used inside the weatherproofing system shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- D. Liquid-Applied Joint Sealants: Comply with ASTM C 920 and other requirements indicated for each liquid-applied joint sealant specified, including those referencing ASTM C 920 classifications for type, grade, class, and uses related to exposure and joint substrates.
 1. Suitability for Immersion in Liquids. Where sealants are indicated for Use I for joints that will be continuously immersed in liquids, provide products that have undergone testing according to ASTM C 1247. Liquid used for testing sealants is deionized water, unless otherwise indicated.
- E. Stain-Test-Response Characteristics: Where sealants are specified to be nonstaining to porous substrates, provide products that have undergone testing according to ASTM C 1248 and have not stained porous joint substrates indicated for Project.
- F. Suitability for Contact with Food: Where sealants are indicated for joints that will come in repeated contact with food, provide products that comply with 21 CFR 177.2600.
- G. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range.

2.2 URETHANE JOINT SEALANTS

- A. Single-Component, Pourable, Traffic-Grade, Urethane Joint Sealant: ASTM C 920, Type S, Grade P, Class 25, for Use T.
1. Exterior horizontal joints in concrete walks.
 2. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. BASF Building Systems; Sonolastic SL 1.
 - b. Bostik, Inc.; Chem-Calk 950.
 - c. May National Associates, Inc.; Bondaflex PUR 35 SL.
 - d. Pecora Corporation; Urexpan NR-201.
 - e. Polymeric Systems, Inc.; Flexiprene 952.
 - f. Schnee-Morehead, Inc.; Permathane SM7101.
 - g. Sika Corporation. Construction Products Division; Sikaflex - 1CSL.
 - h. Tremco Incorporated; Vulkem 45.
 - i. Equivalent by other manufacturer.
- B. Multicomponent, Nonsag, Urethane Joint Sealant: ASTM C 920, Type M, Grade NS, Class 25, for Use NT.
1. Interior and exterior vertical joints in concrete masonry, and where concrete and masonry adjoin windows and doors.
 2. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. BASF Building Systems; Sonolastic NP 2.
 - b. Bostik, Inc.; Chem-Calk 500.
 - c. May National Associates, Inc.; Bondaflex PUR 2 NS.
 - d. Pacific Polymers International, Inc.; Elasto-Thane 227 High Shore Type II
 - e. Pecora Corporation; Dynatred.
 - f. Sika Corporation, Construction Products Division; Sikaflex - 2c NS
 - g. Tremco Incorporated; Vulkem 227.

2.3 JOINT SEALANT BACKING

- A. General: Provide sealant backings of material that are nonstaining; 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 C 1330, Type C (closed-cell material with a surface skin) and of size and density to control sealant depth and otherwise contribute to producing 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. Provide self-adhesive tape where applicable.

2.4 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 Nonporous 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 nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants to joint substrates.
- C. Masking Tape: Nonstaining, nonabsorbent 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, 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 after cleaning operations above by vacuuming or

blowing out joints with oil-free compressed air. Porous joint substrates include the following:

- a. Concrete.
- b. Masonry.
- c. Unglazed surfaces of ceramic tile.
- d. Exterior insulation and finish systems.

3. Remove laitance and form-release agents from concrete.

4. Clean nonporous joint substrate surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants. Nonporous joint substrates include the following:

- a. Metal.
- b. Glass.
- c. Porcelain enamel.
- d. Glazed surfaces of ceramic tile.

B. **Joint Priming:** Prime joint substrates where recommended by joint-sealant manufacturer or as indicated by 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 or primer 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 in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.

C. **Install sealant backings of kind 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 backs of joints.
- E. Install sealants using proven techniques that 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 in each joint configuration.
 - 3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.
- F. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified in subparagraphs 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 sealant from surfaces adjacent to joints.
 - 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 profile per Figure 8A in ASTM C 1193, unless otherwise indicated.
 - 4. Provide flush joint profile where indicated per Figure 8B in ASTM C 1193.
 - 5. Provide recessed joint configuration of recess depth and at locations indicated per Figure 8C in ASTM C 1193.
 - a. Use masking tape to protect surfaces adjacent to recessed tooled joints.
- G. Installation of Preformed Silicone-Sealant System: Comply with the following requirements:
 - 1. Apply masking tape to each side of joint, outside of area to be covered by sealant system.
 - 2. Apply silicone sealant to each side of joint to produce a bead of size complying with preformed silicone-sealant system manufacturer's written instructions and covering a bonding area of not less than 3/8 inch (10 mm). Hold edge of sealant bead 1/4 inch (6 mm) inside masking tape.
 - 3. Within 10 minutes of sealant application, press silicone extrusion into sealant to wet extrusion and substrate. Use a roller to apply consistent pressure and ensure uniform contact between sealant and both extrusion and substrate.
 - 4. Complete installation of sealant system in horizontal joints before installing in vertical joints. Lap vertical joints over horizontal joints. At ends of joints, cut silicone extrusion with a razor knife.
- H. Installation of Preformed Foam Sealants: Install each length of sealant immediately after removing protective wrapping. Do not pull or stretch material. Produce seal continuity at ends, turns, and intersections of joints. For applications at low ambient temperatures, apply heat to sealant in compliance with sealant manufacturer's written instructions.

- I. Acoustical Sealant Installation: At sound-rated assemblies and elsewhere as indicated, seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations. Comply with ASTM C 919 and with manufacturer's written recommendations.

3.4 FIELD QUALITY CONTROL

- A. Field-Adhesion Testing: Field test joint-sealant adhesion to joint substrates as follows:
 1. Extent of Testing: Test completed and cured sealant joints as follows:
 - a. Perform (10) ten tests for the first for each kind of sealant and joint substrate.
 2. Test Method: Test joint sealants according to Method A, Field-Applied Sealant Joint Hand Pull Tab, in Appendix X1 in ASTM C 1193 or Method A, Tail Procedure, in ASTM C 1521.
 - a. For joints with dissimilar substrates, verify adhesion to each substrate separately; extend cut along one side, verifying adhesion to opposite side. Repeat procedure for opposite side.
 3. Inspect tested joints and report on the following:
 - a. Whether sealants filled joint cavities and are free of voids.
 - b. Whether sealant dimensions and configurations comply with specified requirements.
 - c. Whether sealants in joints connected to pulled-out portion failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each kind of product and joint substrate. Compare these results to determine if adhesion passes sealant manufacturer's field-adhesion hand-pull test criteria.
 4. Record test results in a field-adhesion-test log. Include dates when sealants were installed, names of persons who installed sealants, test dates, test locations, whether joints were primed, adhesion results and percent elongations, sealant fill, sealant configuration, and sealant dimensions.
 5. Repair sealants pulled from test area by applying new sealants following same procedures used originally to seal joints. Ensure that original sealant surfaces are clean and that new sealant contacts original sealant.
- B. Evaluation of Field-Adhesion Test Results: Sealants not evidencing adhesive failure from testing or noncompliance with other indicated requirements will be considered satisfactory. Remove sealants that fail to adhere to joint substrates during testing or to comply with other requirements. Retest failed applications until test results prove sealants comply with indicated requirements.

3.5 CLEANING

- A. Clean off excess sealant 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.

3.6 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 original work.

+ + END OF SECTION + +

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SECTION 08110

STEEL DOORS AND FRAMES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Galvanized interior and exterior standard hollow metal doors and frames.
- B. Related Sections:
 - 1. Division 4 Section "Unit Masonry Assemblies" for embedding anchors for hollow metal work into masonry construction.
 - 2. Division 8 Section "Door Hardware (Scheduled by Describing Products)" for door hardware for hollow metal doors.
 - 3. Division 9 Sections "Exterior Painting" and "Interior Painting" for field painting hollow metal doors and frames.
 - 4. Division 16 Sections for electrical connections including conduit and wiring for door controls and operators.

1.3 DEFINITIONS

- A. Minimum Thickness: Minimum thickness of base metal without coatings.
- B. Standard Hollow Metal Work: Hollow metal work fabricated according to ANSI/SDI A250.8.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include construction details, material descriptions, core descriptions, fire-resistance rating and finishes.
- B. Shop Drawings: Include 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 each different wall opening condition.
 6. Details of anchorages, joints, field splices, and connections.
 7. Details of accessories.
 8. Details of moldings, removable stops, and glazing.
 9. Details of conduit and preparations for power, signal, and control systems.
- C. Samples for Initial Selection: For units with factory-applied color finishes.
- D. Other Action Submittals:
1. Schedule: Provide a schedule of hollow metal work prepared by or under the supervision of supplier, using same reference numbers for details and openings as those on Drawings. Coordinate with door hardware schedule.

1.5 INFORMATIONAL SUBMITTALS

- A. Oversize Construction Certification: For assemblies required to be fire rated and exceeding limitations of labeled assemblies.
- B. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for each type of hollow metal door and frame assembly.

1.6 QUALITY ASSURANCE

- A. Source Limitations: Obtain hollow metal work from single source from single manufacturer.
- B. 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, UBC Standard 7-2, UL 10B, or UL 10C (use method required by the authority having jurisdiction).
1. Oversize Fire-Rated Door Assemblies: For units exceeding sizes of tested assemblies, provide certification by a qualified testing agency that doors comply with standard construction requirements for tested and labeled fire-rated door assemblies except for size.
 2. Temperature-Rise Limit: At vertical exit enclosures 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.
- C. Fire-Rated, Borrowed-Light Frame Assemblies: Assemblies complying with NFPA 80 that are listed and labeled, by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated, based on testing according to NFPA 257, UL 9, or UBC Standard 7-4 (use method required by the authority having jurisdiction). Label each individual glazed lite.

- D. Smoke-Control Door Assemblies: Comply with NFPA 105, UL 1784, or UBC Standard 7-2 (use method required by the authority having jurisdiction).

1.7 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 nonvented plastic.
 - 1. Provide additional protection to prevent damage to finish of factory-finished units.
- 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- (102-mm-) high wood blocking. Do not store in a manner that traps excess humidity.
 - 1. Provide minimum 1/4-inch (6-mm) space between each stacked door to permit air circulation.

1.8 PROJECT CONDITIONS

- A. Field Measurements: Verify actual dimensions of openings by field measurements before fabrication.

1.9 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.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Amweld Building Products, LLC.
 - 2. Benchmark; a division of Therma-Tru Corporation.
 - 3. Ceco Door Products; an Assa Abloy Group company.
 - 4. Curries Company; an Assa Abloy Group company.
 - 5. Deansteel Manufacturing Company, Inc.
 - 6. Firedoor Corporation.

7. Fleming Door Products Ltd.; an Assa Abloy Group company.
8. Habersham Metal Products Company.
9. Karpen Steel Custom Doors & Frames.
10. Kewanee Corporation (The).
11. Mesker Door Inc.
12. Pioneer Industries, Inc.
13. Security Metal Products Corp.
14. Steelcraft; an Ingersoll-Rand company.
15. Windsor Republic Doors.
16. Equivalent by other manufacturer.

2.2 MATERIALS

- A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B; suitable for exposed applications.
- B. Hot-Rolled Steel Sheet: ASTM A 1011/A 1011M, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.
- C. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B; with minimum G60 (Z180) or A60 (ZF180) metallic coating.
- D. Frame Anchors: ASTM A 591/A 591M, Commercial Steel (CS), 40Z (12G) coating designation; mill phosphatized.
 1. For anchors built into exterior walls, steel sheet complying with ASTM A 1008/A 1008M or ASTM A 1011/A 1011M, hot-dip galvanized according to ASTM A 153/A 153M, Class B.
- E. Inserts, Bolts, and Fasteners: Hot-dip galvanized according to ASTM A 153/A 153M.
- F. Powder-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hollow metal frames of type indicated.
- G. Grout: ASTM C 476, except with a maximum slump of 4 inches (102 mm), as measured according to ASTM C 143/C 143M.
- H. Mineral-Fiber Insulation: ASTM C 665, Type I (blankets without membrane facing); consisting of fibers manufactured from slag or rock wool with 6- to 12-lb/cu. ft. (96- to 192-kg/cu. m) density; with maximum flame-spread and smoke-development indexes of 25 and 50, respectively; passing ASTM E 136 for combustion characteristics.
- I. Glazing: Comply with requirements in Division 8 Section "Glazing."

- J. Bituminous Coating: Cold-applied asphalt mastic, SSPC-Paint 12, compounded for 15-mil (0.4-mm) dry film thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.

2.3 STANDARD HOLLOW METAL DOORS

- A. General: Provide 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.
 - 1. Design: Flush panel.
 - 2. Core Construction: Manufacturer's standard kraft-paper honeycomb, polystyrene, polyurethane, polyisocyanurate, mineral-board, or vertical steel-stiffener core.
 - a. Fire Door Core: As required to provide fire-protection and temperature-rise ratings indicated.
 - b. Thermal-Rated (Insulated) Doors: Where indicated, provide doors fabricated with thermal-resistance value (R-value) of not less than 12.3 deg F x h x sq. ft./Btu (2.166 K x sq. m/W) when tested according to ASTM C 1363.
 - 1) Locations: Exterior doors
 - 3. Vertical Edges for Single-Acting Doors: Manufacturer's standard.
 - a. Beveled Edge: 1/8 inch in 2 inches (3 mm in 50 mm).
 - 4. Vertical Edges for Double-Acting Doors: Round vertical edges with 2-1/8-inch (54-mm) radius.
 - 5. Top and Bottom Edges: Closed with flush or inverted 0.042-inch-(1.0-mm-) thick, end closures or channels of same material as face sheets.
 - 6. Tolerances: Comply with SDI 117, "Manufacturing Tolerances for Standard Steel Doors and Frames."
- B. Exterior Doors: Face sheets fabricated from metallic-coated steel sheet. Provide doors complying with requirements indicated below by referencing ANSI/SDI A250.8 for level and model and ANSI/SDI A250.4 for physical performance level:
 - 1. Level 2 and Physical Performance Level B (Heavy Duty) galvanized Model 1 (Full Flush)
- C. Interior Doors: Face sheets fabricated from cold-rolled steel sheet unless metallic-coated sheet is indicated]. Provide doors complying with requirements indicated below by referencing ANSI/SDI A250.8 for level and model and ANSI/SDI A250.4 for physical performance level:
 - 1. Level 2 and Physical Performance Level B (Heavy Duty) galvanized Model 1 (Full Flush)
- D. Hardware Reinforcement: Fabricate according to ANSI/SDI A250.6 with reinforcing plates from same material as door face sheets.

- E. Fabricate concealed stiffeners and hardware reinforcement from either cold- or hot-rolled steel sheet.

2.4 STANDARD HOLLOW METAL FRAMES

- A. General: Comply with ANSI/SDI A250.8 and with details indicated for type and profile.
- B. Exterior Frames: Fabricated from metallic-coated steel sheet.
 - 1. Fabricate frames with mitered or coped corners.
 - 2. Fabricate frames as full profile welded, galvanized.
 - 3. Frames for Level 2 Steel Doors: 0.053-inch- (1.3-mm-) thick steel sheet.
- C. Interior Frames: Fabricated from cold-rolled steel sheet unless metallic-coated sheet is indicated.
 - 1. Fabricate frames with mitered or coped corners.
 - 2. Fabricate frames as full profile welded, galvanized.
 - 3. Frames for Level 2 Steel Doors: 0.053-inch- (1.3-mm-) thick steel sheet.
 - 4. Frames for Borrowed Lights: Same as adjacent door frame.
- D. Hardware Reinforcement: Fabricate according to ANSI/SDI A250.6 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, not less than 0.042 inch (1.0 mm) thick, with corrugated or perforated straps not less than 2 inches (50 mm) wide by 10 inches (250 mm) long; or wire anchors not less than 0.177 inch (4.5 mm) thick.
 - 2. Stud-Wall Type: Designed to engage stud, welded to back of frames; not less than 0.042 inch (1.0 mm) thick.
 - 3. Compression Type for Drywall Slip-on Frames: Adjustable compression anchors.
 - 4. Postinstalled Expansion Type for In-Place Concrete or Masonry: Minimum 3/8-inch- (9.5-mm-) diameter bolts with expansion shields or inserts. Provide pipe spacer from frame to wall, with throat reinforcement plate, welded to frame at each anchor location.
- B. Floor Anchors: Formed from same material as frames, not less than 0.042 inch (1.0 mm) thick, and as follows:
 - 1. Monolithic Concrete Slabs: Clip-type anchors, with two holes to receive fasteners.

2. Separate Topping Concrete Slabs: Adjustable-type anchors with extension clips, allowing not less than 2-inch (50-mm) height adjustment. Terminate bottom of frames at finish floor surface.

2.6 HOLLOW METAL PANELS

- A. Provide hollow metal panels of same materials, construction, and finish as specified for adjoining hollow metal work.

2.7 STOPS AND MOLDINGS

- A. Moldings for Glazed Lites in Doors: Minimum 0.032 inch (0.8 mm) thick, fabricated from same material as door face sheet in which they are installed.
- B. Fixed Frame Moldings: Formed integral with hollow metal frames, a minimum of 5/8 inch (16 mm) high unless otherwise indicated.
- C. Loose Stops for Glazed Lites in Frames: Minimum 0.032 inch (0.8 mm) thick, fabricated from same material as frames in which they are installed.

2.8 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 inch (0.4 mm) thick.

2.9 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. To ensure proper assembly at Project site, clearly identify work that cannot be permanently factory assembled before shipment.
- B. Tolerances: Fabricate hollow metal work to tolerances indicated in ANSI/NAAMM-HMMA 861.
- C. Hollow Metal Doors:
 1. Exterior Doors: Provide weep-hole openings in bottom of exterior doors to permit moisture to escape. Seal joints in top edges of doors against water penetration.
 2. Glazed Lites: Factory cut openings in doors.
 3. Astragals: Provide overlapping astragal on one leaf of pairs of doors where required by NFPA 80 for fire-performance rating or where indicated. Ex-

tend minimum 3/4 inch (19 mm) beyond edge of door on which astragal is mounted.

- D. Hollow Metal Frames: 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.
1. Welded Frames: Weld flush face joints continuously; grind, fill, dress, and make smooth, flush, and invisible.
 2. Sidelight and Transom Bar Frames: Provide closed tubular members with no visible face seams or joints, fabricated from same material as door frame. Fasten members at crossings and to jambs by butt welding.
 3. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.
 4. Grout Guards: Weld guards to frame at back of hardware mortises in frames to be grouted.
 5. Floor Anchors: Weld anchors to bottom of jambs and mullions with at least four spot welds per anchor.
 6. Jamb Anchors: Provide number and spacing of anchors as follows:
 - a. Masonry Type: Locate anchors not more than 18 inches (457 mm) from top and bottom of frame. Space anchors not more than 32 inches (813 mm) o.c. and as follows:
 - 1) Two anchors per jamb up to 60 inches (1524 mm) high.
 - 2) Three anchors per jamb from 60 to 90 inches (1524 to 2286 mm) high.
 - 3) Four anchors per jamb from 90 to 120 inches (2286 to 3048 mm) high.
 - 4) Four anchors per jamb plus 1 additional anchor per jamb for each 24 inches (610 mm) or fraction thereof above 120 inches (3048 mm) high.
 - b. Stud-Wall Type: Locate anchors not more than 18 inches (457 mm) from top and bottom of frame. Space anchors not more than 32 inches (813 mm) o.c. and as follows:
 - 1) Three anchors per jamb up to 60 inches (1524 mm) high.
 - 2) Four anchors per jamb from 60 to 90 inches (1524 to 2286 mm) high.
 - 3) Five anchors per jamb from 90 to 96 inches (2286 to 2438 mm) high.
 - 4) Five anchors per jamb plus 1 additional anchor per jamb for each 24 inches (610 mm) or fraction thereof above 96 inches (2438 mm) high.
 - 5) Two anchors per head for frames above 42 inches (1066 mm) wide and mounted in metal-stud partitions.
 - c. Compression Type: Not less than two anchors in each jamb.
 - d. Postinstalled Expansion Type: Locate anchors not more than 6 inches (152 mm) from top and bottom of frame. Space anchors not more than 26 inches (660 mm) o.c.

7. Door Silencers: Except on weather-stripped doors, drill stops to receive door silencers as follows. Keep holes clear during construction.
 - a. Single-Door Frames: Drill stop in strike jamb to receive three door silencers.
 - b. Double-Door Frames: Drill stop in head jamb to receive two door silencers.
- E. Fabricate concealed stiffeners, edge channels, and hardware reinforcement from either cold- or hot-rolled steel sheet.
- F. Hardware Preparation: Factory prepare hollow metal work to receive templated mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping according to the Door Hardware Schedule and templates furnished as specified in Division 8 Section "Door Hardware."
 1. Locate hardware as indicated, or if not indicated, according to ANSI/NAAMM-HMMA 861.
 2. Reinforce doors and frames to receive nontemplated, 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.
 4. Coordinate locations of conduit and wiring boxes for electrical connections with Division 16 Sections.
- G. Stops and Moldings: Provide stops and moldings around glazed lites where indicated. Form corners of stops and moldings with butted or mitered hairline joints.
 1. Single Glazed Lites: Provide fixed stops and moldings welded on secure side of hollow metal work.
 2. Multiple Glazed Lites: Provide fixed and removable stops and moldings so that each glazed lite is capable of being removed independently.
 3. Provide fixed frame moldings on outside of exterior and on secure side of interior doors and frames.
 4. Provide loose stops and moldings on inside of hollow metal work.
 5. Coordinate rabbet width between fixed and removable stops with type of glazing and type of installation indicated.

2.10 STEEL FINISHES

- A. Prime Finish: Apply manufacturer's standard primer immediately after cleaning and pretreating.
 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; compatible with substrate and field-applied coatings despite prolonged exposure.

- B. Factory-Applied Paint Finish: Manufacturer's standard, complying with ANSI/SDI A250.3 for performance and acceptance criteria.
 - 1. Color and Gloss: As selected by Architect from manufacturer's full range.

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. Examine roughing-in for embedded and built-in anchors to verify actual locations before frame installation.
- C. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
- D. 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 to the following tolerances:
 - 1. Squareness: Plus or minus 1/16 inch (1.6 mm), measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
 - 2. Alignment: Plus or minus 1/16 inch (1.6 mm), measured at jambs on a horizontal line parallel to plane of wall.
 - 3. Twist: Plus or minus 1/16 inch (1.6 mm), measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
 - 4. Plumbness: Plus or minus 1/16 inch (1.6 mm), measured at jambs on a perpendicular line from head to floor.
- C. Drill and tap doors and frames to receive nontemplated, 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.
1. Set frames accurately in position, plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces, leaving surfaces smooth and undamaged.
 - a. At fire-protection-rated openings, install frames according to NFPA 80.
 - b. Where frames are fabricated in sections because of shipping or handling limitations, field splice at approved locations by welding face joint continuously; grind, fill, dress, and make splice smooth, flush, and invisible on exposed faces.
 - c. Install frames with removable glazing stops located on secure side of opening.
 - d. Install door silencers in frames before grouting.
 - e. Remove temporary braces necessary for installation only after frames have been properly set and secured.
 - f. Check plumbness, squareness, and twist of frames as walls are constructed. Shim as necessary to comply with installation tolerances.
 - g. Field apply bituminous coating to backs of frames that are filled with grout containing antifreezing agents.
 2. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor, and secure with postinstalled expansion anchors.
 - a. Floor anchors may be set with powder-actuated fasteners instead of postinstalled expansion anchors if so indicated and approved on Shop Drawings.
 3. Metal-Stud Partitions: Solidly pack mineral-fiber insulation behind frames.
 4. Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames and masonry with grout.
 5. Concrete Walls: Solidly fill space between frames and concrete with grout. Take precautions, including bracing frames, to ensure that frames are not deformed or damaged by grout forces.
 6. In-Place Concrete or Masonry Construction: Secure frames in place with postinstalled expansion anchors. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.
 7. In-Place Gypsum Board Partitions: Secure frames in place with postinstalled expansion anchors through floor anchors at each jamb. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.
 8. Ceiling Struts: Extend struts vertically from top of frame at each jamb to overhead structural supports or substrates above frame unless frame is anchored to masonry or to other structural support at each jamb. Bend top of struts to provide flush contact for securing to supporting construction. Provide adjustable wedged or bolted anchorage to frame jamb members.
 9. Installation Tolerances: Adjust hollow metal door frames for squareness, alignment, twist, and plumb to the following tolerances:
 - a. Squareness: Plus or minus 1/16 inch (1.6 mm), measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.

- b. Alignment: Plus or minus 1/16 inch (1.6 mm), measured at jambs on a horizontal line parallel to plane of wall.
 - c. Twist: Plus or minus 1/16 inch (1.6 mm), measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
 - d. Plumbness: Plus or minus 1/16 inch (1.6 mm), measured at jambs at floor.
- 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 (3 mm) plus or minus 1/16 inch (1.6 mm).
 - b. Between Edges of Pairs of Doors: 1/8 inch (3 mm) plus or minus 1/16 inch (1.6 mm).
 - c. Between Bottom of Door and Top of Threshold: Maximum 3/8 inch (9.5 mm).
 - d. Between Bottom of Door and Top of Finish Floor (No Threshold): Maximum 3/4 inch (19 mm).
 - 2. Fire-Rated Doors: Install doors with clearances according to NFPA 80.
- D. Glazing: Comply with installation requirements in Division 8 Section "Glazing" and with hollow metal manufacturer's written instructions.
- 1. Secure stops with countersunk flat- or oval-head machine screws spaced uniformly not more than 9 inches (230 mm) o.c. and not more than 2 inches (50 mm) o.c. from each corner.

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 Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible air-drying, rust-inhibitive primer.
- D. Metallic-Coated Surfaces: Clean abraded areas and repair with galvanizing repair paint according to manufacturer's written instructions.

+ + END OF SECTION + +

SECTION 08220

FIBERGLASS REINFORCED PLASTIC (FRP) DOORS AND FRAMES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Fiberglass Reinforced Plastic (FRP) Doors and Frames, Side Lites, Transoms, Door Louvers, etc. as indicated on Drawings.
 - 2. Fire Rated Fiberglass Reinforced Plastic (FRP) Doors and Frames meeting UL test standards.
 - 3. Fiberglass Reinforced Plastic (FRP) Thresholds.
 - 4. Provide manufacturer's heavy-duty doors and frames only. No light- or medium-duty doors and frames will be accepted.
- B. Related Sections
 - 1. Division 8, Section 08710 Finish Hardware.

1.3 SUBMITTALS

- A. Shop Drawings: Include the following:
 - 1. Summary door schedule indicating the specific reference numbers as used on drawings, with columns noting door type, frame type, size, handing, accessories and hardware.
 - 2. A drawing depicting front and rear door elevations showing hardware with bill of material for each door.
 - 3. Locations of reinforcement and preparations for hardware.
 - 4. Details of each different wall opening condition.
 - 5. Drawing showing dimensional location of each hardware item and size of each door.
 - 6. Individual part drawing and specifications for each hardware item and FRP part or product.
 - 7. Details of moldings, removable stops, and glazing.
 - 8. Construction and mounting detail for each frame type.
- B. Samples for Initial Selection: For factory-applied color finishes.

- C. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for each type of fiberglass reinforced plastic door and frame assembly.
- D. Samples for verification:
 - 1. To demonstrate compliance with requirements for quality of materials and construction, provide one 21 x 18 inch completely assembled (hinged) door and frame corner section, with faces and edges representing typical color and finish. One edge should be exposed for view of interior door and frame composition. Sample should include 6 inch lite opening as well as standard cutouts for hinges and strike plates.
- E. Product Technical Data Including:
 - 1. Acknowledgment that products submitted meet requirements of standards referenced. Coordinate with door hardware schedule.
 - 2. Manufacturer shall provide certificate of compliance with current local and federal regulations as it applies to the manufacturing process.
 - 3. Manufacturer's installation instructions.
 - 4. Schedule of doors and frames indicating the specific reference numbers as used on drawings, door type, frame type, size, handing and applicable hardware.
 - 5. Details of core and edge construction. Include factory-construction specifications.
 - 6. Certification of manufacturer's qualifications.
 - 7. Fire-resistance ratings.
- F. Operation and Maintenance Manuals:
 - 1. Include recommended methods and frequency for maintaining optimum condition of fiberglass doors and frames under anticipated traffic and use conditions.
 - 2. Include one set of final as built drawings with the same requirements as mentioned in Section A, above.
 - 3. Include certificate of warranty for door and frame listing specific door registration numbers.
 - 4. Include hardware data sheets and hardware manufacturer's warranties.

1.4 QUALITY ASSURANCE

- A. Source Limitations:
 - 1. Manufacturer Qualifications: A company specialized in the manufacture of fiberglass reinforced plastic (FRP) doors and frames as specified herein with a minimum of 25 years documented experience and with a record of successful in-service performance for the applications as required for this project.
 - 2. Installer Qualifications: An experienced installer who has completed fire rated fiberglass door and frame installations similar in material, design, and

extent to those indicated and whose work has resulted in construction with a record of successful in-service performance.

3. Source Limitations: Obtain fiberglass reinforced plastic doors and frames through one source fabricated from a single manufacturer, including fire-resistance rated fiberglass frames.
4. Source Limitations: Hardware and accessories for all FRP doors as specified in Section 08710 shall be provided and installed by the fiberglass door and frame manufacturer.
5. Source Limitations: Glass for windows in doors shall be furnished and installed by door and frame manufacturer in accordance with related section, Division 8, Glazing.

B. Referenced Standards

1. ASTM D 635 - Standard Test Method for Rate of Burning and/or Extent and Time of Burning of Self-Supporting Plastics in a Horizontal Position.
2. ASTM E 84 - Standard Test Method for a Surface Burning Characteristics of Building Materials.
3. Door and Frame Assembly
 - a. ASTM E 152 UL 10(b) NFPA 252 and UBC 43-2.
4. Door Properties
 - a. ASTM C 518 Standard test method for steady for state thermal transmission properties by means of the heat flow meter apparatus.
5. Laminate Properties
 - a. ASTM D 882 Tensile Strength
 - b. ASTM D 790 Flexural Strength
 - c. ASTM D 2583 Barcol Hardness
 - d. ASTM D 256 Impact Resistance
 - e. ASTM D 792 Density/Specific Gravity Of Laminate
 - f. ASTM D 1761 Mechanical Fasteners
6. Core Properties
 - a. ASTM C 177 Thermal Properties
 - b. ASTM D 1622 Density/Specific Gravity
 - c. ASTM E 84 Surface Burning Characteristics
 - d. WDMA TM-10 and TM-5 Firestop ASTM E 152 U.L. 10(b)
 - e. ASTM – C-36 Type X
 - f. Federal Specification SS-6-30D Type III, Gladex
 - g. Firestop ASTM E 152 UL 10(b)

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Each door and frame shall be delivered individually crated for protection from damage in cardboard containers, clearly marked with project information, door location, specific reference number as shown on drawings, and shipping information. Each crate should contain all fasteners necessary for installation as well as complete installation instructions.

- B. Doors shall be stored in the original container on edge out of inclement weather for protection against the elements.
- C. Handle doors pursuant to the manufacturer's recommendations as posted on outside of crate.

1.6 PROJECT CONDITIONS

- A. Field Measurements: Verify actual dimensions of openings by field measurements before fabrication.

1.7 WARRANTY

- A. Warranty all fiberglass doors and frames for a period of 25 years against failure due to corrosion. Additionally, warranty all fiberglass doors and frames on materials and workmanship for a period of 10 years, including warp, separation or delamination, and expansion of the core.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements (medium-duty doors and frames will not be accepted), available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 1. Fib-R-Dor Division of Advanced fiberglass, Inc.
 2. Warminster Fiberglass Co.
 3. Ceco Door Products, KhemPro FRP
 4. Corrim Company
 5. Tiger Door Company, LLC
 6. Equivalent by other manufacturer.

2.2 FRP DOORS

- A. Doors shall be made of fiberglass reinforced plastic (FRP) using chemically proven resins resistant to contaminants typically found in the environment for which these specifications are written. Doors shall be 1 3/4 inch thick and of flush construction, having no seams or cracks. All doors up to 4'0 x 8'0 shall have equal diagonal measurements with a maximum tolerance of +/- 1/32 inch. ASTM A 1008/A 1008M, Commercial Steel (CS), Type B; suitable for exposed applications.
- B. Fire rated Fiberglass reinforced Plastic (FRP) Doors certified by Intertek Testing Services for Warnock- Hersey in 20, 45, 60 and 90 minute ratings meeting all specifications of UL 10(c) and UL 10(b) fire door test standards.

- C. Door Plates shall be molded in one continuous piece, starting with a 25-mil gel-coat of the color specified, integrally molded with at least two layers of 1.5 ounce per square foot fiberglass. Door plate weight shall not be less than 0.97 pounds per square foot with a 30/70 fiberglass to resin.
- D. Stiles and Rails shall be constructed starting from the outside toward the inside, of a 25 mil gel coat of the color specified followed by a matrix of at least three layers of 1.5 ounce per square foot of fiberglass mat. The stile and rail shall be molded in one continuous piece to a U-shaped configuration and to the exact dimensions of the door. In this manner there will be no miter joints or disparate materials used to form the once-piece stile and rail. Stiles and Rails for rated openings: Core shall be banded with firestop per factory drawings.
- E. Core material shall be kraft honeycomb, 2 psf expanded polyurethane foam, or mineral core per owners specifications, which completely fills all voids between the door plates. Foam properties ASTM E-84 that comply with IBC Code. Core shall be banded with firestop per factory drawings for rated doors.
- F. Internal Reinforcement shall be #2 SPF of sufficient amount to adequately support required hardware and function of same.
- G. Finish of door and frame shall be identical in color and finish. At time of manufacture, 25 mil of resin-rich gelcoat must be integrally molded into both the door and frame. Secondary painting to achieve color is not acceptable.
- H. Window openings shall be provided for at time of manufacture and shall be completely sealed so that the interior of the door is not exposed to the environment. Fiberglass retainers, which hold the glazing in place, shall be resin transfer molded with a profile that drains away from glazing. Mechanical fasteners shall not be used to attach retainers. The retainers must match the color finish of the door plates. Glass shall be furnished and installed by door and frame manufacturer. At time of manufacture, 25 mil of resin-rich gelcoat must be integrally molded into the window and window retainer.
- I. Glass: Glass per job specification shall be factory furnished, glazed and installed. Standard glass thickness is 1/4". Centered glazing shall be installed between 45 degrees FRP glazing stops and vinyl foam tape with concealed compression retainers for 1/4" glazing. No exposed fasteners or exposed silicone will be allowed for securing 1/4" glazing. Stainless steel screws may be allowed for other glazing thicknesses. Offset glazing shall be installed against a modeled-in 5/8" wide exterior face flange with a bed of tape caulk, square 5/8" glazing stops with stainless steel screws shall complete the installation to secure the glazing in place and cover all unsightly caulking. Double flush 1/4" glazing shall be installed with vinyl foam tape and silicone sealant at all edges to complete flush appearance. All glazing stop material shall be FRP with a minimum fiberglass content of 50%. Metal, PVC, or vinyl "Glass Kit" type lights are not acceptable for non-fire rated openings.

1. Provide insulating glass for exterior doors or window frames:
 - a. Two organically sealed ¼" thick panes of clear fully-tempered glass separated by dehydrated (desiccated) air space, of sizes indicated, meeting requirements of ASTM C 1036, and ASTM C 1048, Type I (transparent flat glass), Class 1 (clear), Quality-Q3 (architectural), and 16 CFR 1201.
 - b. Glass for interior doors or frames: Provide ¼" thick single pane, of clear fully-tempered glass, of sizes indicated, meeting requirements of ASTM C 1036, and ASTM C 1048, Type I (transparent flat glass), Class 1 (clear), Quality-Q3 (architectural), and 16 CFR 1201
- J. Louvers: Fiberglass inverted V blade privacy or flat blade louvers shall be factory furnished and installed. All louvers and louver trim shall be manufactured exclusively from FRP profiles with a minimum fiberglass content of 50%. All louvers shall be coated to match door in color and sheen. Inverted V blade minimum thickness shall be 3/32" thick, flat blade louver minimum thickness shall be 3/16" thick. Metal, PVC, vinyl or other non-fiberglass louvers are not acceptable for non-fire rated openings.
- K. Provisions for lights and louvers shall be performed during manufacture and shall not be attempted in the field. Cutouts are to be totally enclosed by FRP stiles and rails incorporated into the door structure. Light and louver cutouts that expose core material are not acceptable.

2.3 FRAMES

- A. Frames shall be fiberglass and manufactured using the resin transfer method in closed rigid molds to assure uniformity in color and size. Beginning with a minimum 25 mil gel coat and a minimum of two layers continuous strand fiberglass mat saturated with resin, the frame will be of one-piece construction with molded stop. All frame profiles up to 3/4" will be solid fiberglass. All frame profiles greater than 3/4" shall have a core material of 2 psf polyurethane foam. Metal frames or pultruded fiberglass frames will not be accepted.
- B. Finish of frame shall be identical in color and texture to the door. 25 mil resin rich gel coat will be integrally molded into the frame at time of manufacture. Secondary painting to achieve color is not acceptable.
- C. Jamb/Header connection shall be coped by CNC for tight fit.
- D. Internal Reinforcement shall be continuous within the structure to allow for mounting of specified hardware. Material shall be completely non-organic with a minimum hinge screw holding value of 656 lbs. Frame screw holding value to accommodate screw shall be minimum of 1,000 lbs per screw. Documented strength of frame screw holding value after third insert must be submitted. Dissimilar materials, such as steel, will be deemed unacceptable as reinforcement for hardware attachment.

- E. Mortises for hardware shall be accurately machined by CNC to hold dimensions to +/- 0.010 inch in all three axis.
- F. Hinge pockets shall be accurately machined by CNC to facilitate heavy duty hinges at all hinge locations, using spacers when standard weight hinges are used.

2.4 FRP THRESHOLD

- A. 0.5" High (Max.) x 5.0" Wide solid FRP heavy-duty threshold, rated for 1.6 lbs./ft.

PART 3 - EXECUTION

3.1 VERIFICATION OF CONDITIONS

- A. Examine conditions under which construction activities of this section are to be performed, with Installer present, for compliance with requirements and submit a written report to general contractor if conditions are unacceptable.
- B. General Contractor shall submit two copies of the installer's report to the architect within 24 hours of receipt of report.
- C. Verify openings are correctly prepared to receive doors and frames.
- D. Verify openings are correct size and depth in accordance with shop drawings or submittals.
- E. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General: Install fiberglass reinforced plastic work plumb, rigid, properly aligned, and securely fastened in place; comply with Drawings and manufacturer's written instructions.
- B. Field alteration of doors or frames to accommodate field conditions is strictly prohibited.
- C. Fire labeled doors and frames must be installed in strict accordance with manufacturer's instructions and the current version of NFPA 80.

3.3 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 FRP work that is warped, bowed, or otherwise unacceptable.
- B. Adjust doors in accordance with door manufacturer's maintenance instructions to swing open and shut without binding and to remain in place at any angle without being moved by gravitational influence.
 - C. Adjust door hardware to operate correctly in accordance with hardware manufacturer's maintenance instructions.
 - D. Clean surfaces of door opening assemblies and exposed door hardware in accordance with respective manufacturer's maintenance instructions.

3.4 PROTECTION OF INSTALLED PRODUCTS

- A. Protect door opening assemblies and door hardware from damage by subsequent construction activities until final inspection.

++ END OF SECTION ++

SECTION 08331

OVERHEAD COILING DOORS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Insulated service doors.
- B. Related Sections:
 - 1. Division 16 Sections for electrical service and connections for powered operators and accessories.

1.3 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Design overhead coiling doors, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
- B. Structural Performance, Exterior Doors: Exterior overhead coiling doors shall withstand the wind loads, the effects of gravity loads, and loads and stresses within limits and under conditions indicated according to SEI/ASCE 7 .
 - 1. Wind Loads: As indicated on Structural Drawings and required by the Kentucky Building Code.
 - 2. Deflection Limits: Design overhead coiling doors to withstand design wind load without evidencing permanent deformation or disengagement of door components.
- C. Operability under Wind Load: Design overhead coiling doors to remain operable under uniform pressure (velocity pressure) of 20 lbf/sq. ft. (960 Pa) wind load, acting inward and outward.
- D. Windborne-Debris-Impact-Resistance Performance: Provide impact-protective overhead coiling doors that pass missile-impact and cyclic-pressure tests when tested according to ASTM E 1886 and ASTM E 1996.
 - 1. Large Missile Test: For overhead coiling doors located within 30 feet (9.144 m) of grade.
 - 2. Small Missile Test: For overhead coiling doors located more than 30 feet (9.144 m) above grade.

- E. Seismic Performance: Overhead coiling doors shall withstand the effects of earthquake motions determined according to SEI/ASCE 7 and Kentucky Building Code.
 - 1. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the emergency-egress-door component will be fully operational after the seismic event."
- F. Operation Cycles: Provide overhead coiling door components and operators capable of operating for not less than number of cycles indicated for each door. One operation cycle is complete when a door is opened from the closed position to the fully open position and returned to the closed position.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type and size of overhead coiling door and accessory. Include the following:
 - 1. Construction details, material descriptions, dimensions of individual components, profiles for slats, and finishes.
 - 2. Rated capacities, operating characteristics, electrical characteristics, and furnished accessories.
- B. Shop Drawings: For each installation and for special components not dimensioned or detailed in manufacturer's product data. Include plans, elevations, sections, details, and attachments to other work.
 - 1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
 - 2. Wiring Diagrams: For power, signal, and control wiring.
- C. Samples for Initial Selection: Manufacturer's finish charts showing full range of colors and textures available for units with factory-applied finishes.
 - 1. Include similar Samples of accessories involving color selection.
- D. Samples for Verification: For each type of exposed finish required, prepared on Samples of size indicated below.
 - 1. Curtain Slats: 12 inches (305 mm) long.
 - 2. Bottom Bar: 6 inches (150 mm) long with sensor edge.
 - 3. Guides: 6 inches (150 mm) long.
 - 4. Brackets: 6 inches (150 mm) square.
 - 5. Hood: 6 inches (150 mm) square.
 - 6. Laminate-Clad Counter Panel Product: 6 inches (150 mm) square; for each type, color, pattern, and surface finish; laminated to core.
- E. Delegated-Design Submittal: For overhead coiling doors indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1. Detail fabrication and assembly of seismic restraints.
2. Summary of forces and loads on walls and jambs.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified Installer.
- B. Seismic Qualification Certificates: For overhead coiling doors, accessories, and components, from manufacturer.
- C. Oversize Construction Certification: For door assemblies required to be fire-rated and that exceed size limitations of labeled assemblies.

1.6 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For overhead coiling doors to include in maintenance manuals.

1.7 QUALITY ASSURANCE

- A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for both installation and maintenance of units required for this Project.
- B. Source Limitations: Obtain overhead coiling doors from single source from single manufacturer.
 1. Obtain operators and controls from overhead coiling door manufacturer.
- C. Sound-Control Doors: Assemblies that have been fabricated and tested to control the passage of sound and have minimum certified STC rating according to ASTM E 413.
- D. 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.
- E. Regulatory Requirements: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines and ICC/ANSI A117.1.

PART 2 PRODUCTS

2.1 DOOR CURTAIN MATERIALS AND CONSTRUCTION

- A. Door Curtains: Fabricate overhead coiling-door curtain of interlocking metal slats, designed to withstand wind loading indicated, in a continuous length for

width of door without splices. Unless otherwise indicated, provide slats of thickness and mechanical properties recommended by door manufacturer for performance, size, and type of door indicated, and as follows:

1. Aluminum Door Curtain Slats: ASTM B 209 (ASTM B 209M) sheet or ASTM B 221 (ASTM B 221M) extrusions, alloy and temper standard with manufacturer for type of use and finish indicated; thickness of 0.050 inch (1.27 mm) and as required to meet requirements.
 2. Insulation: Fill slats for insulated doors with manufacturer's standard thermal insulation complying with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively, according to ASTM E 84. Enclose insulation completely within slat faces.
 3. Metal Interior Curtain-Slat Facing: Match metal of exterior curtain-slat face.
 4. Plastic Interior Curtain-Slat Facing: Extruded PVC plastic with maximum flame-spread index of 25 and smoke-developed index of 450, according to ASTM E 84.
 5. Gasket Seal: Provide insulated slats with manufacturer's standard interior-to-exterior thermal break or with continuous gaskets between slats.
- B. Endlocks and Windlocks for Service Doors: Malleable-iron casings galvanized after fabrication, secured to curtain slats with galvanized rivets or high-strength nylon. Provide locks on not less than alternate curtain slats for curtain alignment and resistance against lateral movement.
- C. Bottom Bar for Service Doors: Consisting of two angles, each not less than 1-1/2 by 1-1/2 by 1/8 inch (38 by 38 by 3 mm) thick; fabricated from manufacturer's standard aluminum extrusions to match curtain slats and finish.
- D. Curtain Jamb Guides: Manufacturer's standard angles or channels and angles of same material and finish as curtain slats unless otherwise indicated, with sufficient depth and strength to retain curtain, to allow curtain to operate smoothly, and to withstand loading. Slot bolt holes for guide adjustment. Provide removable stops on guides to prevent overtravel of curtain[, and a continuous bar for holding windlocks].

2.2 HOOD

- A. General: Form sheet metal hood to entirely enclose coiled curtain and operating mechanism at opening head. Contour to fit end brackets to which hood is attached. Roll and reinforce top and bottom edges for stiffness. Form closed ends for surface-mounted hoods and fascia for any portion of between-jamb mounting that projects beyond wall face. Equip hood with intermediate support brackets as required to prevent sagging.
1. Aluminum: 0.040-inch- (1.02-mm-) thick aluminum sheet complying with ASTM B 209 (ASTM B 209M), of alloy and temper recommended by manufacturer and finisher for type of use and finish indicated.

2. Exterior-Mounted Doors: Fabricate hood to act as weather protection and with a perimeter sealant-joint-bead profile for applying joint sealant.

2.3 LOCKING DEVICES

- A. Slide Bolt: Fabricate with side-locking bolts to engage through slots in tracks for locking by padlock, located on both left and right jamb sides, operable from coil side.
- B. Locking Device Assembly: Fabricate with cylinder lock, spring-loaded dead bolt, operating handle, cam plate, and adjustable locking bars to engage through slots in tracks.
 1. Lock Cylinders: Provide cylinders specified in Division 8 Section "Door Hardware" standard with manufacturer and keyed to building keying system.
 2. Keys: Provide Three (3) for each cylinder.
- C. Chain Lock Keeper: Suitable for padlock.
- D. Safety Interlock Switch: Equip power-operated doors with safety interlock switch to disengage power supply when door is locked.

2.4 CURTAIN ACCESSORIES

- A. Weatherseals: Equip each exterior door with weather-stripping gaskets fitted to entire perimeter of door for a weathertight installation, unless otherwise indicated.
 1. At door head, use 1/8-inch- (3-mm-) thick, replaceable, continuous sheet secured to inside of hood.
 2. At door jambs, use replaceable, adjustable, continuous, flexible, 1/8-inch- (3-mm-) thick seals of flexible vinyl, rubber, or neoprene.
- B. Push/Pull Handles: Equip each push-up-operated or emergency-operated door with lifting handles on each side of door, finished to match door.
 1. Provide pull-down straps or pole hooks for doors more than 84 inches (2130 mm) high.

2.5 COUNTERBALANCING MECHANISM

- A. General: Counterbalance doors by means of manufacturer's standard mechanism with an adjustable-tension, steel helical torsion spring mounted around a steel shaft and contained in a spring barrel connected to top of curtain with barrel rings. Use grease-sealed bearings or self-lubricating graphite bearings for rotating members.
- B. Counterbalance Barrel: Fabricate spring barrel of manufacturer's standard hot-formed, structural-quality, welded or seamless carbon-steel pipe, of sufficient diameter and wall thickness to support rolled-up curtain without distortion of slats

and to limit barrel deflection to not more than 0.03 in./ft. (2.5 mm/m) of span under full load.

- C. Spring Balance: One or more oil-tempered, heat-treated steel helical torsion springs. Size springs to counterbalance weight of curtain, with uniform adjustment accessible from outside barrel. Secure ends of springs to barrel and shaft with cast-steel barrel plugs.
- D. Torsion Rod for Counterbalance Shaft: Fabricate of manufacturer's standard cold-rolled steel, sized to hold fixed spring ends and carry torsional load.
- E. Brackets: Manufacturer's standard mounting brackets of either cast iron or cold-rolled steel plate.

2.6 MANUAL DOOR OPERATORS

- A. Equip door with manufacturer's recommended manual door operator unless another type of door operator is indicated.
- B. Push-up Door Operation: Design counterbalance mechanism so required lift or pull for door operation does not exceed 25 lbf (111 N).
- C. Chain-Hoist Operator: Consisting of endless steel hand chain, chain-pocket wheel and guard, and gear-reduction unit with a maximum 25 lbf (111 N) force for door operation. Provide alloy-steel hand chain with chain holder secured to operator guide.

2.7 ELECTRIC DOOR OPERATORS

- A. General: Electric door operator assembly of size and capacity recommended and provided by door manufacturer for door and operation-cycles requirement specified, with electric motor and factory-prewired motor controls, starter, gear-reduction unit, solenoid-operated brake, clutch, remote-control stations, control devices, integral gearing for locking door, and accessories required for proper operation.
 - 1. Comply with NFPA 70.
 - 2. Provide control equipment complying with NEMA ICS 1, NEMA ICS 2, and NEMA ICS 6, with NFPA 70 Class 2 control circuit, maximum 24 V, ac or dc.
- B. Usage Classification: Electric operator and components capable of operating for not less than number of cycles per hour indicated for each door.
- C. Door Operator Location(s); one of the following.
 - 1. Top-of-Hood Mounted: Operator is mounted to the right or left door head plate with the operator on top of the door-hood assembly and connected to

- the door drive shaft with drive chain and sprockets. Headroom is required for this type of mounting.
2. Wall Mounted: Operator is mounted to the inside front wall on the left or right side of door and connected to door drive shaft with drive chain and sprockets. Side room is required for this type of mounting. Wall mounted operator can also be mounted above or below shaft; if above shaft, headroom is required.
- D. Electric Motors: Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements specified in Division 11 Section "Common Motor Requirements for Equipment" unless otherwise indicated.
1. Electrical Characteristics:
 - a. GAC Feed Pump Building
 - 1) Phase: Single phase
 - 2) ½ Horespower
 - b. PT-GAC Building
 - 1) Phase: Three Phase
 - 2) ¾ Horsepower
 2. Motor Type and Controller: Reversible motor and controller (disconnect switch) for motor exposure indicated.
 3. Motor Size: Minimum size as indicated. If not indicated, large enough to start, accelerate, and operate door in either direction from any position, at a speed not less than 8 in./sec. (203 mm/s) and not more than 12 in./sec. (305 mm/s), without exceeding nameplate ratings or service factor.
 4. Operating Controls, Controllers (Disconnect Switches), Wiring Devices, and Wiring: Manufacturer's standard unless otherwise indicated.
 5. Coordinate wiring requirements and electrical characteristics of motors and other electrical devices with building electrical system and each location where installed.
- E. Limit Switches: Equip each motorized door with adjustable switches interlocked with motor controls and set to automatically stop door at fully opened and fully closed positions.
- F. Obstruction Detection Device: Equip motorized door with indicated external automatic safety sensor capable of protecting full width of door opening. For non-fire-rated doors, activation of device immediately stops and reverses downward door travel.
1. Photoelectric Sensor: Manufacturer's standard system designed to detect an obstruction in door opening without contact between door and obstruction.
 - a. Self-Monitoring Type: Designed to interface with door operator control circuit to detect damage to or disconnection of sensing device. When self-monitoring feature is activated, door closes only with sustained pressure on close button.
 2. Sensor Edge: Automatic safety sensor edge, located within astragal or weather stripping mounted to bottom bar. Contact with sensor activates de-

- vice. Connect to control circuit using manufacturer's standard take-up reel or self-coiling cable.
 - a. Self-Monitoring Type: Four-wire configured device designed to interface with door operator control circuit to detect damage to or disconnection of sensor edge.
- G. Remote-Control Station: Momentary-contact, three-button control station with push-button controls labeled "Open," "Close," and "Stop."
 - 1. Interior units, full-guarded, surface-mounted, heavy-duty type, with general-purpose NEMA ICS 6, Type 1 enclosure.
 - 2. Exterior units, full-guarded, standard-duty, surface-mounted, weatherproof type, NEMA ICS 6, Type 4 enclosure, key operated.
- H. Emergency Manual Operation: Equip each electrically powered door with capability for emergency manual operation. Design manual mechanism so required force for door operation does not exceed 25 lbf (111 N)
- I. Emergency Operation Disconnect Device: Equip operator with hand-operated disconnect mechanism for automatically engaging manual operator and releasing brake for emergency manual operation while disconnecting motor without affecting timing of limit switch. Mount mechanism so it is accessible from floor level. Include interlock device to automatically prevent motor from operating when emergency operator is engaged.
- J. Motor Removal: Design operator so motor may be removed without disturbing limit-switch adjustment and without affecting emergency manual operation.
- K. Audible and Visual Signals: Audible alarm and visual indicator lights in compliance with regulatory requirements for accessibility.
- L. Radio-Control System: Consisting of the following:
 - 1. Three-channel universal coaxial receiver to open, close, and stop door; two per operator.
 - 2. Multifunction remote control.
 - 3. Remote-antenna mounting kit.

2.8 DOOR ASSEMBLY

- A. Insulated Service Door: Overhead coiling door formed with curtain of interlocking metal slats.
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. ACME Rolling Doors.
 - b. Alpine Overhead Doors, Inc.
 - c. AlumaTek, Inc.
 - d. C.H.I. Overhead Doors.

- e. City-Gates.
- f. Cookson Company.
- g. Cornell Iron Works, Inc.
- h. Dynamic Closures Corp.
- i. Lawrence Roll-Up Doors, Inc.
- J. Mahon Door Corporation.
- k. McKeon Rolling Steel Door Company, Inc.
- l. Metro Door.
- m. Overhead Door Corporation.
- n. QMI Security Solutions.
- o. Raynor.
- p. Southwestern Steel Rolling Door Co.
- q. Wayne-Dalton Corp.
- r. Windsor Door.
- s. Equivalent by other manufacturer.
- t. Operation Cycles: Not less than 50,000.

- B. Include tamperproof cycle counter.
- C. STC Rating: 26.
- D. Curtain R-Value: 8.
- E. Door Curtain Material: Aluminum.
- F. Door Curtain Slats: Flat profile slats of 3-1/4-inch (83-mm) center-to-center height.
 - 1. Insulated-Slat Interior Facing: Plastic.
- G. Curtain Jamb Guides: Aluminum with exposed finish matching curtain slats. Provide continuous integral wear strips to prevent metal-to-metal contact and to minimize operational noise.
- H. Hood: Aluminum.
 - 1. Shape: Round or Square.
 - 2. Mounting: Face of wall or between jambs.
- I. Locking Devices: Equip door with slide bolt for padlock locking device assembly and chain lock keeper.
 - 1. Locking Device Assembly: Single-jamb side locking bars, operable from inside with thumb turn and outside with cylinder outside only, with cylinder.
- J. Manual Door Operator: Chain-hoist operator.
 - 1. Provide operator with through-wall shaft operation.
 - 2. Provide operator with manufacturer's standard removable operating arm.
- K. Electric Door Operator:

1. Usage Classification: Heavy duty, 60 to 90 cycles per hour.
 2. Operator Location: Top of hood or Wall.
 3. Motor Exposure: Interior humid.
 4. Emergency Manual Operation: Chain.
 5. Obstruction-Detection Device: Automatic pneumatic sensor edge on bottom bar.
 - a. Sensor Edge Bulb Color: As selected by Architect from manufacturer's full range.
 6. Remote-Control Station: Interior.
 7. Other Equipment: Audible and visual signals and Radio-control system.
- L. Door Finish:
1. Aluminum Finish: Anodized color as selected by Architect from full range of industry colors and color densities.

2.9 GENERAL FINISH REQUIREMENTS

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.10 ALUMINUM FINISHES

- A. Mill Finish: Manufacturer's standard.
- B. Clear Anodic Finish: AAMA 611, AA-M12C22A41, Class I, 0.018 mm or thicker.
- C. Color Anodic Finish: AAMA 611, AA-M12C22A42/A44, Class I, 0.018 mm or thicker.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates areas and conditions, with Installer present, for compliance with requirements for substrate construction and other conditions affecting performance of the Work.
- B. Examine locations of electrical connections.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install overhead coiling doors and operating equipment complete with necessary hardware, anchors, inserts, hangers, and equipment supports; according to manufacturer's written instructions and as specified.
- B. Install overhead coiling doors, hoods, and operators at the mounting locations indicated for each door.
- C. Accessibility: Install overhead coiling doors, switches, and controls along accessible routes in compliance with regulatory requirements for accessibility.

3.3 STARTUP SERVICE

- A. Engage a factory-authorized service representative to perform startup service.
 - 1. Perform installation and startup checks according to manufacturer's written instructions.
 - 2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
 - 3. Test door closing when activated by detector or alarm-connected fire-release system. Reset door-closing mechanism after successful test.

3.4 ADJUSTING

- A. Adjust hardware and moving parts to function smoothly so that doors operate easily, free of warp, twist, or distortion.
- B. Lubricate bearings and sliding parts as recommended by manufacturer.
- C. Adjust seals to provide weathertight fit around entire perimeter.

3.5 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain overhead coiling doors.

++ END OF SECTION ++

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SECTION 08411

ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Exterior and interior storefront framing.
 - 2. Storefront framing for punched openings.
 - 3. Exterior and interior manual-swing entrance doors and door-frame units.
- B. Related Sections:
 - 1. Division 8 Section "Fiberglass Sandwich Panel Assemblies" for translucent panels installed storefront framing.

1.3 DEFINITIONS

- A. ADA/ABA Accessibility Guidelines: U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disability Act (ADA) and Architectural Barriers Act (ABA) Accessibility Guidelines for Buildings and Facilities."

1.4 PERFORMANCE REQUIREMENTS

- A. General Performance: Aluminum-framed systems shall withstand the effects of the following performance requirements without exceeding performance criteria or failure due to defective manufacture, fabrication, installation, or other defects in construction:
 - 1. Movements of supporting structure indicated on Drawings including, but not limited to, story drift and deflection from uniformly distributed and concentrated live loads.
 - 2. Dimensional tolerances of building frame and other adjacent construction.
 - 3. Failure includes the following:
 - a. Deflection exceeding specified limits.
 - b. Thermal stresses transferring to building structure.
 - c. Framing members transferring stresses, including those caused by thermal and structural movements to glazing.
 - d. Glazing-to-glazing contact.
 - e. Noise or vibration created by wind and by thermal and structural movements.

- f. Loosening or weakening of fasteners, attachments, and other components.
 - g. Sealant failure.
 - h. Failure of operating units.
- B. Delegated Design: Design aluminum-framed systems, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
- C. Structural Loads:
 - 1. Wind Loads: As indicated on the Structural Drawings, applicable sections of the Kentucky Building Code.
 - 2. Seismic Loads: As indicated on the Structural Drawings.
- D. Deflection of Framing Members:
 - 1. Deflection Normal to Wall Plane: Limited to edge of glass in a direction perpendicular to glass plane shall not exceed $L/175$ of the glass edge length for each individual glazing lite, $1/175$ of clear span for spans up to 13 feet 6 inches (4.1 m) and to $1/240$ of clear span plus $1/4$ inch (6.35 mm) for spans greater than 13 feet 6 inches (4.1 m) or an amount that restricts edge deflection of individual glazing lites to $3/4$ inch (19 mm), whichever is less.
 - 2. Deflection Parallel to Glazing Plane: Limited to $L/360$ of clear span or $1/8$ inch (3.2 mm), whichever is smaller, amount not exceeding that which reduces glazing bite to less than 75 percent of design dimension and that which reduces edge clearance between framing members and glazing or other fixed components directly below them to less than $1/8$ inch (3.2 mm) and clearance between members and operable units directly below them to less than $1/16$ inch (1.5 mm).
- E. Structural-Test Performance: Provide aluminum-framed systems tested according to ASTM E 330 as follows:
 - 1. When tested at positive and negative wind-load design pressures, systems do not evidence deflection exceeding specified limits.
 - 2. When tested at 150 percent of positive and negative wind-load design pressures, systems, including anchorage, do not evidence material failures, structural distress, and permanent deformation of main framing members exceeding 0.2 percent of span.
 - 3. Test Durations: As required by design wind velocity, but not fewer than 10 seconds.
- F. Windborne-Debris-Impact-Resistance Performance: Provide aluminum-framed systems that pass missile-impact and cyclic-pressure tests when tested according to ASTM E 1886 and testing information in ASTM E 1996 or AAMA 506.
 - 1. Large-Missile Impact: For aluminum-framed systems located within 30 feet (9.1 m) of grade.
 - 2. Small-Missile Impact: For aluminum-framed systems located more than 30 feet (9.1 m) above grade.

- G. Story Drift: Provide aluminum-framed systems that accommodate design displacement of adjacent stories indicated.
1. Test Performance: Meet criteria for passing, based on building occupancy type, when tested according to AAMA 501.4 at design displacement and 1.5 times design displacement.
- H. Air Infiltration: Provide aluminum-framed systems with maximum air leakage through fixed glazing and framing areas of 0.06 cfm/sq. ft. (0.03 L/s per sq. m)] <Insert rate> of fixed wall area when tested according to ASTM E 283 at a minimum static-air-pressure difference of 6.24 lbf/sq. ft. (300 Pa) .
- I. Water Penetration under Static Pressure: Provide aluminum-framed systems that do not evidence water penetration through fixed glazing and framing areas when tested according to ASTM E 331 at a minimum static-air-pressure difference of 20 percent of positive wind-load design pressure, but not less than 6.24 lbf/sq. ft. (300 Pa).
- J. Water Penetration under Dynamic Pressure: Provide aluminum-framed systems that do not evidence water leakage through fixed glazing and framing areas when tested according to AAMA 501.1 under dynamic pressure equal to 20 percent of positive wind-load design pressure, but not less than 6.24 lbf/sq. ft. (300 Pa) .
1. Maximum Water Leakage: According to AAMA 501.1 No uncontrolled water penetrating aluminum-framed systems or water appearing on systems' normally exposed interior surfaces from sources other than condensation. Water leakage does not include water controlled by flashing and gutters that is drained to exterior and water that cannot damage adjacent materials or finishes.
- K. Thermal Movements: Provide aluminum-framed systems that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
1. Temperature Change (Range): 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.
 2. Test Performance: No buckling; stress on glass; sealant failure; excess stress on framing, anchors, and fasteners; or reduction of performance when tested according to AAMA 501.5.
 - a. High Exterior Ambient-Air Temperature: That which produces an exterior metal-surface temperature of 180 deg F (82 deg C)
 - b. Low Exterior Ambient-Air Temperature: 0 deg F (minus 18 deg C).
 3. Interior Ambient-Air Temperature: 75 deg F (24 deg C).
- L. Condensation Resistance: Provide aluminum-framed systems with fixed glazing and framing areas having condensation-resistance factor (CRF) of not less than 53 when tested according to AAMA 1503.

- M. Thermal Conductance: Provide aluminum-framed systems with fixed glazing and framing areas having an average U-factor of not more than [0.57 Btu/sq. ft. x h x deg F (3.23 W/sq. m x K)] [0.69 Btu/sq. ft. x h x deg F (3.92 W/sq. m x K)] <Insert U-factor> when tested according to AAMA 1503.
- N. Sound Transmission: Provide aluminum-framed systems with fixed glazing and framing areas having the following sound-transmission characteristics:
 - 1. Sound Transmission Class (STC): Minimum 35 STC when tested for laboratory sound transmission loss according to ASTM E 90 and determined by ASTM E 413.
 - 2. Outdoor-Indoor Transmission Class (OITC): Minimum 34 OITC when tested for laboratory sound transmission loss according to ASTM E 90 and determined by ASTM E 1332.
- O. Structural Sealant: Capable of withstanding tensile and shear stresses imposed by aluminum-framed systems without failing adhesively or cohesively. When tested for preconstruction adhesion and compatibility, cohesive failure of sealant shall occur before adhesive failure.
 - 1. Adhesive failure occurs when sealant pulls away from substrate cleanly, leaving no sealant material behind.
 - 2. Cohesive failure occurs when sealant breaks or tears within itself but does not separate from each substrate because sealant-to-substrate bond strength exceeds sealant's internal strength.
- P. Structural-Sealant Joints: Designed to produce tensile or shear stress of less than 20 psi (138 kPa).

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for aluminum-framed systems.
- B. LEED Submittals:
 - 1. Project will not be certified however shall meet intent.
 - 2. Product Data for Credit IEQ 4.1: For adhesives and sealants used inside of the weatherproofing system, documentation including printed statement of VOC content.
 - 3. Laboratory Test Reports for Credit IEQ 4: For adhesives and sealants used inside the weatherproofing system, documentation indicating that products comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- C. Shop Drawings: For aluminum-framed systems. Include plans, elevations, sections, details, and attachments to other work.

1. Include details of provisions for system expansion and contraction and for drainage of moisture in the system to the exterior.
 2. For entrance doors, include hardware schedule and indicate operating hardware types, functions, quantities, and locations.
- D. Samples for Initial Selection: For units with factory-applied color finishes.
- E. Samples for Verification: For each type of exposed finish required, in manufacturer's standard sizes.
- F. Other Action Submittals:
1. Entrance Door Hardware Schedule: Prepared by or under the supervision of supplier, detailing fabrication and assembly of entrance door hardware, as well as procedures and diagrams. Coordinate final entrance door hardware schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of entrance door hardware.
- G. Delegated-Design Submittal: For aluminum-framed systems indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
1. Detail fabrication and assembly of aluminum-framed systems.
 2. Include design calculations.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified Installer and testing agency.
- B. Seismic Qualification Certificates: For aluminum-framed systems, accessories, and components, from manufacturer.
1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
- C. Welding certificates.
- D. Preconstruction Test Reports: For sealant.
- E. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for aluminum-framed systems, indicating compliance with performance requirements.
- F. Source quality-control reports.
- G. Quality-Control Program for Structural-Sealant-Glazed System: Include reports.
- H. Field quality-control reports.
- I. Warranties: Sample of special warranties.

1.7 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For aluminum-framed systems to include in maintenance manuals.

1.8 QUALITY ASSURANCE

- A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.
- B. Testing Agency Qualifications: Qualified according to ASTM E 699 for testing indicated.
- C. Engineering Responsibility: Prepare data for aluminum-framed systems, including Shop Drawings, based on testing and engineering analysis of manufacturer's standard units in systems similar to those indicated for this Project.
- D. Quality-Control Program for Structural-Sealant-Glazed System: Develop quality control program specifically for Project. Document quality-control procedures and verify results for aluminum-framed systems. Comply with ASTM C 1401 recommendations including, but not limited to, system material-qualification procedures, preconstruction sealant-testing program, procedures for system fabrication and installation, and intervals of reviews and checks.
- E. Product Options: Information on Drawings and in Specifications establishes requirements for systems' aesthetic effects and performance characteristics. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction. Performance characteristics are indicated by criteria subject to verification by one or more methods including preconstruction testing, field testing, and in-service performance.
 - 1. Do not revise intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If revisions are proposed, submit comprehensive explanatory data to Architect for review.
- F. Preconstruction Sealant Testing: For structural-sealant-glazed systems, perform sealant manufacturer's standard tests for compatibility with and adhesion of each material that will come in contact with sealants and each condition required by aluminum-framed systems.
 - 1. Test a minimum five samples each of metal, glazing, and other material.
 - 2. Prepare samples using techniques and primers required for installed systems.
 - 3. For materials that fail tests, determine corrective measures necessary to prepare each material to ensure compatibility with and adhesion of sealants including, but not limited to, specially formulated primers. After performing these corrective measures on the minimum number of samples required for each material, retest materials.

- G. Accessible Entrances: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines and ICC/ANSI A117.1.
- H. Source Limitations for Aluminum-Framed Systems: Obtain from single source from single manufacturer.
- I. Structural-Sealant Glazing: Comply with ASTM C 1401, "Guide for Structural Sealant Glazing" for design and installation of structural-sealant-glazed systems.
- J. Structural-Sealant Joints: Design reviewed and approved by structural-sealant manufacturer.
- K. Welding Qualifications: Qualify procedures and personnel according to AWS D1.2, "Structural Welding Code - Aluminum."
- L. Preinstallation Conference: Conduct conference at Project site.

1.9 PROJECT CONDITIONS

- A. Field Measurements: Verify actual locations of structural supports for aluminum-framed systems by field measurements before fabrication and indicate measurements on Shop Drawings.

1.10 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of aluminum-framed systems that do not comply with requirements or that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Structural failures including, but not limited to, excessive deflection.
 - b. Noise or vibration caused by thermal movements.
 - c. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
 - d. Adhesive or cohesive sealant failures.
 - e. Water leakage through fixed glazing and framing areas.
 - f. Failure of operating components.
 - 2. Warranty Period: 10 ten years from date of Substantial Completion.
- B. Special Finish Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components on which finishes do not comply with requirements or that fail in materials or workmanship within specified warranty period. Warranty does not include normal weathering.
 - 1. Warranty Period: (20) twenty years from date of Substantial Completion.

1.11 MAINTENANCE SERVICE

- A. Entrance Door Hardware:
 - 1. 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 entrance door hardware.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide Kawneer, 1600 Wall System (7-1/2 inch depth) for openings interfacing with fiberglass sandwich panel assemblies and Kawneer Trifab 451T for single punched openings or comparable product by one of the following:
 - 1. Arcadia, Inc.
 - 2. Arch Aluminum & Glass Co., Inc.
 - 3. CMI Architectural
 - 4. Commercial Architectural Products, Inc.
 - 5. EFCO Corporation.
 - 6. Kawneer North America; an Alcoa company.
 - 7. Leed Himmel Industries, Inc.
 - 8. Pittco Architectural Metals, Inc.
 - 9. TRACO.
 - 10. Tubelite.
 - 11. United States Aluminum.
 - 12. Vistawall Architectural Products; The Vistawall Group; a Bluescope Steel company.
 - 13. YKK AP America Inc.
 - 14. Equivalent by other manufacturers.

2.2 MATERIALS

- A. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.
 - 1. Sheet and Plate: ASTM B 209 (ASTM B 209M).
 - 2. Extruded Bars, Rods, Profiles, and Tubes: ASTM B 221 (ASTM B 221M).
 - 3. Extruded Structural Pipe and Tubes: ASTM B 429.
 - 4. Structural Profiles: ASTM B 308/B 308M.
 - 5. Welding Rods and Bare Electrodes: AWS A5.10/A5.10M.

- B. Steel Reinforcement: Manufacturer's standard zinc-rich, corrosion-resistant primer, complying with SSPC-PS Guide No. 12.00; applied immediately after surface preparation and pretreatment. Select surface preparation methods according to recommendations in SSPC-SP COM and prepare surfaces according to applicable SSPC standard.
 - 1. Structural Shapes, Plates, and Bars: ASTM A 36/A 36M.

2. Cold-Rolled Sheet and Strip: ASTM A 1008/A 1008M.
3. Hot-Rolled Sheet and Strip: ASTM A 1011/A 1011M.

2.3 FRAMING SYSTEMS

- A. Framing Members: Manufacturer's standard extruded-aluminum framing members of thickness required and reinforced as required to support imposed loads.
 1. Construction: Thermally broken.
 2. Glazing System: Retained mechanically with gaskets on four sides.
 3. Glazing Plane: Front for Kawneer 1600 and Center for Kawneer 451T.
- B. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with nonstaining, nonferrous shims for aligning system components.
- C. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials.
 1. Use self-locking devices where fasteners are subject to loosening or turning out from thermal and structural movements, wind loads, or vibration.
 2. Reinforce members as required to receive fastener threads.
 3. Use exposed fasteners with countersunk Phillips screw heads, fabricated from stainless steel.
- D. Concrete and Masonry Inserts: Hot-dip galvanized cast-iron, malleable-iron, or steel inserts, complying with ASTM A 123/A 123M or ASTM A 153/A 153M.
- E. Concealed Flashing: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding flashing compatible with adjacent materials or Dead-soft, 0.018-inch- (0.457-mm-) thick stainless steel, ASTM A 240/A 240M of type recommended by manufacturer.
- F. Framing System Gaskets and Sealants: Manufacturer's standard, recommended by manufacturer for joint type.
 1. Sealants used inside the weatherproofing system shall have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.4 GLAZING SYSTEMS

- A. Glazing: As specified in Division 8 Section "Glazing."
- B. Glazing Gaskets: Manufacturer's standard compression types; replaceable, molded or extruded, of profile and hardness required to maintain watertight seal.
- C. Spacers and Setting Blocks: Manufacturer's standard elastomeric type.
- D. Bond-Breaker Tape: Manufacturer's standard TFE-fluorocarbon or polyethylene material to which sealants will not develop adhesion.

- E. Glazing Sealants: For structural-sealant-glazed systems, as recommended by manufacturer for joint type, and as follows:
1. Structural Sealant: ASTM C 1184, single-component neutral-curing silicone formulation that is compatible with system components with which it comes in contact, specifically formulated and tested for use as structural sealant and approved by a structural-sealant manufacturer for use in aluminum-framed systems indicated.
 - a. Sealants used inside the weatherproofing system shall have a VOC content of 100 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
 - b. Sealants used inside the weatherproofing system shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
 - c. Color: As selected by Architect from manufacturer's full range of colors.
 2. Weatherseal Sealant: ASTM C 920 for Type S, Grade NS, Class 25, Uses NT, G, A, and O; single-component neutral-curing formulation that is compatible with structural sealant and other system components with which it comes in contact; recommended by structural-sealant, weatherseal-sealant, and aluminum-framed-system manufacturers for this use.
 - a. Sealants used inside the weatherproofing system shall have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
 - b. Sealants used inside the weatherproofing system shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
 - c. Color: Matching structural sealant.

2.5 ENTRANCE DOOR SYSTEMS

- A. Entrance Doors: Manufacturer's standard glazed entrance doors for manual-swing operation.
1. Door Construction: 2- to 2-1/4-inch (50.8- to 57.2-mm) overall thickness, with minimum 0.125-inch- (3.2-mm-) thick, extruded-aluminum tubular rail and stile members. Mechanically fasten corners with reinforcing brackets that are deeply penetrated and fillet welded or that incorporate concealed tie rods.
 - a. Thermal Construction: High-performance plastic connectors separate aluminum members exposed to the exterior from members exposed to the interior.
 2. Door Design: Medium stile; 3-1/2-inch (88.9-mm) nominal width.
 - a. Accessible Doors: Smooth surfaced for width of door in area within 10 inches (255 mm) above floor or ground plane.

3. Glazing Stops and Gaskets: Beveled, snap-on, extruded-aluminum stops and preformed gaskets.
 - a. Provide nonremovable glazing stops on outside of door.
- B. Entrance Door Hardware: As specified in Division 8 Section "Door Hardware."

2.6 ENTRANCE DOOR HARDWARE

- A. General: Provide entrance door hardware and entrance door hardware sets indicated in door and frame schedule and entrance door hardware sets indicated in "Entrance Door Hardware Sets" Article for each entrance door to comply with requirements in this Section.
 1. Entrance Door Hardware Sets: Provide quantity, item, size, finish or color indicated, and named manufacturers' products] [products equivalent in function and comparable in quality to named products] [products complying with BHMA standard referenced].
 2. Sequence of Operation: Provide electrified door hardware function, sequence of operation, and interface with other building control systems indicated.
 3. Opening-Force Requirements:
 - a. Egress Doors: Not more than 15 lbf (67 N) to release the latch and not more than 30 lbf (133 N) to set the door in motion and not more than 15 lbf (67 N) to open the door to its minimum required width.
 - b. Accessible Interior Doors: Not more than 5 lbf (22.2 N) to fully open door.
- B. Designations: Requirements for design, grade, function, finish, size, and other distinctive qualities of each type of entrance door hardware are indicated in "Entrance Door Hardware Sets" Article. Products are identified by using entrance door hardware designations as follows:
 1. Named Manufacturers' Products: Manufacturer and product designation are listed for each door hardware type required for the purpose of establishing minimum requirements. Manufacturers' names are abbreviated in "Entrance Door Hardware Sets" Article.
 2. References to BHMA Standards: Provide products complying with these standards and requirements for description, quality, and function.
- C. Opening-Force Requirements:
 1. Latches and Exit Devices: Not more than 15 lbf (67 N) required to release latch.
- D. Pivot Hinges: BHMA A156.4, Grade 1.
 1. Offset-Pivot Hinges: Provide top, bottom, and intermediate offset pivots at each door leaf.
- E. Mortise Auxiliary Locks: BHMA A156.5, Grade 1. Coordinate with Owner's electronic security requirements.

- F. Cylinders: [As specified in Division 8 Section "Door Hardware."]
 - 1. Keying: Master key system. Permanently inscribe each key with a visual key control number and include notation "DO NOT DUPLICATE" to be furnished by Owner.
- G. Strikes: Provide strike with black-plastic dust box for each latch or lock bolt; fabricated for aluminum framing. Coordinate with Owner's electronic security requirements
- H. Operating Trim: BHMA A156.6.
- I. Closers: Concealed BHMA A156.4, Grade 1, with accessories required for a complete installation, sized as required by door size, exposure to weather, and anticipated frequency of use; adjustable to meet field conditions and requirements for opening force.
- J. Door Stops: BHMA A156.16, Grade 1, floor or wall mounted, as appropriate for door location indicated, with integral rubber bumper.
- K. Weather Stripping: Manufacturer's standard replaceable components.
 - 1. Compression Type: Made of ASTM D 2000, molded neoprene, or ASTM D 2287, molded PVC.
 - 2. Sliding Type: AAMA 701, made of wool, polypropylene, or nylon woven pile with nylon-fabric or aluminum-strip backing.
- L. Weather Sweeps: Manufacturer's standard exterior-door bottom sweep with concealed fasteners on mounting strip.
- M. Silencers: BHMA A156.16, Grade 1.
- N. Thresholds: BHMA A156.21, raised thresholds beveled with a slope of not more than 1:2, with maximum height of 1/2 inch (13 mm).
- O. Finger Guards: Manufacturer's standard collapsible neoprene or PVC gasket anchored to frame hinge-jamb at center-pivoted doors.

2.7 ACCESSORY MATERIALS

- A. Joint Sealants: For installation at perimeter of aluminum-framed systems, as specified in Division 7 Section "Joint Sealants."
 - 1. Sealants used inside the weatherproofing system shall have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
 - 2. Sealants used inside the weatherproofing system shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

- B. Bituminous Paint: Cold-applied, asphalt-mastic paint complying with SSPC-Paint 12 requirements except containing no asbestos; formulated for 30-mil (0.762-mm) thickness per coat.

2.8 FABRICATION

- A. Form or extrude aluminum shapes before finishing.
- B. Weld in concealed locations to greatest extent possible to minimize distortion or discoloration of finish. Remove weld spatter and welding oxides from exposed surfaces by descaling or grinding.
- C. Framing Members, General: Fabricate components that, when assembled, have the following characteristics:
 - 1. Profiles that are sharp, straight, and free of defects or deformations.
 - 2. Accurately fitted joints with ends coped or mitered.
 - 3. Means to drain water passing joints, condensation within framing members, and moisture migrating within the system to exterior.
 - 4. Physical and thermal isolation of glazing from framing members.
 - 5. Accommodations for thermal and mechanical movements of glazing and framing to maintain required glazing edge clearances.
 - 6. Provisions for field replacement of glazing from [exterior] [interior] [interior for vision glass and exterior for spandrel glazing or metal panels].
 - 7. Fasteners, anchors, and connection devices that are concealed from view to greatest extent possible.
- D. Mechanically Glazed Framing Members: Fabricate for flush glazing without projecting stops.
- E. Structural-Sealant-Glazed Framing Members: Include accommodations for using temporary support device to retain glazing in place while structural sealant cures.
- F. Storefront Framing: Fabricate components for assembly using shear-block system, screw-spline system or head-and-sill-receptor system with shear blocks at intermediate horizontal members.
- G. Entrance Door Frames: Reinforce as required to support loads imposed by door operation and for installing entrance door hardware.
 - 1. At exterior doors, provide compression weather stripping at fixed stops.
 - 2. At interior doors, provide silencers at stops to prevent metal-to-metal contact. Install three silencers on strike jamb of single-door frames and two silencers on head of frames for pairs of doors.
- H. Entrance Doors: Reinforce doors as required for installing entrance door hardware.
 - 1. At pairs of exterior doors, provide sliding-type weather stripping retained in adjustable strip and mortised into door edge.

2. At exterior doors, provide weather sweeps applied to door bottoms.
- I. Entrance Door Hardware Installation: Factory install entrance door hardware to the greatest extent possible. Cut, drill, and tap for factory-installed entrance door hardware before applying finishes.
- J. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.

2.9 ALUMINUM FINISHES

- A. Clear Anodic Finish: AAMA 611, AA-M12C22A41, Class I, 0.018 mm or thicker.

2.10 SOURCE QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to evaluate structural-sealant-glazed systems.
- B. Structural-Sealant-Glazed Systems: Perform quality-control procedures complying with ASTM C 1401 recommendations, including, but not limited to, system material-qualification procedures, sealant testing, and system fabrication reviews and checks.
- C. Structural-sealant-glazed system will be considered defective if it does not pass tests and inspections.
- D. Prepare test and inspection reports.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General:
 1. Comply with manufacturer's written instructions.
 2. Do not install damaged components.
 3. Fit joints to produce hairline joints free of burrs and distortion.
 4. Rigidly secure nonmovement joints.

5. Install anchors with separators and isolators to prevent metal corrosion and electrolytic deterioration.
 6. Seal joints watertight unless otherwise indicated.
- B. Metal Protection:
1. Where aluminum will contact dissimilar metals, protect against galvanic action by painting contact surfaces with primer or applying sealant or tape, or by installing nonconductive spacers as recommended by manufacturer for this purpose.
 2. Where aluminum will contact concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.
- C. Install components to drain water passing joints, condensation occurring within framing members, and moisture migrating within the system to exterior.
- D. Set continuous sill members and flashing in full sealant bed as specified in Division 7 Section "Joint Sealants" to produce weathertight installation.
- E. Install components plumb and true in alignment with established lines and grades, and without warp or rack.
- F. Install glazing as specified in Division 8 Section "Glazing."
1. Structural-Sealant Glazing:
 - a. Prepare surfaces that will contact structural sealant according to sealant manufacturer's written instructions to ensure compatibility and adhesion. Preparation includes, but is not limited to, cleaning and priming surfaces.
 - b. Install weatherseal sealant according to Division 7 Section "Joint Sealants" and according to sealant manufacturer's written instructions to produce weatherproof joints. Install joint filler behind sealant as recommended by sealant manufacturer.
- G. Entrance Doors: Install doors to produce smooth operation and tight fit at contact points.
1. Exterior Doors: Install to produce weathertight enclosure and tight fit at weather stripping.
 2. Field-Installed Entrance Door Hardware: Install surface-mounted entrance door hardware according to entrance door hardware manufacturers' written instructions using concealed fasteners to greatest extent possible.
- H. Install perimeter joint sealants as specified in Division 7 Section "Joint Sealants" to produce weathertight installation.

3.3 ERECTION TOLERANCES

- A. Install aluminum-framed systems to comply with the following maximum erection tolerances:

1. Location and Plane: Limit variation from true location and plane to 1/8 inch in 12 feet (3 mm in 3.7 m); 1/4 inch (6 mm) over total length.
 2. Alignment:
 - a. Where surfaces abut in line, limit offset from true alignment to 1/16 inch (1.5 mm).
 - b. Where surfaces meet at corners, limit offset from true alignment to 1/32 inch (0.8 mm).
- B. Diagonal Measurements: Limit difference between diagonal measurements to 1/8 inch (3 mm).

3.4 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified independent testing and inspecting agency to perform field tests and inspections.
- B. Testing Services: Testing and inspecting of representative areas to determine compliance of installed systems with specified requirements shall take place as follows and in successive phases as indicated on Drawings. Do not proceed with installation of the next area until test results for previously completed areas show compliance with requirements.
1. Structural-Sealant Compatibility and Adhesion: Structural sealant shall be tested according to recommendations in ASTM C 1401.
 - a. Destructive Test Method A, "Hand Pull Tab (Destructive)," in ASTM C 1401, Appendix X2, shall be used.
 - 1) A minimum of two areas on each building face shall be tested.
 - 2) Repair installation areas damaged by testing.
 2. Structural-Sealant Glazing Inspection: After installation of aluminum-framed systems is complete, structural-sealant glazing shall be inspected and evaluated according to recommendations in ASTM C 1401.
 3. Air Infiltration: Areas shall be tested for air leakage of 1.5 times the rate specified for laboratory testing under "Performance Requirements" Article, but not more than 0.09 cfm/sq. ft. (0.03 L/s per sq. m), of fixed wall area when tested according to ASTM E 783 at a minimum static-air-pressure difference of [1.57 lbf/sq. ft. (75 Pa)] [6.24 lbf/sq. ft. (300 Pa)].
 4. Water Penetration: Areas shall be tested according to ASTM E 1105 at a minimum uniform and cyclic static-air-pressure difference of 0.67 times the static-air-pressure difference specified for laboratory testing under "Performance Requirements" Article, but not less than 4.18 lbf/sq. ft. (200 Pa) , and shall not evidence water penetration.
 5. Water Spray Test: Before installation of interior finishes has begun, a minimum area of 75 feet (23 m) by 1 story of aluminum-framed systems designated by Architect shall be tested according to AAMA 501.2 and shall not evidence water penetration.
- C. Repair or remove work if test results and inspections indicate that it does not comply with specified requirements.

- D. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
- E. Aluminum-framed assemblies will be considered defective if they do not pass tests and inspections.
- F. Prepare test and inspection reports.

3.5 ADJUSTING

- A. Adjust operating entrance door hardware to function smoothly as recommended by manufacturer.
 - 1. For entrance doors accessible to people with disabilities, adjust closers to provide a 3-second closer sweep period for doors to move from a 70-degree open position to 3 inches (75 mm) from the latch, measured to the leading door edge.

3.6 ENTRANCE DOOR HARDWARE SETS

Door Hardware Set No.
 Aluminum Doors and Glass; each to have the following:

Qty.	Item	Description	Manufacturer	Finish
*	Hanging Devices	Pivots	<Insert manufacturer>.	<Insert finish>.
#	Securing Devices (inactive leaf)	Latch Set/Electric Strike	<Insert manufacturer>.	<Insert finish>.
#	Securing Devices (active leaf)	<Insert description>.	<Insert manufacturer>.	<Insert finish>.
#	Operating Trim	Door Pull/Push Plate	<Insert manufacturer>.	Match Door
#	Accessories for Pairs of Doors	<Insert description>.	<Insert manufacturer>.	<Insert finish>.
#	Closing Devices	Concealed Closer	LCN	Match Door
#	Protective Trim Units	<Insert description>.	<Insert manufacturer>.	<Insert finish>.
#	Stops and Holders	<Insert description>.	<Insert manufacturer>.	<Insert finish>.
#	Accessories	Threshold/ Weather-stripping	<Insert manufacturer>.	<Insert finish>.
#	Miscellaneous Items	<Insert description>.	<Insert manufacturer>.	<Insert finish>.

* Number of hinges, as specified.

++ END OF SECTION ++

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SECTION 08710

DOOR HARDWARE

PART 1 – GENERAL

1.1 SUMMARY

- A. Furnish and deliver all items of finish hardware required to adequately trim and hang all doors, also hardware as specified and as enumerated in “Set Numbers” and as indicated and required by actual conditions at the building. The hardware shall include the furnishing of all necessary screws, bolts, special bolts, expansion shields and all other devices necessary for the proper application of the hardware.
- B. Related Sections:
1. The following items are covered in other sections:
 - a. Division 06; Rough/Finish Carpentry
 - b. Division 08; Metal Doors and Frames
 - c. Division 08; Wood Doors
 - d. Division 08; Aluminum Entrances
 - e. Division 26; Electrical
 - f. Division 28; Security
- C. Specific Omissions: Hardware for the following is specified or indicated elsewhere, unless specifically listed in the hardware sets.
1. Overhead Doors (except cylinders where scheduled)
 2. Cabinets of all kinds, including open wall shelving and locks.
 3. Windows
 4. Signs, except as noted.
 5. Toilet accessories of all kinds including grab bars.

1.2 REFERENCES

- A. Finish hardware in this section shall meet the following standards as established by and the standard latest revision will be effect:
1. The Door and Hardware Institute (DHI) Various Publications
 2. American National Standards (ANSI)/Builders Hardware Manufacturer Association (BMHA)
 3. National Fire Prevention Association (NFPA)
 - a. NFPA 80 Standard for Fire Doors and Fire Windows
 - b. NFPA 101 Life Safety Code
 - c. NFPA 105 Smoke and Draft Control Door Assemblies
 4. CABO/ANSI A117.1 Accessible and Usage Buildings and Facilities
 5. Underwriters Laboratories (UL)
 - a. UL 10C – Fire Tests of Door Assemblies
 - b. UL 305 – Panic Hardware

6. Applicable State and Local Building Codes
7. American Disabilities Act (ADA) – 1990 Civil Law

1.3 SUBMITTALS

A. Schedules:

1. The finish hardware supplier shall, upon award of the contract, furnish six (6) copies of a completely detailed schedule of finish hardware in “Vertical Format” in the Door and Hardware Institute’s Sequence and Format for approval within 30 days. Hardware schedule to be complete with Title page, Door Index/Keying Schedule and Manufactures legend. After “Approval” provide six (6) copies, unless otherwise requested, of the corrected, revised and approved schedule for field use, distribution and files. Provide one (1) copy complete with Catalog Cuts, marked “Installers Copy” and deliver it to the job site. Horizontal format schedules will be rejected.

B. Product Data:

1. Provide a catalog cut, clearly marked and identified, illustrating and describing each product included in the hardware schedule. Formulate these catalog cuts into sets and include a set with each copy of the hardware schedule submitted.

C. Samples:

1. If so requested by the Architect, provide a sample of any product or item requested, properly marked and tagged, for the opening for which it is intended. After examination and approval by the Architect, the sample shall be turned over to the General Contractor, for incorporation into the project.

D. Templates:

1. Upon “Approved” copies of the hardware schedule, provide a complete “Template List”. Further and upon request, provide copies to manufacturers or trades, whose work includes preparation of their products, to receive hardware. Provide copies of all such transmittals to the contractor, for their files. If physical samples are required, the manufacturer may request it from the general contractor and assume all responsibility of shipping it complete to the project.

E. Keying:

1. The hardware supplier shall meet with owner and/or architect to establish keying requirements. Provide a keying schedule, listing the levels of keying, (GMKD, MKD, Keyed alike, etc.) as well as an explanation of the key’s function, the symbols used and the numbers of the doors controlled. This shall be provided in reference to the Door and Hardware Institute’s manual “Keying Systems and Nomenclature”. Also in conjunction the Door Index/Keying Schedule (which lists the door number, schedule heading, lock type and individual key symbol and remarks or special instructions) mentioned in paragraph “B”, Schedules.

F. Wiring Diagrams:

1. Unless otherwise specifically stated, for any electrified hardware furnished on this project, provide complete point to point wiring diagrams along with riser drawings and elevations, showing locations where such material is to be installed. Also check with the system installer as to the scope of their work.

G. Operations and Maintenance Data:

1. At the completion of the project, provide an Owner's Operation and Maintenance Manual. The manual shall consist of a hard three ring binder. Include a copy of the latest revised and updated schedule of finish hardware, complete with catalog cuts and keying schedule. In addition, furnish one copy of maintenance and parts manual, for those items, for which they are readily available and normally provided.

1.4 QUALITY ASSURANCE

A. Substitutions:

1. The manufacturers and catalog numbers listed are intended to establish a standard of quality. Items specified as "owner's standard" shall be provided as listed they have been requested by the Owner/Architect to match existing for continuity and/or future performance, maintenance standards or there is no equal product. Certain products have been selected for their unique characteristics and particular project suitability. Requests for substitutions will require architects approval and must be made in accordance with Division 01. Provide sample if requested. Substitution item will be reviewed and if approved it will be listed in an addendum prior to bid date.

B. Supplier Qualification:

1. The hardware supplier must be engaged currently in the furnishing, delivery and servicing of contract builders hardware. The firm shall have been furnishing hardware on similar projects in the vicinity for not less than five (5) years. The supplier must employ a certified Architectural Hardware Consultant (AHC) qualification and be available at reasonable times during the course of this project for consultation with the owner, architect and general contractor.

C. Single source responsibility: Obtain each type of hardware (latches and locks, hinges, exit devices, door closers, etc) from a single manufacturer.

D. Fire-Rated Openings:

1. Provide door hardware for fire-rated openings that complies with NFPA and requirements of authorities having jurisdiction. Provide only items of door hardware that are listed and are identical to products tested by Underwriters Laboratories, Warnock Hersey, Factory Mutual, or other testing and inspecting organization for given type/size and degree of label. Provide proper latching hardware, door closers, approved bearing hinges and seals whether listed in the hardware schedule or not. All hardware shall comply with standards UBC702 (1997) and UL10C. These must be acceptable to the authorities having jurisdiction for use on types and sizes of doors indicated in compliance with requirements of fire-rated door and frame labels.
 - a. Where emergency exit devices are required on fire rated doors, (with supplementary marking on door' UL labels indicating "Fire Doors to be equipped with Fire Exit Hardware") provide UL label on exit devices indicating, "Fire Exit Hardware".

E. Electronic Security Hardware:

1. When electrified hardware is included in the hardware specification, the hardware supplier must employ an individual knowledgeable in electrified components and systems, who is capable of producing wiring diagrams and consulting as needed. Coordinate installation and technical data of the electronic security hardware with Architect, electrical engineers and other related contractors. Upon completion of the electronic security hardware installation, verify that components are working properly, and state in the required guarantee that this inspection has been performed. Provide electrical door hardware from the same source manufacturer as the mechanical door hardware.

1.5 DELIVERY, STORAGE AND HANDLING

A. Marking and packaging:

1. All items of hardware shall be delivered to the job site, in the manufacturer's original packages, they shall be marked to correspond with approved hardware schedule, item number, heading number, door number and key sets symbols. Include installation instructions with each piece of hardware.

B. Delivery:

1. The hardware supplier shall coordinate delivery with general contractor, in order to compile a mutually beneficial delivery schedule, which imposes no hardship on either party. Some items of the hardware may be delivered to fabricators for factory installation in such case, the general contractor shall be advised of such shipments, along with copies of shipping tickets and any other documentation, thus transferring responsibility to the manufacturer or fabricator, for care of said hardware. Any delivery fees will be in the quoted price of the material.

- C. Storage:
 - 1. Hardware is to be delivered to the job site and stored in a clean dry, secure area, with adequate strong shelving. If requested by the contractor, the hardware supplier shall send a representative to the job site to “assist” the check in and laying-out of the hardware on the shelves. A representative of the contractor MUST be present. At this time any installation tips or special instructions will be reviewed.

- D. No direct shipments will be allowed unless prior approval by the contractor.

1.6 WARRANTY

- A. Starting date for all warranty periods will be from the date of substantial completion.

- B. All material must carry a limited warranty against defects in workmanship and materials from the date of acceptance of the project as follows.
 - 1. Door Closers: at least ten (10) year warranty, except electronic closers, two (2) years
 - 2. Exit Devices: at least three (3) year warranty, except electrified devices, one (1) year.
 - 3. Locksets: at least seven (7) year warranty, except electrified devices, one (1) year.
 - 4. Hinges: life of the building.
 - 5. Balance of the hardware: one (1) year.

- C. Products judged to be defective during the warranty period will be replaced or repaired in accordance with the manufacturer’s warranty at no additional cost to the owner. However, NO warranty against defects due to improper installation or failure to exercise normal maintenance.

1.7 MAINTENANCE

- A. Maintenance service:
 - 1. If there are any products listed hereinafter that normally require a maintenance or service contract, provide the owner with details and costs of said contract.

- B. Maintenance Tools and Instructions:
 - 1. Furnish a complete set of specialized tools and maintenance instructions as needed for the owners continued adjustment, maintenance, and removal and the replacement of door hardware.

PART 2 – PRODUCTS

2.1 MANUFACTURERS:

- A. The following manufacturers listed in 2.02 Materials have been selected for this project, whose products numbers have been used in the preparation for this specification.
- B. Note that even though an acceptable substitute manufacturer may be listed, the product must provide all the functions and features of the specified product or it will not be approved.
- C. Hand of Door: Drawings show direction of slide, swing, or hand of each door leaf. Furnish each item of hardware for proper installation and operation of door movement as shown.
- D. Where the exact types of hardware specified are not adaptable to the finished shape or size of the members requiring hardware, furnish suitable types having as nearly as possible the same operation and quality as the type specified, subject to Architect's approval.

2.2 MATERIALS

- A. Screws and Fasteners:
 - 1. Provide all screws and fasteners of the proper size and type to properly anchor or attach the item of hardware they are intended for. Provide all fasteners with Phillips head, do not use through-bolts for installation where bolt head or nut on opposite face is exposed in other work unless their use is the only means of reinforcing the work adequately to fasten the hardware securely.
- B. Hinges:
 - 1. The following is a guide for hinge type required for this specification:
 - a. 1-3/4" thick doors up to and including 3'0" wide:
 - 1) Exterior: standard (.134) or heavy weight (.180) ball bearing, bronze/stainless steel 4-1/2" high.
 - 2) Interior: standard (.134) or heavy weight (.180) plain or ball bearing, steel 4-1/2" high.
 - b. 1-3/4" doors over 3'0" wide:
 - 1) Exterior: standard (.134) or heavy weight (.180) ball bearing, bronze/stainless steel 5" high.
 - 2) Interior: standard (.134) or heavy weight (.180) plain or ball bearing, steel 5" high.
 - c. Furnish one pair of hinges for all doors up to 60" high. Furnish one additional hinge for every additional 30" or fraction thereof. The width of hinges shall be sufficient to clear all trim.

- d. Hinges specified Ives (IVE), approved acceptable substitute Hager, Stanley, McKinney
- C. Continuous Hinges:
- 1. Hinges shall be manufactured of three interlocking components and two hinge leafs. The door leaf and jamb leaf shall be pinned together for the entire length of the hinge. The assembly of three interlocking shall be applied to the full height of the door and frame without mortising.
 - a. Continuous Hinges specified Ives (IVE), approved acceptable substitute Hager Roton, McKinney, Select
- D. Automatic and Manual Flush Bolts:
- 1. Shall have forged bronze faceplate with extruded brass lever and with wrought brass guide and strike. Flush bolts for hollow metal doors shall be extension rod type door up to 7'6" in height shall have 12" steel or brass rods, manual flush bolts for doors over 7'6" in height shall be increased by 6" for each additional 6" of door height. Wood doors shall have corner-wrap type. Provide dust proof strikes for all bottom bolts.
 - a. Flush Bolts specified Ives (IVE), approved acceptable substitute DCI, Rockwood
- E. Coordinators:
- 1. Where pairs of doors are equipped with automatic flush bolts, provide bar type coordinating device, surface applied to the underside of the stop at the frame head. Provide a filler bar of the correct length to span the entire width of the opening, and any appropriate brackets for parallel arm door closers, surface vertical rod strikes, and or any other hardware. Finish of the coordinator, filler bar and mounting brackets to be US28 unless otherwise noted.
 - a. Coordinators specified Ives (IVE), approved acceptable substitute DCI, Rockwood
- F. Mortise Locks:
- 1. Locks shall be ANSI A156.13, Grade 1 Operational, and manufactured from heavy gauge steel, containing components of steel with a zinc dichromate plating for corrosion resistance. Lock case shall be multi-function and field reversible for handing without opening the case. Cylinders: Refer to 2.04 KEYING.
 - 2. Locks to have a standard 2-3/4" backset with a full 3/4" throw stainless steel mechanical anti-friction latch bolt. Deadbolt shall be a full 1" throw, constructed of stainless steel.
 - 3. Provide standard ASA strikes unless extended lip strikes are necessary to protect trim.

4. Provide electrical options as scheduled. Provide electrified locksets with micro switch (RX) option that monitors the retractor crank, and is actuated when rotation of the inside or outside lever rotates the retractor hub. Provide normally closed contacts or normally open contacts as required by security system. All electrification and or additional switches shall be added to the mortise lock by the manufacturer of the mortise lock. Electric and Non-Electric additions to the mortise lock by a second manufacturer that void the warranty of the mortise lock manufacturer will not be acceptable.
5. Lever trim shall be cast or forged in the design specified, with 2-1/8" diameter roses with wrought roses and external lever spring cages. Levers shall be thru-bolted to assure proper alignment, and shall have a 2-piece spindle. Levers to be thru-bolted to assure proper alignment. Trim shall be applied by threaded bushing "no exposed screws".
6. Lever trim on the secure side of doors serving rooms considered by the authority having jurisdiction to be hazardous shall have a tactile warning.
7. Locks meeting this specification: Schlage (SCH) L9000 x 17L approved acceptable substitute Sargent 8200 series , Stanley Best 45H series

G. Exit Devices:

1. Exit devices shall be touch pad type, fabricated of brass, bronze, stainless steel, or aluminum, plated to the standard architectural finishes to match the balance of the door hardware.
2. Exit devices shall be tested to ANSI/BHMA A156.3 test requirements by a BHMA certified laboratory. A written certification showing successful completion of a minimum 1,000,000 cycles must be provided.
3. All exit devices shall incorporate a fluid damper or other device, which eliminates noise associated with the standard operation.
4. Touch pad shall extend a minimum of one half of the door width. Maximum unlatching force shall not exceed 15 pounds. End-cap will have three-point attachment to the door. Touch pad shall match exit device finish, and shall be stainless steel for US26, US26D, US28, US32, and US32D finishes.
5. Only compression springs will be used in devices, latches, and outside trim and/or controls.
6. All lever design shall match mortise lock lever designs.
7. All devices to incorporate a security dead-latching feature.
8. Provide roller strikes for all rim and surface mounted vertical rod devices, ASA strikes for mortise devices, and manufacturer's standard strikes for concealed vertical rod devices.
9. Device mechanism case and bar shall sit flush on the face of all flush doors, or spacers shall be furnished to fill gaps behind devices. Where glass trim or the moulding projects off the face of the door, provide glass bead kits.
10. Exit devices shall be UL listed panic exit hardware. All exit devices for fire rated openings shall be UL labeled fire exit hardware.
11. Provide electrical options as scheduled.
12. Exit devices meeting this specification: Von Duprin (VON) 98 series approved acceptable substitute None Owners Standard

H. Door Closers:

1. All closers will utilize a stable fluid withstanding temperature range of 120 degrees f to -30 degrees f without seasonal adjustment of closer speed to properly close the door. Closers on fire rated doors will be provided with temperature stabilizing fluid that complies with standard UL 10C for "Positive Pressure Fire Tests of Door Assemblies" and UBC 7-2 (1997).
2. Door closers shall hydraulic, full rack and pinion action with a high strength cast iron cylinder. Cylinder body shall be 1 1/2" in diameter, and double heat-treated pinion shall be 11/16" in diameter. A written certificate showing successful completion of a minimum of 10,000,000 cycles for exterior door closers must be provided.
3. Spring power shall be continuously adjustable over the full range of closer sizes, and allow for reduced opening force for the physically handicapped. Hydraulic regulation shall be by tamper-proof, non-critical valves. Closers shall have separate adjustment for latch speed, general speed, and back check.
4. All closer shall have forged steel main arms and forged forearms for parallel arm closers.
5. Closer cylinders and arms (and metal covers when specified) shall have a powder coating finish which has been certified to exceed 100 hours of salt spray testing by ETL, an independent testing laboratory used by BHMA for ANSI certification. For metal components that can't be powder coated, a special rust inhibiting finish (SRI) must be used.
6. All closers will not be seen on the public side or hallway side of the door. The appropriate drop plate or mounting plates will be used as conditions dictate.
7. Door closers meeting this specification: LCN (LCN) 4011, 4111 approved acceptable substitute None Owners Standard

I. Door Stops and Holders:

1. It shall be the responsibility of the hardware supplier to provide doorstops for all doors in accordance with following requirements:
 - a. Wall stops may be used wherever possible.
 - b. Where wall stops cannot be used, provide dome type floor stops of the proper height.
 - c. At any opening where a wall or floor stop cannot be used, a heavy-duty overhead stop will be required.
 - d. At no time will a hinge pin stop be acceptable.
 - e. Stops specified Ives (IVE), approved acceptable substitute Hager, Rockwood

J. Overhead Stops/Holders:

1. Overhead door stops and holders; surface or concealed at the top of the door shall have shock absorber in extruded stainless steel case. Hold open and shock absorber feature that automatically engages and releases the door. Sliding member in the channel shall have accessible adjustment screw to regulate hold open tension.

2. Overhead stops/holders specified Glynn-Johnson (GLY), approved acceptable substitute Sargent, Rixson

K. Thresholds and Gasketing:

1. Furnish as specified and per details. Match finish of other items as closely as possible. Provide only those units where resilient or flexible seal strip is easily replaceable and readily available. Threshold, sweep and weather-stripping will be supplied to weather proof the exterior doors. The thresholds will be supplied to fit the particular sill conditions and not conflict with the American Disabilities Act (ADA). Exterior pairs of doors will have split astragal to prevent air infiltration. Interior doors may require gasketing, thresholds and sweeps to act as a sound barrier per the owner's request.
 - a. Thresholds specified National Guard Products (NGP), approved acceptable substitute Reese, Zero

L. Silencers:

1. Furnish Ives SR64 for the "push in type: for metal frames, Ives SR65 for wood frames, or Ives SR66 adhesive type. Supply 3 each for single doors, 2 each for pair of doors. Omit silencers where gasketing is scheduled.
 - a. Silencers specified Ives (IVE), approved acceptable substitute Hager, Rockwood

M. Miscellaneous Items:

1. Transom Spring Bolts specified Richard Wilcox (RIC), approved acceptable substitute architect approved.

2.3 FINISHES

- A. All hardware is to be furnished in one of the following finishes, depending upon the item and its base metal. All satin chrome or satin stainless steel or as noted.

Item	BHMA #	US #
Hinges exterior	630	(US32D)
Hinges interior	630	(US32D)
Continuous Hinges	630	(US32D)
Flush Bolts	630	(US32D)
Coordinators	628	(US28)
Mounting Brackets	689	(alum painted)
Locks	630	(US32D)
Exit Devices	630	(US32D)
Door Closers	689	(alum painted)
Door wall stops	630	(US32D)
Overhead Holders	630	(US32D)

Other items to be 630 if available. If not, 626 over brass or bronze.

2.4 KEYING

- A. All locksets shall be furnished with two (2) cut keys and with key code number stamped on the bow of the key. All cylinders shall be factory masterkeyed and grand masterkeyed as required. Furnish three (3) grand masterkeys and six (6) masterkeys for each masterkeyed group. The grand masterkeys and masterkeys shall be sent direct to the owner's representative by registered mail, return receipt requested.
- B. Consult with architect and/or owner's representative and secure written approval of the complete keying layout prior to placing lock order with factory.
 - 1. Cylinders and Keying specified Schlage (SCH), approved acceptable substitute Sargent, Stanley Best

PART 3 – EXECUTION

3.1 EXAMINATION

- A. Prior to installation of hardware, examine condition of opening size, shall be verified as to door frames being plumb and of correct tolerance, walls or any related items that would prevent proper installation of doors and hardware. Correct any and all defects prior to proceeding with installation.

3.2 INSTALLATION

- A. Prior to hardware installation the general contractor will set up a preinstall job site meeting with the hardware supplier, hardware installer and any other trades people deemed necessary (i.e. electrical contractor, security contractor, etc.) for communication to assure trouble free installation. This meeting would be best coordinated with the delivery requirements detained in section 1.05.
- B. Review with the architect the mounting locations of various items of hardware in accordance with the Door and Hardware Institute's (DHI), "Recommended Locations for Architectural Hardware" for standard and custom steel doors and frames, and DHI's WDHS-3 for flush wood doors. Special attention to be given to all special and unusual conditions. All hardware shall be installed by carpenter mechanics skilled in the application of said hardware.
- C. Install each hardware item in compliance with the manufacturer's instructions and recommendations, using only the fasteners provided by the manufacturer.
- D. Set thresholds for exterior doors in a full bed of butyl-rubber or polyisobutylene mastic sealant complying with requirements specified in Division 7 "Joint-Sealers".

3.3 FIELD QUALITY CONTROL

- A. After all hardware has been installed, provide the services of a qualified hardware consultant to check for proper installation of hardware, according to the “Approved” hardware and keying schedule’s. Also, check the operation and adjustment of all hardware items in accordance with the manufacturer’s recommendations.

3.4 ADJUSTING AND CLEANING

- A. At final completion, hardware shall be left clean and free from disfigurement. Make final adjustment to all door closers and other items of hardware. Where hardware is found defective, repair or replace or otherwise correct as directed. After building is occupied, arrange an appointment with owner’s representative to instruct in the proper use, servicing, adjusting and maintenance of the hardware.
- B. Hardware items specified to receive antimicrobial coating may be cleaned with a mild detergent, air-dry or dried with soft cloth.
- C. Avoid harsh abrasive cleaners and abrasive cleaning pads.

3.5 PROTECTION

- A. Provide protection for all items of hardware during construction, to prevent damage, field painting or marring. Damaged or disfigured hardware shall be replaced or corrected by the responsible party.

3.6 HARDWARE SCHEDULE

- A. Provide hardware for each door to comply with requirements of this section “Finish Hardware” hardware set numbers indicated in the door schedule, and in the following schedule of hardware sets.
- B. It is intended that the following schedule includes all items of the finish hardware necessary to complete the work. If a discrepancy is found in the schedule, such as a missing item, improper hardware for a frame, door or fire codes, it shall be the responsibly of the hardware supplier to supply the proper materials.

C. Hardware Sets:

HW SET: 01

DOOR NUMBERS: 101A, 102A, 108A and 112B

Each to have:

1	ea	Continuous Hinge	700	630	IVE
1	ea	Panic Hardware	LD98L-NL 996L-NL X 17	630	VON
1	ea	Rim Cylinder	20-021	626	SCH
1	ea	Surface Closer	4111 SCUSH SRI	689	LCN
1	set	Seals	130SSS	630	NGP
1	ea	Threshold	SIA-896SS-S MS/LA	630	NGP

Door requires special 3/8 inch undercut for threshold.

HW SET: 02

DOOR NUMBER: 101B

Each to have:

6	ea	Hinge	5BB1HW 4.5 X 4.5	630	IVE
1	set	Auto Flush Bolt	FB31P	630	IVE
1	ea	Panic Hardware	LD9875L-BE 996L-BE X 17	630	VON
1	ea	Coordinator	COR X FL	628	IVE
2	ea	Mounting Bracket	MB2	689	IVE
1	ea	Astragal	SS-565-ASA-FB	630	NGP
2	ea	Surface Closer	4111 CUSH SRI X ST1496	689	LCN

HW SET: 03

DOOR NUMBERS: 102, 103B and 110B

Each to have:

2	ea	Continuous Hinge	700	630	IVE
1	set	Auto Flush Bolt	FB31P	630	IVE
1	ea	Panic Hardware	LD9875L-NL 996L-NL X 17	630	VON
1	ea	Mortise Cylinder	20-001	626	SCH
1	ea	Coordinator	COR X FL	628	IVE
2	ea	Mounting Bracket	MB2	689	IVE
1	set	Astragal	9125SS	630	NGP
1	ea	Astragal	SS-565-ASA-FB	630	NGP
2	ea	Surface Closer	4111 SCUSH SRI X ST1496	689	LCN
1	set	Seals	130SSS (JAMBS)	630	NGP
1	ea	Seals	5050CL (SEAL AT HEAD)	CLR	NGP
1	ea	Threshold	SIA-896SS-S MS/LA	630	NGP

Doors require special 3/8 inch undercut for threshold.

HW SET: 04

DOOR NUMBERS: 103A, 103C and 104A

Each to have:

3	ea	Hinge	5BB1HW 4.5 X 4.5	630	IVE
1	ea	Panic Hardware	LD98L-BE 996L-BE X 17	630	VON
1	ea	Surface Closer	4111 EDA SRI	689	LCN
1	ea	Wall Stop	WS407CVX	630	IVE
3	ea	Silencer	SR64	GRY	IVE

HW SET: 05

DOOR NUMBERS: 101 and 104C

Each to have:

1	ea	Continuous Hinge	700	630	IVE
1	ea	Panic Hardware	LD98L 996L X 17	630	VON
1	ea	Rim Cylinder	20-021	626	SCH
1	ea	Surface Closer	4111 SHCUSH SRI	689	LCN
1	set	Seals	130SSS	630	NGP
1	ea	Threshold	SIA-896SS-S MS/LA	630	NGP

Door requires 3/8 inch under cut for ADA type threshold.

HW SET: 06

DOOR NUMBERS: 102B, 206 and 301

Each to have:

3	ea	Hinge	5BB1HW 4.5 X 4.5	630	IVE
1	ea	Passage Set	L9010 17L	630	SCH
1	ea	Surface Closer	4011 SRI	689	LCN
1	ea	Wall Stop	WS407CVX	630	IVE
3	ea	Silencer	SR64	GRY	IVE

HW SET: 07

DOOR NUMBERS: 104B and 104D

Each to have:

All hardware by door manufacturer					B/O
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HW SET: 08A

DOOR NUMBER: 104E.1

Each to have:

2	ea	Continuous Hinge	700	630	IVE
1	set	Auto Flush Bolt	FB31P	630	IVE
1	ea	Panic Hardware	LD9875L-BE 996L-BE X 17	630	VON
1	ea	Coordinator	COR X FL	628	IVE
2	ea	Mounting Bracket	MB2	689	IVE
1	ea	Astragal	SS-565-ASA-FB	630	NGP
2	ea	Surface Closer	4111 HCUSH SRI X ST1496	689	LCN

HW SET: 08B

DOOR NUMBER: 104E.2

Each to have:

2	ea	Continuous hinge	700	630	IVE
2	ea	Spring bolt	0434.00027 WITH 0434.00027	600	RIC
1	ea	Astragal	SS-565-BLANK	630	NGP
2	ea	Overhead holder	900F	630	GLY

HW SET: 09

DOOR NUMBER: 105A

Each to have:

3	ea	Hinge	5BB1HW 4.5 X 4.5	630	IVE
1	ea	Office Lock	LV9050P 17L L583-363	630	SCH
1	ea	Surface Closer	4111 CUSH SRI	689	LCN
1	set	Seals	130SSS	630	NGP
1	ea	Threshold	SIA-896SS-S MS/LA	630	NGP

Door requires special 3/8 inch undercut for threshold.

HW SET: 10

DOOR NUMBER: 105B

Each to have:

3	ea	Hinge	5BB1 4.5 X 4.5	630	IVE
1	ea	Office Lock	LV9050P 17L L583-363	630	SCH
1	ea	Wall Stop	WS407CVX	630	IVE
3	ea	Silencer	SR64	GRY	IVE

HW SET: 11

DOOR NUMBER: 106A

Each to have:

3	ea	Hinge	5BB1HW 4.5 X 4.5	630	IVE
1	ea	Classroom Lock	LV9070P 17L	630	SCH
1	ea	Surface Closer	4011 SRI	689	LCN
1	ea	Wall Stop	WS407CVX	630	IVE
3	ea	Silencer	SR64	GRY	IVE

HW SET: 12

DOOR NUMBER: 106B

Each to have:

3	ea	Hinge	5BB1HW 4.5 X 4.5 NRP	630	IVE
1	ea	Storeroom Lock	LV9080P 17L	630	SCH
1	ea	Surface Closer	4111 CUSH SRI	689	LCN
3	ea	Silencer	SR64	GRY	IVE

HW SET: 13

DOOR NUMBER: 107

Each to have:

3	ea	Hinge	5BB1HW 4.5 X 4.5	630	IVE
1	ea	Privacy Set	LV9040 17L L583-363	630	SCH
1	ea	Surface Closer	4011 SRI	689	LCN
1	ea	Wall Stop	WS407CVX	630	IVE
1	set	Seals	130SSS	630	NGP
1	ea	Threshold	SIA-896SS-S MS/LA	630	NGP

Door requires special 3/8 inch undercut for threshold.

HW SET: 14

DOOR NUMBER: 108B

Each to have:

3	ea	Hinge	5BB1HW 4.5 X 4.5	630	IVE
1	ea	Classroom Lock	LV9070P 17L	630	SCH
1	ea	Surface Closer	4011 SRI	689	LCN
1	ea	Wall Stop	WS407CVX	630	IVE
1	set	Seals	130SSS	630	NGP
1	ea	Threshold	SIA-896SS-S MS/LA	630	NGP

Door requires special 3/8 inch undercut for threshold.

HW SET: 15

DOOR NUMBER: 109

Each to have:

3	ea	Hinge	5BB1HW 4.5 X 4.5	630	IVE
1	ea	Privacy Set	LV9040 17L L583-363	630	SCH
1	ea	Surface Closer	4011 SRI	689	LCN
1	ea	Wall Stop	WS407CVX	630	IVE
3	ea	Silencer	SR64	GRY	IVE

HW SET: 16

DOOR NUMBER: 110A and 208

Each to have:

3	ea	Hinge	5BB1HW 4.5 X 4.5	630	IVE
1	ea	Storeroom Lock	LV9080P 17L	630	SCH
1	ea	Surface Closer	4011 SRI	689	LCN
1	ea	Wall Stop	WS407CVX	630	IVE
3	ea	Silencer	SR64	GRY	IVE

HW SET: 17

DOOR NUMBER: 203

Each to have:

3	ea	Hinge	5BB1HW 4.5 X 4.5	630	IVE
1	ea	Passage Set	L9010 17L	630	SCH
1	ea	Surface Closer	4011 SRI	689	LCN
1	ea	Wall Stop	WS407CVX	630	IVE

HW SET: 18

DOOR NUMBER: 205

Each to have:

3	ea	Hinge	5BB1HW 4.5 X 4.5	630	IVE
1	ea	Passage Set	L9010 17A	630	SCH
1	ea	Surface Closer	4111 CUSH SRI	689	LCN

HW SET: 19

DOOR NUMBER: 207

Each to have:

1	ea	Continuous Hinge	700	630	IVE
1	ea	Passage Set	L9010 17L	630	SCH
1	ea	Surface Closer	4111 SHCUSH SRI	689	LCN
1	set	Seals	130SSS	630	NGP
1	ea	Threshold	SIA-896SS-S MS/LA	630	NGP

Door requires special 3/8 inch undercut for threshold.

HW SET: 20

DOOR NUMBER: 401 and 501

Each to have:

3	ea	Hinge	5BB1HW 4.5 X 4.5	630	IVE
1	ea	Classroom Lock	LV9070P 17L	630	SCH
1	ea	Surface Closer	4011 SRI	689	LCN
1	set	Seals	130SSS	630	NGP
1	ea	Threshold	SIA-896SS-S MS/LA	630	NGP

Door requires special 3/8 inch undercut for threshold.

HW SET: 21

DOOR NUMBER: 302

Each to have:

6	ea	Hinge	5BB1HW 4.5 X 4.5 NRP	630	IVE
1	set	Auto Flush Bolt	FB31P	630	IVE
1	ea	Panic Hardware	LD9875L-NL 996L-NL X 17	630	VON
1	ea	Mortise Cylinder	20-001	626	SCH
1	ea	Coordinator	COR X FL	628	IVE
2	ea	Mounting Bracket	MB2	689	IVE
1	ea	Astragal	SS-565-ASA-FB	630	NGP
2	ea	Surface Closer	4111 CUSH SRI X ST1496	689	LCN

Door/Hardware Index
AREA #05

Door Number	Hw Set
101A	01
101B	02
102	03
103A	04
103B	03
103C	04

Door/Hardware Index
AREA #06

Door Number	Hw Set
101	05
102A	01
102B	06
104A	04
104B	07
104C	05
104D	07
104E.1	08A
104E.2	08B
105A	09
105B	10
106A	11
106B	12
107	13
108A	01
108B	14
109	15
110A	16
110B	03
203	17
205	18
206	06
207	19
208	16
301	06
401	20
501	20

Door/Hardware Index
AREA #08

Door Number	Hw Set
302	21

Door/Hardware Index
AREA #09

Door Number	Hw Set
112B	01

++ END OF SECTION ++

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SECTION 08952

FIBERGLASS-SANDWICH-PANEL ASSEMBLIES

PART 1- GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes assemblies incorporating fiberglass sandwich panels and aluminum frame systems as follows:
 - 1. Wall assemblies.
 - 2. Skylight assemblies.
- B. Related Sections include the following:
 - 1. Division 5 Section "Structural Steel" for steel framing that supports skin-system assemblies.
 - 2. Division 7 Section "Building Insulation" for insulation materials field installed with assemblies.
 - 3. Division 7 Section "Sheet Metal Flashing and Trim" for metal flashings installed at perimeters of assemblies.
 - 4. Division 7 Section "Joint Sealants" for sealants installed at perimeters of assemblies.

1.3 PERFORMANCE REQUIREMENTS

- A. Provide assemblies, including anchorage, capable of withstanding, without failure, the effects of the following:
 - 1. Structural loads.
 - 2. Thermal movements.
 - 3. Movements of supporting structure.
 - 4. Dimensional tolerances of building frame and other adjacent construction.
- B. Failure includes the following:
 - 1. Deflection exceeding specified limits.
 - 2. Water leakage.
 - 3. Thermal stresses transferred to building structure.
 - 4. Noise or vibration created by wind and thermal and structural movements.
 - 5. Loosening or weakening of fasteners, attachments, and other components.
 - 6. Delamination of fiberglass-sandwich-panel faces from panel cores.

- C. Structural Loads:

1. Wind Loads: As indicated by structural design data on structural Drawings.
 2. Snow Loads: As indicated by structural design data on structural Drawings.
 3. Concentrated Live Loads on Overhead Assemblies: 300 lbf (1334 N) applied to assemblies at locations that will produce greatest stress or deflection.
 4. Seismic Loads: As indicated by earthquake design data on structural Drawings.
 5. Load Combinations: Calculate according to ACI 318-08 Building Code.
- D. Deflection of Assemblies:
1. Vertical Assemblies: Limited to 1/180 of clear span for each assembly component.
 2. Overhead Assemblies: Limited to 1/180 of clear span for each assembly component.
- E. Roof Assemblies: Class A per ASTM E 108 or UL 790.
- F. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
1. Temperature Change (Range): 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

1.4 PERFORMANCE TESTING

- A. Provide assemblies that comply with test-performance requirements indicated, as evidenced by reports of tests performed on manufacturer's standard assemblies by a qualified independent testing agency.
1. Engage a testing agency to perform preconstruction tests on laboratory mockups of assemblies.
 2. Build laboratory mockups at testing agency facility using personnel, materials, and methods of construction that will be used at Project site.
 3. Notify Architect seven days in advance of the dates and times when laboratory mockups will be constructed.
 4. Preconstruction Testing Sequence: Perform specified tests on laboratory mockups in the following order:
 - a. Structural-performance preloading (ASTM E 330).
 - b. Air infiltration (ASTM E 283).
 - c. Water penetration under static pressure (ASTM E 331).
 - d. Water penetration under dynamic pressure (AAMA 501.1).
 - e. Water penetration, wind-driven rain (ICBO ES AC07).
 - f. Structural performance at design load (ASTM E 330).
 - g. Repeat air filtration (ASTM E 283).
 - h. Repeat water penetration under static pressure (ASTM E 331).
 - i. Structural performance at specified maximum test load (ASTM E 330).

- B. Structural-Performance Test: ASTM E 330.
 - 1. Performance at Design Load: When tested at positive and negative wind-load design pressures, assemblies do not evidence deflection exceeding specified limits.
 - 2. Performance at Maximum Test Load: When tested at 150 percent of positive and negative wind-load design pressures, assemblies, including anchorage, do not evidence material failures, structural distress, and permanent deformation of main supporting members exceeding 0.2 percent of span.
 - 3. Test Durations: As required by design wind velocity but not less than 10 seconds.

- C. Air-Infiltration Test: ASTM E 283.
 - 1. Minimum Static-Air-Pressure Difference: 6.24 lbf/sq. ft. (300 Pa).
 - 2. Maximum Air Leakage: 0.06 cfm/sq. ft. (0.30 L/s per sq. m)

- D. Test for Water Penetration under Static Pressure: ASTM E 331.
 - 1. Minimum Static-Air-Pressure Difference: 20 percent of positive wind-load design pressure, but not less than 10 lbf/sq. ft. (479 Pa).
 - 2. Water Leakage: None.

- E. Test for Water Penetration under Dynamic Pressure: AAMA 501.1.
 - 1. Dynamic Pressure: 20 percent of positive wind-load design pressure, but not less than 15 lbf/sq. ft. (718 Pa).
 - 2. Water Leakage: None, as defined by AAMA 501.1. Water controlled by flashing and gutters that is drained to exterior and cannot damage adjacent materials or finishes is not considered water leakage.

- F. Water-Penetration, Wind-Driven-Rain Test: Wind-driven-rain test in ICBO ES AC07, "Special Roofing Systems."
 - 1. Water Leakage: None.

1.5 ACTION SUBMITTALS

- A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for assemblies.

- B. LEED Submittals:
 - 1. Project will not be certified however shall meet the intent.
 - 2. product Data for Credit IEQ 4.1: For sealants used inside the weatherproofing system, documentation including printed statement of VOC content.
 - 3. Laboratory Test Reports for Credit IEQ 4: For sealants used inside the weatherproofing system, documentation indicating that products comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

- B. Shop Drawings: For assemblies. Include plans, elevations, sections, details, and attachments to other work.
 - 1. Include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
- C. Samples for Initial Selection: For units with factory-applied color finishes.
- D. Samples for Verification: For each type of exposed finish required, in manufacturer's standard sizes.
- E. Fabrication Sample: Of each frame system intersection of assemblies, made from 12-inch (300-mm) lengths of full-size components and showing details of the following:
 - 1. Joinery.
 - 2. Anchorage.
 - 3. Expansion provisions.
 - 4. Fiberglass sandwich panels.
 - 5. Flashing and drainage.

1.6 INFORMATIONAL SUBMITTALS

- A. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for assemblies.
- B. Preconstruction Testing Program: For assemblies, developed specifically for Project. Include plans, elevations, sections, and details of laboratory mockup.
- C. Preconstruction Test Reports: For assemblies.
- D. Field quality-control test reports.
- E. Warranties: Special warranties specified in this Section.

1.7 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For assemblies to include in maintenance manuals.

1.8 QUALITY ASSURANCE

- A. Installer Qualifications: Entity capable of assuming engineering responsibility, including preparation of Shop Drawings, and performing work of this Section and who is acceptable to manufacturer.
- B. Manufacturer Qualifications: For fiberglass sandwich panels, a qualified manufacturer whose facilities, processes, and products are monitored by an independent, accredited quality-control agency for compliance with applicable requirements in ICBO ES AC04, "Sandwich Panels."

- C. Testing Agency Qualifications: An independent agency qualified according to ASTM E 699 for testing indicated.
- D. Product Options: Information on Drawings and in Specifications establishes requirements for assemblies' aesthetic effects and performance characteristics. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction. Performance characteristics are indicated by criteria subject to verification by one or more methods including testing conducted by an independent testing agency and in-service performance.
 - 1. Do not modify intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If modifications are proposed, submit comprehensive explanatory data to Architect for review.
- E. Fire-Test-Response Characteristics: Where fire-test-response characteristics are indicated for assemblies and components, provide products identical to those tested per test method indicated by an independent testing and inspecting agency acceptable to authorities having jurisdiction.
- F. Welding: Qualify procedures and personnel according to AWS D1.2, "Structural Welding Code - Aluminum."
- G. NFRC Certification: Provide fiberglass sandwich panels that are certified for U-factors indicated according to NFRC 100 and listed in its "National Fenestration Council Incorporated - Certified Products Directory."
- H. Mockups: Build mockups to demonstrate aesthetic effects and set quality standards for fabrication and installation.
 - 1. Build mockup of typical assembly area as shown on Drawings.
 - 2. Field testing shall be performed on mockups according to requirements in Part 3 "Field Quality Control" Article.
 - 3. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.
- I. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination."

1.9 PROJECT CONDITIONS

- A. Field Measurements: Indicate measurements on Shop Drawings.

1.10 WARRANTY

- A. Special Assembly Warranty: Manufacturer's standard form in which manufacturer and Installer agree to repair or replace components of assemblies that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:

- a. Structural failures including, but not limited to, excessive deflection.
 - b. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
 - c. Water leakage.
 - 2. Warranty Period: Five years from date of Substantial Completion.
- B. Special Fiberglass-Sandwich-Panel Warranty: Manufacturer's standard form in which manufacturer agrees to replace panels that exhibit defects in materials or workmanship.
- 1. Defects include, but are not limited to, the following:
 - a. Fiberbloom.
 - b. Delamination of coating, if any, from exterior face sheet.
 - c. Discoloration of exterior face sheet of more than 8.0 units Delta E when measured according ASTM D 2244.
 - d. Delamination of panel face sheets from panel cores.
 - 2. Warranty Period: 10 years from date of Substantial Completion.
- C. Special Aluminum-Finish Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components on which finishes fail within specified warranty period. Warranty does not include normal weathering.
- 1. Failures include, but are not limited to, checking, crazing, peeling, chalking, and fading of finishes.
 - 2. Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- 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:
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
- C. Subject to compliance with requirements, provide the named product or a comparable product by one of the following:
 - 1. Kalwall Corporation.
 - 2. Major Industries, Inc.
 - 3. Skywall Translucent Systems; Vistawall Group (The).
 - 4. Structures Unlimited, Inc.
 - 5. Equivalent by other manufacturer.

2.2 ALUMINUM FRAME SYSTEMS

- A. Aluminum: Alloy and temper recommended in writing by manufacturer for type of use and finish indicated.
 - 1. Sheet and Plate: ASTM B 209 (ASTM B 209M).
 - 2. Extruded Bars, Rods, Profiles, and Tubes: ASTM B 221 (ASTM B 221M).
 - 3. Extruded Structural Pipe and Tubes: ASTM B 429.

- B. Components: Manufacturer's standard extruded-aluminum members of thickness required and reinforced as required to support imposed loads.
 - 1. Construction: Thermally broken; framing members are composite assemblies of two separate extruded-aluminum components permanently bonded by a material of low thermal conductance.

- C. Exposed Flashing and Closures: Manufacturer's standard aluminum components not less than 0.060 inch (1.524 mm) thick.

- D. Frame-System Gaskets: Manufacturer's standard.

- E. Frame-System Sealants: As recommended in writing by manufacturer.
 - 1. Sealants used inside the weatherproofing system shall have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
 - 2. Sealants used inside the weatherproofing system shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

- F. Anchors, Fasteners, and Accessories: Manufacturer's standard, corrosion-resistant, nonstaining, and nonbleeding; compatible with adjacent materials.
 - 1. At closures, retaining caps, or battens, use ASTM A 193/A 193M, 300 series stainless-steel screws.
 - 2. Where fasteners are subject to loosening or turning out from thermal and structural movements, wind loads, or vibration, use self-locking devices.
 - 3. At movement joints, use slip-joint linings, spacers, and sleeves of material and type recommended in writing by manufacturer.

- G. Concrete and Masonry Inserts: Hot-dip galvanized cast-iron, malleable-iron, or steel inserts complying with ASTM A 123/A 123M or ASTM A 153/A 153M requirements.

- H. Anchor Bolts: ASTM A 307, Grade A (ASTM F 568M, Property Class 4.6), hot-dip zinc coating, ASTM A 153/A 153M, Class C.

- I. Frame System Fabrication:
 - 1. Fabricate components before finishing.
 - 2. Fabricate components that, when assembled, have the following characteristics:
 - a. Profiles that are sharp, straight, and free of defects or deformations.

- b. Accurately fitted joints with ends coped or mitered.
 - c. Internal guttering systems or other means to drain water passing joints, condensation occurring within components, and moisture migrating within the assembly to exterior.
3. Fabricate sill closures with weep holes and for installation as continuous component.
 4. Reinforce components as required to receive fastener threads.

2.3 FIBERGLASS SANDWICH PANELS

- A. Panel Construction: Assembly of uniformly colored, translucent, thermoset, fiberglass-reinforced-polymer face sheets bonded to both sides of a grid core and complying with requirements applicable to panel materials in ICBO ES AC04, "Sandwich Panels."
 1. Face-Sheet, Self-Ignition Temperature: 650 deg F (343 deg C) or more per ASTM D 1929.
 2. Face-Sheet Burning Extent: 1 inch (25 mm) or less per ASTM D 635.
 3. Face-Sheet, Smoke-Developed Index: 450 or less per ASTM E 84.
 4. Interior Face-Sheet, Flame-Spread Index: Not more than 25 per ASTM E 84.
 5. Roof-Covering Class: Class A per ASTM E 108 or UL 790.
- B. Panel Thickness: 4 inches (101.6 mm)
- C. Panel U-Factor: Not more than 0.53 (3.01), measured in Btu/sq. ft. x h x deg F (W/sq. m x K) according to NFRC 100 or ASTM C 1363 using procedures described in ASTM C 1199 and ASTM E 1423.
- D. Panel Strength Characteristics:
 1. Maximum Panel Deflection: 3-1/2 inches (89 mm) when a 4-by-12-foot (1.2-by-3.6-m) panel is tested according to ASTM E 72 at 34 lbf/ sq. ft. (1.6 kPa), with a maximum 0.090-inch (2.3-mm) set deflection after 5 minutes.
 2. Panel Support Strength: Capable of supporting, without failure, a 300-lbf (1334 N) concentrated load when applied to a 3-inch- (76-mm-) diameter disk according to ASTM E 661.
- E. Grid Core: Mechanically interlocked extruded-aluminum I-beams, with a minimum flange width of 7/16 inch (11.1 mm).
 1. Extruded Aluminum: ASTM B 221 (ASTM B 221M), in alloy and temper recommended in writing by manufacturer.
 2. I-Beam Construction: Thermally broken; two separate extruded-aluminum components permanently bonded by a material of low thermal conductance.
 3. Grid Pattern: Inline rectangle, nominal 12 by 24 inches (305 by 610 mm) as indicated on Drawings.
- F. Exterior Face Sheet:
 1. Thickness: 0.070 inches (1.778 mm).

2. Color: As selected by Architect from manufacturer's full range.
 3. Color Stability: Not more than 3.0 units Delta E when measured according to ASTM D 2244 after outdoor weathering in southern Florida according to procedures in ASTM D 1435 with panels mounted facing south and as follows:
 - a. Panel Mounting Angle: Not more than 5 or 45 degrees from horizontal.
 - b. Exposure Period: 60 months.
 4. Erosion Protection: Manufacturer's standard.
 5. Impact Resistance: No fracture or tear at impact of 70 ft. x lbf (95 J) by a 3-1/4-inch- (83-mm-) diameter, 5-lb (2.3-kg) free-falling ball according to test procedure in UL 972.
- G. Interior Face Sheet:
1. Thickness: 0.045 inch (1.143 mm).
 2. Color: As selected by Architect from manufacturer's full range.
- H. Fiberglass-Sandwich-Panel Adhesive: ASTM D 2559.
1. Compatible with facing and core materials.
 2. Tensile and shear bond strength of aged adhesive ensures permanent adhesion of facings to cores, as evidenced by testing according to ASTM C 297 and ASTM D 1002 after accelerated aging procedures that comply with aging requirements for adhesives with high resistance to moisture in ICBO ES AC05, "Sandwich Panel Adhesives."
- I. Panel Fabrication: Factory assemble and seal panels.
1. Laminate face sheets to grid core under a controlled process using heat and pressure to produce straight adhesive bonding lines that cover width of core members and that have sharp edges.
 - a. White spots indicating lack of bond at intersections of grid-core members are limited in number to 4 for every 40 sq. ft. (3.7 sq. m) of panel and limited in diameter to 3/64 inch (1.2 mm).
 2. Fabricate with grid pattern that is symmetrical about centerlines of each panel.
 3. Fabricate panel to allow condensation within panel to escape.
 4. Reinforce panel corners.

2.4 ACCESSORY MATERIALS

- A. Bituminous Paint: Cold-applied asphalt-mastic paint complying with SSPC-Paint 12 requirements except containing no asbestos, formulated for 30-mil (0.762-mm) thickness per coat.

2.5 ALUMINUM FINISHES

- A. General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

- B. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.
- C. Class I, Clear Anodic Finish: AA-M12C22A41 (Mechanical Finish: nonspecular as fabricated; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class I, clear coating 0.018 mm or thicker) complying with AAMA 611.

PART3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work.
 - 1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General:
 - 1. Comply with manufacturer's written instructions.
 - 2. Do not install damaged components.
 - 3. Fit joints between aluminum components to produce hairline joints free of burrs and distortion.
 - 4. Rigidly secure nonmovement joints.
 - 5. Install anchors with separators and isolators to prevent metal corrosion and electrolytic deterioration and to prevent impeding movement of moving joints.
 - 6. Weld aluminum components in concealed locations to minimize distortion or discoloration of finish. Protect glazing surfaces from welding.
 - 7. Seal joints watertight, unless otherwise indicated.
- B. Metal Protection: Where aluminum components will contact dissimilar materials, protect against galvanic action by painting contact surfaces with bituminous paint or by installing nonconductive spacers as recommended in writing by manufacturer for this purpose.
- C. Install continuous aluminum sill closure with weatherproof expansion joints and locked and sealed or welded corners. Locate weep holes at rafters.
- D. Install components to drain water passing joints, condensation occurring within aluminum members and panels, and moisture migrating within assembly to exterior.
- E. Install components plumb and true in alignment with established lines and elevations.

- F. Install insulation materials as specified in Division 7 Section "Building Insulation."
- G. Erection Tolerances: Install assemblies to comply with the following maximum tolerances:
 - 1. Alignment: Limit offset from true alignment to 1/32 inch (0.8 mm) where surfaces abut in line, edge to edge, at corners, or where a reveal or protruding element separates aligned surfaces by less than 3 inches (76 mm); otherwise, limit offset to 1/8 inch (3.2 mm).
 - 2. Location and Plane: Limit variation from true location and plane to 1/8 inch in 12 feet (3.2 mm in 3.7 m); 1/2 inch (13 mm) over total length.

3.3 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.
- B. Testing Services: Testing and inspecting of representative areas to determine compliance of installed assemblies with specified requirements shall take place as follows and in successive stages as indicated on Drawings. Do not proceed with installation of the next area until test results for previously completed areas show compliance with requirements.
 - 1. Water Penetration under Static Pressure: Before installation of interior finishes has begun, areas shall be tested according to ASTM E 1105.
 - a. Water Penetration: None.
 - 2. Water-Spray Test: Before installation of interior finishes has begun, assemblies shall be tested according to AAMA 501.2 and shall not evidence water penetration.
- C. Repair or remove work where test results and inspections indicate that it does not comply with specified requirements.
- D. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

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SECTION 09111

NON-LOAD-BEARING STEEL FRAMING

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. Non-load-bearing steel framing systems for interior gypsum board assemblies.
 - 2. Suspension systems for interior gypsum ceilings, soffits, and grid systems.
- B. Related Requirements:
 - 1. Section 05400 "Cold-Formed Metal Framing" for exterior and interior load-bearing and exterior non-load-bearing wall studs; floor joists; roof rafters and ceiling joists; and roof trusses.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. LEED Submittals:
 - 1. Project will not be certified however shall meet the intent.
 - 2. Product Data for Credit MR 4: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating costs for each product having recycled content.

1.4 INFORMATION SUBMITTALS

- A. Evaluation Reports: For dimpled steel studs and runners [firestop tracks], from ICC-ES.

PART 2 - PRODUCTS

2.1 DESCRIPTION

- A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than (25) twenty-five percent.

2.2 FRAMING SYSTEMS

- A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than (25) twenty-five percent.
- B. Framing Members, General: Comply with ASTM C 754 for conditions indicated.
 - 1. Steel Sheet Components: Comply with ASTM C 645 requirements for metal unless otherwise indicated.
 - 2. Protective Coating: ASTM A 653/A 653M, G40 (Z120).
- C. Studs and Runners: ASTM C 645. Use either steel studs and runners or dimpled steel studs and runners.
 - 1. Dimpled Steel Studs and Runners:
 - a. Minimum Base-Metal Thickness: 20 gauge.
 - b. Depth: As indicated on Drawings .

2.3 AUXILIARY MATERIALS

- A. General: Provide auxiliary materials that comply with referenced installation standards.
 - 1. Fasteners for Metal Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and substrates, with Installer present, and including welded hollow-metal frames, cast-in anchors, and structural framing, for compliance with requirements and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

- A. Installation Standard: ASTM C 754, except comply with framing sizes and spacing indicated.
 - 1. Gypsum Board Assemblies: Also comply with requirements in ASTM C 840 that apply to framing installation.
- B. Install supplementary framing, and blocking to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction.
- C. Install bracing at terminations in assemblies.

- D. Do not bridge building control and expansion joints with non-load-bearing steel framing members. Frame both sides of joints independently.

3.3 INSTALLING FRAMED ASSEMBLIES

- A. Where studs are installed directly against exterior masonry walls or dissimilar metals at exterior walls, install isolation strip between studs and exterior wall.
- B. Install studs so flanges within framing system point in same direction.
 - 1. Space studs as follows:
 - a. Single-Layer Application: 16 inches (406 mm) o.c. unless otherwise indicated.
- C. Install tracks (runners) at floors and overhead supports. Extend framing full height to structural supports or substrates above suspended ceilings, except where partitions are indicated to terminate at suspended ceilings. Continue framing around ducts penetrating partitions above ceiling.
 - 1. Door Openings: Screw vertical studs at jambs to jamb anchor clips on door frames; install runner track section (for cripple studs) at head and secure to jamb studs.
 - a. Install two studs at each jamb unless otherwise indicated.
 - b. Install cripple studs at head adjacent to each jamb stud, with a minimum 1/2-inch (13-mm) clearance from jamb stud to allow for installation of control joint in finished assembly.
 - c. Extend jamb studs through suspended ceilings and attach to underside of overhead structure.
 - 2. Other Framed Openings: Frame openings other than door openings the same as required for door openings unless otherwise indicated. Install framing below sills of openings to match framing required above door heads.
 - 3. Fire-Resistance-Rated Partitions: Install framing to comply with fire-resistance-rated assembly indicated and support closures and to make partitions continuous from floor to underside of solid structure.
 - 4. Sound-Rated Partitions: Install framing to comply with sound-rated assembly indicated.
- D. Installation Tolerance: Install each framing member so fastening surfaces vary not more than 1/8 inch (3 mm) from the plane formed by faces of adjacent framing.

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SECTION 09250

GYPSUM BOARD

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. Interior gypsum board.
- B. Related Requirements:
 - 1. Section 09111 "Non-Load-Bearing Steel Framing" for non-structural framing and suspension systems that support gypsum board panels.
 - 2. Section 09310 "Ceramic Tile" for cementitious backer units installed as substrates for ceramic tile.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. LEED Submittals:
 - 1. Project will not be certified however shall meet the intent.
 - 2. Product Data for Credit MR 4: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.
 - 3. Product Certificates for Credit MR 5: For products and materials required to comply with requirements for regional materials, certificates indicating location of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include statement indicating distance to Project, cost for each regional material, and fraction by weight that is considered regional.
 - 4. Product Certificates for Credit MR 5: For products and materials required to comply with requirements for regionally manufactured[and regionally extracted and manufactured] materials. Include statement indicating cost for each regionally manufactured material.
 - a. Include statement indicating location of manufacturer and distance to Project for each regionally manufactured material.
 - b. Include statement indicating location of manufacturer and point of extraction, harvest, or recovery for each raw material used in regionally

extracted and manufactured materials. Indicate distance to Project and fraction by weight of each regionally manufactured material that is regionally extracted.

5. Product Data for Credit IEQ 4.1: For adhesives used to laminate gypsum board panels to substrates, documentation including printed statement of VOC content.

1.4 DELIVERY, STORAGE AND HANDLING

- A. Store materials inside under cover and keep them dry and protected against weather, condensation, direct sunlight, construction traffic, and other potential causes of damage. Stack panels flat and supported on risers on a flat platform to prevent sagging.

1.5 FIELD CONDITIONS

- A. Environmental Limitations: Comply with ASTM C 840 requirements or gypsum board manufacturer's written recommendations, whichever are more stringent.
- B. Do not install paper-faced gypsum panels until installation areas are enclosed and conditioned.
- C. Do not install panels that are wet, those that are moisture damaged, and those that are mold damaged.
 1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
 2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Resistance-Rated Assemblies: For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing agency.

2.2 GYPSUM BOARD, GENERAL

- A. Recycled Content of Gypsum Panel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than twenty (20) percent.
- B. Regional Materials: Gypsum panel products shall be manufactured within 500 miles (800 km) of Project site from materials that have been extracted, harvested, or recovered, as well as manufactured, within 500 miles (800 km) of Project site.

- C. Regional Materials: Gypsum panel products shall be manufactured within 500 miles (800 km) of Project site.
- D. Size: Provide maximum lengths and widths available that will minimize joints in each area and that correspond with support system indicated.

2.3 INTERIOR GYPSUM BOARD

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. [American Gypsum](#).
 - 2. [CertainTeed Corp.](#)
 - 3. [Georgia-Pacific Gypsum LLC](#).
 - 4. [Lafarge North America Inc.](#)
 - 5. [National Gypsum Company](#).
 - 6. [PABCO Gypsum](#).
 - 7. [Temple-Inland](#).
 - 8. [USG Corporation](#).
 - 9. Equivalent by other manufacturer.
- B. Gypsum Wallboard: ASTM C 1396/C 1396M.
- C. Gypsum Board, Type X: ASTM C 1396/C 1396M.
 - 1. Thickness: 5/8 inch (15.9 mm).
 - 2. Long Edges: Tapered.

2.4 TRIM ACCESSORIES

- A. Interior Trim: ASTM C 1047.
 - 1. Material: Galvanized or aluminum-coated steel sheet or rolled zinc.
 - 2. Shapes:
 - a. Cornerbead.
 - b. L-Bead: L-shaped; exposed long flange receives joint compound.

2.5 JOINT TREATMENT MATERIALS

- A. General: Comply with ASTM C 475/C 475M.
- B. Joint Tape:
 - 1. Interior Gypsum Board: Paper.
- C. Joint Compound for Interior Gypsum Board: For each coat use formulation that is compatible with other compounds applied on previous or for successive coats.
 - 1. Prefilling: At open joints or beveled panel edges, and damaged surface areas, use setting-type taping compound.

2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use setting-type taping compound.
 - a. Use setting-type compound for installing paper-faced metal trim accessories.
3. Fill Coat: For second coat, use drying-type, all-purpose compound.
4. Finish Coat: For third coat, use drying-type, all-purpose compound.

2.6 AUXILIARY MATERIALS

- A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written recommendations.
- B. Steel Drill Screws: ASTM C 1002, unless otherwise indicated.
 1. Use screws complying with ASTM C 954 for fastening panels to steel members from 0.033 to 0.112 inch (0.84 to 2.84 mm) thick.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and substrates including welded hollow-metal frames and framing, with Installer present, for compliance with requirements and other conditions affecting performance.
- B. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 APPLYING AND FINISHING PANELS, GENERAL

- A. Comply with ASTM C 840.
- B. Install panels with face side out. Butt panels together for a light contact at edges and ends with not more than 1/16 inch (1.5 mm) of open space between panels. Do not force into place.
- C. Locate edge and end joints over supports, except in ceiling applications where intermediate supports or gypsum board back-blocking is provided behind end joints. Do not place tapered edges against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Do not make joints other than control joints at corners of framed openings.
- D. Form control and expansion joints with space between edges of adjoining gypsum panels.

- E. Cover both faces of support framing with gypsum panels in concealed spaces (above ceilings, etc.), except in chases braced internally.
 - 1. Unless concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. (0.7 sq. m) in area.
 - 2. Fit gypsum panels around ducts, pipes, and conduits.
 - 3. Where partitions intersect structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by structural members; allow 1/4- to 3/8-inch- (6.4- to 9.5-mm-) wide joints to install sealant.
- F. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments, except floors. Provide 1/4- to 1/2-inch- (6.4- to 12.7-mm-) wide spaces at these locations and trim edges with edge trim where edges of panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.
- G. Attachment to Steel Framing: Attach panels so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.

3.3 APPLYING INTERIOR GYPSUM BOARD

- A. Install interior gypsum board in the following locations:
 - 1. Type X: Vertical surfaces unless otherwise indicated.
- B. Single-Layer Application:
 - 1. On ceilings, apply gypsum panels before wall/partition board application to greatest extent possible and at right angles to framing unless otherwise indicated.
 - 2. On partitions/walls, apply gypsum panels vertically (parallel to framing) or horizontally (perpendicular to framing) unless otherwise indicated or required by fire-resistance-rated assembly, and minimize end joints.
 - a. Stagger abutting end joints not less than one framing member in alternate courses of panels.
 - 3. Fastening Methods: Apply gypsum panels to supports with steel drill screws.

3.4 INSTALLING TRIM ACCESSORIES

- A. General: For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.
- B. Control Joints: Install control joints according to ASTM C 840 and in specific locations approved by Architect for visual effect.
- C. Interior Trim: Install in the following locations:

1. Cornerbead: Use at outside corners unless otherwise indicated.
2. L-Bead: Use where edge of gypsum board meets other finished material.

3.5 FINISHING GYPSUM BOARD

- A. General: Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration. Promptly remove residual joint compound from adjacent surfaces.
- B. Prefill open joints and damaged surface areas.
- C. Apply joint tape over gypsum board joints, except for trim products specifically indicated as not intended to receive tape.
- D. Gypsum Board Finish Levels: Finish panels to levels indicated below and according to ASTM C 840:
 1. Level 4: At panel surfaces that will be exposed to view unless otherwise indicated.

3.6 PROTECTION

- A. Protect adjacent surfaces from drywall compound and promptly remove from floors and other non-drywall surfaces. Repair surfaces stained, marred, or otherwise damaged during drywall application.
- B. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.
- C. Remove and replace panels that are wet, moisture damaged, and mold damaged.
 1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
 2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

+ + END OF SECTION + +

SECTION 09310

CERAMIC TILE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Ceramic tile.
 - 2. Stone thresholds.
 - 3. Waterproof membrane.
 - 4. Crack isolation membrane.
- B. Related Sections:
 - 1. Division 3 Section "Cast-In-Place Concrete" for concrete slab substrate.
 - 2. Division 4 Section "Unit Masonry Assemblies" for CMU substrate.

1.3 DEFINITIONS

- A. General: Definitions in the ANSI A108 series of tile installation standards and in ANSI A137.1 apply to Work of this Section unless otherwise specified.
- B. ANSI A108 Series: ANSI A108.01, ANSI A108.02, ANSI A108.1A, ANSI A108.1B, ANSI A108.1C, ANSI A108.4, ANSI A108.5, ANSI A108.6, ANSI A108.8, ANSI A108.9, ANSI A108.10, ANSI A108.11, ANSI A108.12, ANSI A108.13, ANSI A108.14, ANSI A108.15, ANSI A108.16, and ANSI A108.17, which are contained in "American National Standard Specifications for Installation of Ceramic Tile."
- C. Module Size: Actual tile size plus joint width indicated.
- D. Face Size: Actual tile size, excluding spacer lugs.

1.4 PERFORMANCE REQUIREMENTS

- A. Static Coefficient of Friction: For tile installed on walkway surfaces, provide products with the following values as determined by testing identical products per ASTM C 1028:
 - 1. Level Surfaces: Minimum <Insert required static coefficient of friction>.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. LEED Submittals:
 - 1. Project will not be certified however shall meet intent.
 - 2. Product Data for Credit IEQ 4.1: For adhesives and sealants, documentation including printed statement of VOC content.
 - 3. Product Data for Credit IEQ 4.3: For adhesives and grouts, documentation including printed statement of VOC content.
 - 4. Product Data for Credit IEQ 4.3: For tile floors, documentation from an independent testing agency indicating compliance with the Floor Score Standard.
 - 5. Laboratory Test Reports for Credit IEQ 4: For adhesives, sealants, and tile flooring systems, documentation indicating that products comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- C. Shop Drawings: Show locations of each type of tile and tile pattern. Show widths, details, and locations of expansion, contraction, control, and isolation joints in tile substrates and finished tile surfaces.
- D. Samples for Initial Selection: For each type of tile and grout indicated. Include Samples of accessories involving color selection.
- E. Samples for Verification:
 - 1. Full-size units of each type and composition of tile and for each color and finish required.
 - 2. Assembled samples mounted on a rigid panel, with grouted joints, for each type and composition of tile and for each color and finish required. Make samples at least 12 inches (300 mm) square, but not fewer than 4 tiles. Use grout of type and in color or colors approved for completed Work.
 - 3. Full-size units of each type of trim and accessory for each color and finish required.
 - 4. Stone thresholds in 6-inch (150-mm) lengths.
 - 5. Metal edge strips in 6-inch (150-mm) lengths.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified Installer.
- B. Master Grade Certificates: For each shipment, type, and composition of tile, signed by tile manufacturer and Installer.
- C. Product Certificates: For each type of product, signed by product manufacturer.

- D. Material Test Reports: For each tile-setting and -grouting product and special purpose tile.

1.7 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match and are from same production runs as products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Tile and Trim Units: Furnish quantity of full-size units equal to 3 percent of amount installed for each type, composition, color, pattern, and size indicated.
 - 2. Grout: Furnish quantity of grout equal to 3 percent of amount installed for each type, composition, and color indicated.

1.8 QUALITY ASSURANCE

- A. Source Limitations for Tile: Obtain tile of each type and color or finish from one source or producer.
 - 1. Obtain tile of each type and color or finish from same production run and of consistent quality in appearance and physical properties for each contiguous area.
- B. Source Limitations for Setting and Grouting Materials: Obtain ingredients of a uniform quality for each mortar, adhesive, and grout component from one manufacturer and each aggregate from one source or producer.
- C. Source Limitations for Other Products: Obtain each of the following products specified in this Section from a single manufacturer for each product:
 - 1. Stone thresholds.
 - 2. Crack isolation membrane.
 - 3. Joint sealants.
- D. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
 - 1. Build mockup of each type of floor tile installation.
 - 2. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.
- E. Preinstallation Conference: Conduct conference at Project site.
 - 1. Review requirements in ANSI A108.01 for substrates and for preparation by other trades.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Deliver and store packaged materials in original containers with seals unbroken and labels intact until time of use. Comply with requirements in ANSI A137.1 for labeling tile packages.
- B. Store tile and cementitious materials on elevated platforms, under cover, and in a dry location.
- C. Store aggregates where grading and other required characteristics can be maintained and contamination can be avoided.
- D. Store liquid materials in unopened containers and protected from freezing.
- E. Handle tile that has temporary protective coating on exposed surfaces to prevent coated surfaces from contacting backs or edges of other units. If coating does contact bonding surfaces of tile, remove coating from bonding surfaces before setting tile.

1.10 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install tile until construction in spaces is complete and ambient temperature and humidity conditions are maintained at the levels indicated in referenced standards and manufacturer's written instructions.

PART 2 - PRODUCTS

2.1 PRODUCTS, GENERAL

- A. ANSI Ceramic Tile Standard: Provide tile that complies with ANSI A137.1 for types, compositions, and other characteristics indicated.
 - 1. Provide tile complying with Standard grade requirements unless otherwise indicated.
- B. ANSI Standards for Tile Installation Materials: Provide materials complying with ANSI A108.02, ANSI standards referenced in other Part 2 articles, ANSI standards referenced by TCA installation methods specified in tile installation schedules, and other requirements specified.
- C. FloorScore Compliance: Tile for floors shall comply with requirements of FloorScore Standard.
- D. Low-Emitting Materials: Tile flooring systems shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

- E. **Factory Blending:** For tile exhibiting color variations within ranges, blend tile in factory and package so tile units taken from one package show same range in colors as those taken from other packages and match approved Samples.
- F. **Mounting:** For factory-mounted tile, provide back- or edge-mounted tile assemblies as standard with manufacturer unless otherwise indicated.
- G. **Factory-Applied Temporary Protective Coating:** Where indicated under tile type, protect exposed surfaces of tile against adherence of mortar and grout by precoat-ing with continuous film of petroleum paraffin wax, applied hot. Do not coat un-exposed tile surfaces.

2.2 TILE PRODUCTS

- A. **Tile Type:** Unglazed square-edged quarry tile.
 - 1. **Manufacturers:** Subject to compliance with requirements.
 - 2. **Basis-of-Design Product:** Subject to compliance with requirements, provide Daltile, Quarry textures, color Diablo Red or comparable product by one of the following:
 - a. American Olean; Division of Dal-Tile International Inc.
 - b. Atlas Minerals & Chemicals, Inc.
 - c. Daltile; Division of Dal-Tile International Inc.
 - d. Deutsche Steinzeug America, Inc.
 - e. Endicott Tile Ltd.; Endicott Clay Products Co.
 - f. Florida Brick & Clay Company Inc.
 - r. Florida Tile Industries, Inc.
 - h. Interceramic.
 - i. Metropolitan Ceramics.
 - j. Portobello America, Inc.
 - k. Quarry Tile Co.
 - l. Seneca Tiles, Inc.
 - m. Summitville Tiles, Inc.
 - n. United States Ceramic Tile Company.
 - o. Equivalent by other manufacturer.
 - 3. **Face Size:** 8 by 8 inches (203 by 203 mm).
 - 4. **Thickness:** 1/2 inch (12.7 mm).
 - 5. **Wearing Surface:** Nonabrasive, smooth.
 - 6. **Finish:** Mat, clear.
 - 7. **Tile Color and Pattern:** Color as indicated above.
 - 8. **Grout Color:** As selected by Architect from manufacturer's full range.
 - 9. **For furan-grouted quarry tile,** precoat with temporary protective coating.
 - 10. **Trim Units:** Coordinated with sizes and coursing of adjoining flat tile where applicable and matching characteristics of adjoining flat tile. Provide shapes as follows, selected from manufacturer's standard shapes:
 - a. **Base:** Coved with surface bullnose top edge, face size 5 by 6 inches or 5 by 8 inches.

2.3 THRESHOLDS

- A. General: Fabricate to sizes and profiles indicated or required to provide transition between adjacent floor finishes.
 - 1. Bevel edges at 1:2 slope, with lower edge of bevel aligned with or up to 1/16 inch (1.5 mm) above adjacent floor surface. Finish bevel to match top surface of threshold. Limit height of threshold to 1/2 inch (12.7 mm) or less above adjacent floor surface.
- B. Granite Thresholds: ASTM C 615, with polished finish.
 - 1. Description: Uniform, medium-grained, gray stone without veining.

2.4 CRACK ISOLATION MEMBRANE

- A. General: Manufacturer's standard product, selected from the following that complies with ANSI A118.12 for high performance and is recommended by the manufacturer for the application indicated. Include reinforcement and accessories recommended by manufacturer. Product shall be acceptable to the tile manufacturer.
- B. Chlorinated Polyethylene Sheet: Nonplasticized, chlorinated polyethylene faced on both sides with nonwoven polyester fabric; 0.030-inch (0.76-mm) nominal thickness.
 - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Noble Company (The); Nobleseal CIS.
- C. PVC Sheet: Two layers of PVC sheet heat-fused together and to facings of nonwoven polyester; 0.040-inch (1.01-mm) nominal thickness.
 - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Compotite Corporation; Composeal Gold.
- D. Polyethylene Sheet: Polyethylene faced on both sides with fleece webbing; 0.008-inch (0.203-mm) nominal thickness.
 - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Schluter Systems L.P.; KERDI.
- E. Corrugated Polyethylene: Corrugated polyethylene with dovetail-shaped corrugations and with anchoring webbing on the underside; 3/16-inch (4-mm) nominal thickness.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Schluter Systems L.P.; DITRA.

- F. Fabric-Reinforced, Modified-Bituminous Sheet: Self-adhering, modified-bituminous sheet with fabric reinforcement facing; 0.040-inch (1.01-mm) nominal thickness.
 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. MAPEI Corporation; Mapelastic SM.
 - b. National Applied Construction Products, Inc.; Strataflex.

- G. Fabric-Reinforced, Fluid-Applied Membrane: System consisting of liquid-latex rubber or elastomeric polymer and fabric reinforcement.
 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Boiardi Products; a QEP company; Elastiment 344 Reinforced Waterproofing and Anti-Fracture/Crack Suppression Membrane.
 - b. Bonsal American; an Oldcastle company; B 6000 Waterproof Membrane with Glass Fabric.
 - c. Bostik, Inc.; Hydroment Blacktop 90210.
 - d. Custom Building Products; 9240 Waterproofing and Anti-Fracture Membrane.
 - e. Laticrete International, Inc.; Laticrete Blue 92 Anti-Fracture Membrane or 9235 Waterproof Membrane.
 - f. MAPEI Corporation; Mapelastic L (PRP M19) or Mapelastic HPG with MAPEI Fiberglass Mesh.
 - g. Mer-Kote Products, Inc.; Hydro-Guard 2000.
 - h. Summitville Tiles, Inc.; S-9000.

- H. Fluid-Applied Membrane: Liquid-latex rubber or elastomeric polymer.
 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Bostik, Inc.; Durabond D-222 Duraguard Membrane or Hydroment Gold.
 - b. C-Cure; CureLastic 949 or Pro-Red Waterproofing Membrane 963.
 - c. Custom Building Products; Redgard Waterproofing and Crack Prevention Membrane, FractureFree Crack Prevention Membrane, or Semco Crack Prevention Membrane.
 - d. Jamo Inc.; Waterproof.
 - e. Mer-Kote Products, Inc.; Fracture-Guard 5000.
 - f. Southern Grouts & Mortars, Inc.; Southcrete 1100 Crack Suppression and Waterproofing.

- g. TEC; a subsidiary of H. B. Fuller Company; HydraFlex - Waterproofing Crack Isolation Membrane.
- I. Latex-Portland Cement: Flexible mortar consisting of cement-based mix and latex additive.
 - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. C-Cure; UltraCure 971.
 - b. MAPEI Corporation; Mapelastic (PRP 315).
 - c. TEC; a subsidiary of H. B. Fuller Company; Triple Flex Waterproofing, Crack Isolation Membrane & Mortar.
 - J. Urethane Crack Isolation Membrane and Tile-Setting Adhesive: One-part, liquid-applied urethane, with a VOC content of 65 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24), that complies with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers," in a consistency suitable for trowel application and intended for use as both waterproofing and tile-setting adhesive in a two-step process.
 - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Bostik, Inc.; Durabond D-200, Hydroment Ultra-Set, or Hydroment Ultra-Set Advanced.

2.5 SETTING MATERIALS

- A. Portland Cement Mortar (Thickset) Installation Materials: ANSI A108.02.
 - 1. Cleavage Membrane: Asphalt felt, ASTM D 226, Type I (No. 15); or polyethylene sheeting, ASTM D 4397, 4.0 mils (0.1 mm) thick.
 - 2. Reinforcing Wire Fabric: Galvanized, welded wire fabric, 2 by 2 inches (50.8 by 50.8 mm) by 0.062-inch (1.57-mm) diameter; comply with ASTM A 185 and ASTM A 82 except for minimum wire size.
 - 3. Expanded Metal Lath: Diamond-mesh lath complying with ASTM C 847.
 - a. Base Metal and Finish for Interior Applications: Uncoated or zinc-coated (galvanized) steel sheet, with uncoated steel sheet painted after fabrication into lath.
 - b. Base Metal and Finish for Exterior Applications: Zinc-coated (galvanized) steel sheet.
 - c. Configuration over Solid Surfaces: Self furring.
 - d. Weight: 3.4 lb/sq. yd. (1.8 kg/sq. m).
 - 4. Latex Additive: Manufacturer's standard, acrylic resin or styrene-butadiene-rubber water emulsion, serving as replacement for part or all of gaging water, of type specifically recommended by latex-additive manufacturer for use with field-mixed portland cement and aggregate mortar bed.

- B. Chemical-Resistant Furan Mortar: ANSI A118.5, with carbon filler.
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Atlas Minerals & Chemicals, Inc.
 - b. Equivalent by other manufacturer.

2.6 GROUT MATERIALS

- A. Sand-Portland Cement Grout: ANSI A108.10, composed of white or gray cement and white or colored aggregate as required to produce color indicated.
- B. Standard Cement Grout: ANSI A118.6.
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Boiardi Products; a QEP company.
 - b. Bonsal American; an Oldcastle company.
 - c. Bostik, Inc.
 - d. C-Cure.
 - e. Custom Building Products.
 - f. Jamo Inc.
 - g. Laticrete International, Inc.
 - h. MAPEI Corporation.
 - i. Southern Grouts & Mortars, Inc.
 - j. Summitville Tiles, Inc.
 - k. TEC; a subsidiary of H. B. Fuller Company.
 - l. Equivalent by other manufacturer.

2.7 ELASTOMERIC SEALANTS

- A. General: Provide sealants, primers, backer rods, and other sealant accessories that comply with the following requirements and with the applicable requirements in Division 7 Section "Joint Sealants."
 - 1. Sealants shall have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
 - 2. Sealants shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
 - 3. Use primers, backer rods, and sealant accessories recommended by sealant manufacturer.
- B. Colors: Provide colors of exposed sealants to match colors of grout in tile adjoining sealed joints unless otherwise indicated.

2.8 MISCELLANEOUS MATERIALS

- A. Trowelable Underlayments and Patching Compounds: Latex-modified, portland cement-based formulation provided or approved by manufacturer of tile-setting materials for installations indicated.
- B. Metal Edge Strips: Angle or L-shape, height to match tile and setting-bed thickness, metallic or combination of metal and PVC or neoprene base, designed specifically for flooring applications; nickel silver exposed-edge material.
- C. Temporary Protective Coating: Either product indicated below that is formulated to protect exposed surfaces of tile against adherence of mortar and grout; compatible with tile, mortar, and grout products; and easily removable after grouting is completed without damaging grout or tile.
 - 1. Petroleum paraffin wax, fully refined and odorless, containing at least 0.5 percent oil with a melting point of 120 to 140 deg F (49 to 60 deg C) per ASTM D 87.
 - 2. Grout release in form of manufacturer's standard proprietary liquid coating that is specially formulated and recommended for use as temporary protective coating for tile.
- D. Tile Cleaner: A neutral cleaner capable of removing soil and residue without harming tile and grout surfaces, specifically approved for materials and installations indicated by tile and grout manufacturers.
- E. Grout Sealer: Manufacturer's standard silicone product for sealing grout joints and that does not change color or appearance of grout.
 - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Bonsal American; an Oldcastle company; Grout Sealer.
 - b. Bostik, Inc.; CeramaSeal Grout & Tile Sealer, Magic Seal, Silox 8, or Siloxane 220.
 - c. C-Cure; Penetrating Sealer 978.
 - d. Custom Building Products; Surfaceguard, Grout and Tile, or Grout Sealer.
 - e. Jamo Inc.; Matte Finish or Penetrating Sealer.
 - f. MAPEI Corporation; KER 003, Silicone Spray Sealer for Cementitious Tile Grout or 004, Keraseal Penetrating Sealer for Unglazed Grout and Tile.
 - g. Southern Grouts & Mortars, Inc.; Silicone Grout Sealer.
 - h. Summitville Tiles, Inc.; SL-15, Invisible Seal Penetrating Grout and Tile Sealer.
 - i. TEC; a subsidiary of H. B. Fuller Company; TA-256 Penetrating Silicone or TA-257 Silicone Grout Sealer.

2.9 MIXING MORTARS AND GROUT

- A. Mix mortars and grouts to comply with referenced standards and mortar and grout manufacturers' written instructions.
- B. Add materials, water, and additives in accurate proportions.
- C. Obtain and use type of mixing equipment, mixer speeds, mixing containers, mixing time, and other procedures to produce mortars and grouts of uniform quality with optimum performance characteristics for installations indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions where tile will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of installed tile.
 - 1. Verify that substrates for setting tile are firm, dry, clean, free of coatings that are incompatible with tile-setting materials including curing compounds and other substances that contain soap, wax, oil, or silicone; and comply with flatness tolerances required by ANSI A108.01 for installations indicated.
 - 2. Verify that concrete substrates for tile floors installed with bonded mortar bed comply with surface finish requirements in ANSI A108.01 for installations indicated.
 - a. Verify that surfaces that received a steel trowel finish have been mechanically scarified.
 - b. Verify that protrusions, bumps, and ridges have been removed by sanding or grinding.
 - 3. Verify that installation of grounds, anchors, recessed frames, electrical and mechanical units of work, and similar items located in or behind tile has been completed.
 - 4. Verify that joints and cracks in tile substrates are coordinated with tile joint locations; if not coordinated, adjust joint locations in consultation with Architect.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Fill cracks, holes, and depressions in concrete substrates for tile floors installed with thin-set mortar with trowelable leveling and patching compound specifically recommended by tile-setting material manufacturer.

- B. Where indicated, prepare substrates to receive waterproofing by applying a reinforced mortar bed that complies with ANSI A108.1A and is sloped 1/4 inch per foot (1:50) toward drains.
- C. Blending: For tile exhibiting color variations, verify that tile has been factory blended and packaged so tile units taken from one package show same range of colors as those taken from other packages and match approved Samples. If not factory blended, either return to manufacturer or blend tiles at Project site before installing.
- D. Field-Applied Temporary Protective Coating: If indicated under tile type or needed to prevent grout from staining or adhering to exposed tile surfaces, precoat them with continuous film of temporary protective coating, taking care not to coat unexposed tile surfaces.

3.3 TILE INSTALLATION

- A. Comply with TCA's "Handbook for Ceramic Tile Installation" for TCA installation methods specified in tile installation schedules. Comply with parts of the ANSI A108 Series "Specifications for Installation of Ceramic Tile" that are referenced in TCA installation methods, specified in tile installation schedules, and apply to types of setting and grouting materials used.
 - 1. For the following installations, follow procedures in the ANSI A108 Series of tile installation standards for providing 95 percent mortar coverage:
 - a. Tile floors composed of tiles 8 by 8 inches (200 by 200 mm) or larger.
- B. Extend tile work into recesses and under or behind equipment and fixtures to form complete covering without interruptions unless otherwise indicated. Terminate work neatly at obstructions, edges, and corners without disrupting pattern or joint alignments.
- C. Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces. Carefully grind cut edges of tile abutting trim, finish, or built-in items for straight aligned joints. Fit tile closely to electrical outlets, piping, fixtures, and other penetrations so plates, collars, or covers overlap tile.
- D. Provide manufacturer's standard trim shapes where necessary to eliminate exposed tile edges.
- E. Jointing Pattern: Lay tile in grid pattern unless otherwise indicated. Lay out tile work and center tile fields in both directions in each space or on each wall area. Lay out tile work to minimize the use of pieces that are less than half of a tile. Provide uniform joint widths unless otherwise indicated.
 - 1. For tile mounted in sheets, make joints between tile sheets same width as joints within tile sheets so joints between sheets are not apparent in finished work.

2. Where adjoining tiles on floor, base, walls, or trim are specified or indicated to be same size, align joints.
 3. Where tiles are specified or indicated to be whole integer multiples of adjoining tiles on floor, base, walls, or trim, align joints unless otherwise indicated.
- F. Joint Widths: Unless otherwise indicated, install tile with the following joint widths:
1. Quarry Tile: [1/4 inch (6.35 mm)] [3/8 inch (9.5 mm)].
- G. Lay out tile wainscots to dimensions indicated or to next full tile beyond dimensions indicated.
- H. Expansion Joints: Provide expansion joints and other sealant-filled joints, including control, contraction, and isolation joints, where indicated. Form joints during installation of setting materials, mortar beds, and tile. Do not saw-cut joints after installing tiles.
1. Where joints occur in concrete substrates, locate joints in tile surfaces directly above them.
 2. Prepare joints and apply sealants to comply with requirements in Division 7 Section "Joint Sealants."
- I. Stone Thresholds: Install stone thresholds in same type of setting bed as adjacent floor unless otherwise indicated.
1. At locations where mortar bed (thickset) would otherwise be exposed above adjacent floor finishes, set thresholds in latex-portland cement mortar (thin set).
 2. Do not extend cleavage membrane, waterproofing, or crack isolation membrane under thresholds set in dry-set portland cement or latex-portland cement mortar. Fill joints between such thresholds and adjoining tile set on cleavage membrane waterproofing or crack isolation membrane with elastomeric sealant.
- K. Grout Sealer: Apply grout sealer to cementitious grout joints in tile floors according to grout-sealer manufacturer's written instructions. As soon as grout sealer has penetrated grout joints, remove excess sealer and sealer from tile faces by wiping with soft cloth.

3.6 CRACK ISOLATION MEMBRANE INSTALLATION

- A. Install crack isolation membrane to comply with ANSI A108.17 and manufacturer's written instructions to produce membrane of uniform thickness and bonded securely to substrate.
- B. Do not install tile or setting materials over crack isolation membrane until membrane has cured.

3.7 CLEANING AND PROTECTING

- A. Cleaning: On completion of placement and grouting, clean all ceramic tile surfaces so they are free of foreign matter.
 - 1. Remove grout residue from tile as soon as possible.
 - 2. Clean grout smears and haze from tile according to tile and grout manufacturer's written instructions but no sooner than 10 days after installation. Use only cleaners recommended by tile and grout manufacturers and only after determining that cleaners are safe to use by testing on samples of tile and other surfaces to be cleaned. Protect metal surfaces and plumbing fixtures from effects of cleaning. Flush surfaces with clean water before and after cleaning.
 - 3. Remove temporary protective coating by method recommended by coating manufacturer and that is acceptable to tile and grout manufacturer. Trap and remove coating to prevent drain clogging.
- B. Protect installed tile work with kraft paper or other heavy covering during construction period to prevent staining, damage, and wear. If recommended by tile manufacturer, apply coat of neutral protective cleaner to completed tile walls and floors.
- C. Prohibit foot and wheel traffic from tiled floors for at least seven days after grouting is completed.
- D. Before final inspection, remove protective coverings and rinse neutral protective cleaner from tile surfaces.

3.9 INTERIOR TILE INSTALLATION SCHEDULE

- A. Interior Floor Installations, Concrete Subfloor:
 - 1. Tile Installation F111: Cement mortar bed (thickset) with cleavage membrane; TCA F111 and ANSI A108.1A.
 - a. Tile Type: Quarry.
 - b. Thin-Set Mortar for Cured-Bed Method: Medium-bed, latex-portland cement mortar.
 - c. Grout: Standard sanded cement grout.

++ END OF SECTION 09310 ++

SECTION 09402

RESINOUS MATRIX TERRAZZO FLOORING

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. Thin-set, epoxy-resin terrazzo flooring and base.
- B. Related Requirements:
 - 1. Section 07920 "Joint Sealants" for sealants installed with terrazzo.

1.3 DEFINITIONS

- A. Aggregate: Marble chips or other types of aggregate to match existing.

1.4 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.
 - 1. Review methods and procedures related to terrazzo including, but not limited to, the following:
 - a. Inspect and discuss condition of substrate and other preparatory work performed by other trades.
 - b. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
 - c. Review special terrazzo designs and patterns.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. LEED Submittals:
 - 1. Project will not be certified however shall meet the intent.
 - 2. Product Data for Credit MR 4: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.

3. Product Data for Credit IEQ 4.1: For adhesives, documentation including printed statement of VOC content.
 4. Product Data for Credit IEQ 4.3: For sealers, documentation including printed statement of VOC content.
 5. Product Data for Credit IEQ 4.3: For terrazzo flooring, documentation from an independent testing agency indicating compliance with the FloorScore Standard.
 6. Laboratory Test Reports for Credit IEQ 4: For adhesives and flooring system, documentation indicating that products comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- C. Shop Drawings: Include terrazzo installation requirements. Include plans, elevations, sections, component details, and attachments to other work. Show layout of the following:
1. Divider strips.
 2. Control-joint strips.
 3. Accessory strips.
 4. Abrasive strips.
 5. Stair treads, risers, and landings.
 6. Precast terrazzo jointing and edge configurations.
 7. Terrazzo patterns.
 8. Match existing terrazzo for the above items.
- D. Samples: For each exposed product and for each color and texture specified, 12 inches (300 mm) in size.
- E. Samples for Initial Selection: NTMA color plates showing the full range of colors and patterns available for each terrazzo type.
- F. Samples for Verification: For each type, material, color, and pattern of terrazzo and accessory required showing the full range of color, texture, and pattern variations expected. Label each terrazzo sample to identify manufacturer's matrix color and aggregate types, sizes, and proportions. Prepare Samples of same thickness and from same material to be used for the Work, in size indicated below:
1. Terrazzo: 12-inch- (300-mm-) square Samples.
 2. Accessories: 6-inch- (150-mm-) long Samples of each exposed strip item required.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Material Certificates: For each type of terrazzo material or product, from manufacturer.

- C. Installer Certificates: Signed by manufacturers certifying that installers comply with requirements.

1.7 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For terrazzo to include in maintenance manuals.

1.8 QUALITY ASSURANCE

- A. Installer Qualifications:
 - 1. Engage an installer who is a contractor member of NTMA.
 - 2. Engage an installer who is certified in writing by terrazzo manufacturer as qualified to install manufacturer's products.
- B. Source Limitations: Obtain primary terrazzo materials from single source from single manufacturer. Provide secondary materials including patching and fill material, joint sealant, and repair materials of type and from source recommended by manufacturer of primary materials.
- C. Source Limitations for Aggregates: Obtain each color, grade, type, and variety of granular materials from single source with resources to provide materials of consistent quality in appearance and physical properties.
- D. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
 - 1. Build mockups for terrazzo including accessories.
 - a. Size: Minimum 10 sq. ft. (.9 sq. m) of typical poured-in-place flooring condition for each color and pattern in locations directed by Architect.
 - 2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to Project site in supplier's original wrappings and containers, labeled with source's or manufacturer's name, material or product brand name, and lot number if any.
- B. Store materials in their original, undamaged packages and containers, inside a well-ventilated area protected from weather, moisture, soiling, extreme temperatures, and humidity.

1.10 FIELD CONDITIONS

- A. Environmental Limitations: Comply with manufacturer's written instructions for substrate temperature, ambient temperature, moisture, ventilation, and other conditions affecting terrazzo installation.
- B. Field Measurements: Verify actual dimensions of construction contiguous with precast terrazzo by field measurements before fabrication.
- C. Provide permanent lighting or, if permanent lighting is not in place, simulate permanent lighting conditions during terrazzo installation.
- D. Close spaces to traffic during terrazzo application and for not less than 24 hours after application unless manufacturer recommends a longer period.
- E. Control and collect water and dust produced by grinding operations. Protect adjacent construction from detrimental effects of grinding operations.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. NTMA Standards: Comply with NTMA's "Terrazzo Specifications and Design Guide" and with written recommendations for terrazzo type indicated unless more stringent requirements are specified.
- B. FloorScore Compliance: Terrazzo floors shall comply with requirements of FloorScore Standard.
- C. Low-Emitting Materials: Flooring system shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.2 EPOXY-RESIN TERRAZZO

- A. Epoxy-Resin Terrazzo: Comply with NTMA's "Terrazzo Specifications and Design Guide" and manufacturer's written instructions for matrix and aggregate proportions and mixing.
 - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following manufacturers and shall confirm ability to match existing terrazzo color:
 - a. Crossfield Products Corp., Dex-O-Tex Division; [Cheminert] [Spectrum] Terrazzo.
 - b. General Polymers Corporation; Terrazzo 1100.

- c. Key Resin Company; Key Epoxy Terrazzo.
 - d. Master Terrazzo Technologies LLC; Morricite.
 - e. Quadrant Chemical Corporation; Quadset Epoxy Terrazzo.
 - f. TEC Specialty Construction Brands, Inc.; Tuff-Lite Epoxy Terrazzo.
 - g. Terrazzo & Marble Supply Companies; Terroxy Resin Systems.
 - h. Equivalent for other manufacturer.
2. Thickness: 3/8 inch (9.5 mm) nominal.
 3. Custom Mix Color and Pattern: Match existing.

B. Materials:

1. Flexible Reinforcing Membrane: Manufacturer's resinous membrane for substrate-crack preparation and reflective-crack reduction.
 - a. Reinforcement: Fiberglass scrim.
2. Primer: Manufacturer's product recommended for substrate and use indicated.
3. Epoxy-Resin Matrix: Manufacturer's standard recommended for use indicated and in color required for mix indicated.
 - a. Physical Properties without Aggregates:
 - 1) Hardness: 60 to 85 per ASTM D 2240, Shore D.
 - 2) Minimum Tensile Strength: 3000 psi (20.7 MPa) per ASTM D 638 for a 2-inch (51-mm) specimen made using a "C" die per ASTM D 412.
 - 3) Minimum Compressive Strength: 10,000 psi (6.9 MPa) per ASTM D 695, Specimen B cylinder.
 - 4) Chemical Resistance: No deleterious effects by contaminants listed below after seven-day immersion at room temperature per ASTM D 1308.
 - a) Distilled water.
 - b) Mineral water.
 - c) Isopropanol.
 - d) Ethanol.
 - e) 0.025 percent detergent solution.
 - f) 1.0 percent soap solution.
 - g) 10 percent sodium hydroxide.
 - h) 10 percent hydrochloric acid.
 - i) 30 percent sulfuric acid.
 - j) 5 percent acetic acid.
 - b. Physical Properties with Aggregates: For resin blended with Georgia white marble, ground, grouted, and cured per requirements in NTMA's "Terrazzo Specifications and Design Guide"; comply with the following:
 - 1) Flammability: Self-extinguishing, maximum extent of burning 1/4 inch (6.35 mm) per ASTM D 635.
 - 2) Thermal Coefficient of Linear Expansion: 0.0025 inch/inch per deg F (0.0025 mm/mm per 0.5556 deg C) for temperature range of minus 12 to plus 140 deg F (minus 24 to plus 60 deg C) per ASTM D 696.

4. Aggregates: Comply with NTMA gradation standards for mix indicated and contain no deleterious or foreign matter.
 - a. Abrasion and Impact Resistance: Less than 40 percent loss per ASTM C 131.
 - b. 24-Hour Absorption Rate: Less than 0.75 percent.
 - c. Dust Content: Less than 1.0 percent by weight.
 - d. Recycled Content of Epoxy-Resin Terrazzo: Postconsumer recycled content plus one-half of preconsumer recycled content not less than (20) twenty percent.
5. Finishing Grout: Resin based.

2.3 STRIP MATERIALS

- A. Thin-Set Divider Strips: L-type angle, 1/4 inch (6.4 mm) deep.
 1. Material: Match existing.
 2. Top Width: Match existing.
- B. Heavy-Top Divider Strips: L-type angle in depth required for topping thickness indicated.
 1. Bottom-Section Material: Match existing.
 2. Top-Section Material: Match existing.
 3. Top-Section Width: Match existing.
- C. Control-Joint Strips: Separate, double L-type angles, positioned back to back, that match material and color of divider strips and in depth required for topping thickness indicated.
- D. Accessory Strips: Match divider-strip width, material, and color unless otherwise indicated. Use the following types of accessory strips as required to provide a complete installation:
 1. Edge-bead strips for exposed edges of terrazzo.

2.4 MISCELLANEOUS ACCESSORIES

- A. Strip Adhesive: Epoxy-resin adhesive recommended by adhesive manufacturer for this use.
 1. Adhesives shall have a VOC content of 70 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
 2. Adhesives shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- B. Anchoring Devices:
 1. Strips: Provide mechanical anchoring devices or adhesives for strip materials as recommended by manufacturer and required for secure attachment to substrate.

2. Precast Terrazzo: Provide mechanical anchoring devices as recommended by fabricator for proper anchorage and support of units for conditions of installation and support.
- C. Patching and Fill Material: Terrazzo manufacturer's resinous product approved and recommended by manufacturer for application indicated.
- D. Joint Compound: Terrazzo manufacturer's resinous product approved and recommended by manufacturer for application indicated.
- E. Resinous Matrix Terrazzo Cleaner: Chemically neutral cleaner with pH factor between 7 and 10 that is biodegradable, phosphate free, and recommended by sealer manufacturer for use on terrazzo type indicated.
- F. Sealer: (Slip- and stain-resistant, penetrating-type sealer that is chemically neutral; does not affect terrazzo color or physical properties; is recommended by sealer manufacturer; and complies with NTMA's "Terrazzo Specifications and Design Guide" for terrazzo type indicated). Acrylic, Urethane, or Chemical-resistant epoxy as recommended by manufacturer.
 1. Surface Friction: Not less than 0.6 according to ASTM D 2047.
 2. Acid-Base Properties: With pH factor between 7 and 10.
 3. Sealers shall have a VOC content of 200 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions, including levelness tolerances, have been corrected.

3.2 PREPARATION

- A. Clean substrates of substances, including oil, grease, and curing compounds, that might impair terrazzo bond. Provide clean, dry, and neutral substrate for terrazzo application.
- B. Concrete Slabs:
 1. Provide sound concrete surfaces free of laitance, glaze, efflorescence, curing compounds, form-release agents, dust, dirt, grease, oil, and other contaminants incompatible with terrazzo.

- a. Shot-blast surfaces with an apparatus that abrades the concrete surface, contains the dispensed shot within the apparatus, and recirculates the shot by vacuum pickup.
 - b. Repair damaged and deteriorated concrete according to terrazzo manufacturer's written recommendations.
 - c. Use patching and fill material to fill holes and depressions in substrates according to terrazzo manufacturer's written instructions.
- C. Verify that concrete substrates are dry and moisture-vapor emissions are within acceptable levels according to manufacturer's written instructions.
- 1. Moisture Testing: Perform tests indicated below.
 - a. Calcium Chloride Test: Perform anhydrous calcium chloride test per ASTM F 1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. (1.36 kg of water/92.9 sq. m) in 24 hours.
 - 1) Perform tests so that each test area does not exceed 200 sq. ft. (18.6 sq. m), and perform not less than two tests in each installation area and with test areas evenly spaced in installation areas.
 - b. In-Situ Probe Test: Perform relative-humidity test using in-situ probes per ASTM F 2170. Proceed with installation only after substrates have a maximum 75 percent relative-humidity-level measurement.
 - c. Test Method: Test for moisture content by method recommended in writing by terrazzo manufacturer. Proceed with installation only after substrates pass testing.
- D. Protect other work from water and dust generated by grinding operations. Control water and dust to comply with environmental protection regulations.
- 1. Erect and maintain temporary enclosures and other suitable methods to limit water damage and dust migration and to ensure adequate ambient temperatures and ventilation conditions during installation.

3.3 EPOXY-RESIN TERRAZZO INSTALLATION

- A. Comply with NTMA's written recommendations for terrazzo and accessory installation.
- B. Place, rough grind, grout, cure grout, fine grind, and finish terrazzo according to manufacturer's written instructions and NTMA's "Terrazzo Specifications and Design Guide."
- C. Installation Tolerance: Limit variation in terrazzo surface from level to 1/4 inch in 10 feet (6.4 mm in 3 m); noncumulative.
- D. Ensure that matrix components and fluids from grinding operations do not stain terrazzo by reacting with divider and control-joint strips.

- E. Delay fine grinding until heavy trade work is complete and construction traffic through area is restricted.
- F. Flexible Reinforcing Membrane:
 - 1. Prepare and prefill substrate cracks with membrane material.
 - 2. Install membrane at substrate cracks in areas to receive terrazzo.
 - 3. Reinforce membrane with fiberglass scrim.
 - 4. Prepare membrane according to manufacturer's written instructions before applying substrate primer.
- G. Primer: Apply to terrazzo substrates according to manufacturer's written instructions.
- H. Strip Materials:
 - 1. Divider and Control-Joint Strips:
 - a. Locate divider strips to match existing.
 - b. Install control-joint strips back to back directly above concrete-slab control joints.
 - c. Install control-joint strips with 1/4-inch (6.4-mm) gap between strips, and install sealant in gap.
 - d. Install strips in adhesive setting bed without voids below strips, or mechanically anchor strips as required to attach strips to substrate, as recommended by strip manufacturer.
 - 2. Accessory Strips: Install as required to provide a complete installation to match existing.

3.4 REPAIR

- A. Cut out and replace terrazzo areas that evidence lack of bond with substrate. Cut out terrazzo areas in panels defined by strips and replace to match adjacent terrazzo, or repair panels according to NTMA's written recommendations, as approved by Architect.

3.5 CLEANING AND PROTECTION

- A. Cleaning:
 - 1. Remove grinding dust from installation and adjacent areas.
 - 2. Wash surfaces with cleaner according to NTMA's written recommendations and manufacturer's written instructions; rinse surfaces with water and allow them to dry thoroughly.
- B. Sealing:
 - 1. Seal surfaces according to NTMA's written recommendations.
 - 2. Apply sealer according to sealer manufacturer's written instructions.

- C. Protection: Provide final protection and maintain conditions, in a manner acceptable to Installer, that ensure that terrazzo is without damage or deterioration at time of Substantial Completion.

++ END OF SECTION ++

SECTION 09514

ACOUSTICAL METAL PAN CEILINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes clip-in or snap-in acoustical metal pans and the following suspension system for ceilings:
 - 1. Match existing concealed grid designed to support metal pans.
- B. Products furnished, but not installed under this Section, include anchors, clips, and other ceiling attachment devices to be cast in concrete at ceilings.

1.3 DEFINITIONS

- A. CAC: Ceiling Attenuation Class.
- B. LR: Light Reflectance coefficient.
- C. NRC: Noise Reduction Coefficient.

1.4 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Exterior snap-in metal pan ceilings shall withstand exterior exposure and the effects of gravity loads and the following loads and stresses without showing permanent deformation of ceiling system components including pans and suspension system; noise or metal fatigue caused by vibration, deflection, and displacement of ceiling units; or permanent damage to fasteners and anchors.
- B. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
 - 1. Temperature Change (Range): 100 deg F (55 deg C).

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.

- B. LEED Submittals:
 - 1. Project will not be certified however shall meet intent.
 - 2. Product Data for Credit MR 4: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.
 - 3. Product Data for Credit IEQ 4.1: For sealants, documentation including printed statement of VOC content.
 - 4. Laboratory Test Reports for Credit IEQ 4: For ceiling systems and sealants, documentation indicating that products comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- C. Samples for Initial Selection: For components with factory-applied color and other decorative finishes.
- D. Samples for Verification: For each component indicated and for each exposed finish required, prepared on Samples of size indicated below:
 - 1. Metal Pans: Set of full-size Samples of each type, finish, color, pattern, and texture. Show pan edge profile.
 - 2. Sound Absorber: Match size of Sample metal pan.
- E. Performance Data: For installed products indicated to comply with design loads and other criteria, include structural analysis and other analytical data signed and sealed by the qualified professional engineer responsible for their preparation.

1.6 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from Installers of the items involved:
 - 1. Ceiling suspension members.
 - 2. Method of attaching hangers to building structure.
 - a. Furnish layouts for cast-in-place anchors, clips, and other ceiling attachment devices whose installation is specified in other Sections.
 - 3. Ceiling-mounted items including lighting fixtures, diffusers, grilles, speakers, sprinklers, access panels, and special moldings.
 - 4. Ceiling perimeter and penetrations through the ceiling; and trim and moldings.
 - 5. Minimum Drawing Scale: 1/4 inch = 1 foot (1:48).
- B. Qualification Data: For testing agency.
- C. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for each acoustical metal pan ceiling.

- D. Evaluation Reports: For each acoustical metal pan ceiling and components, anchor and fastener type.
- E. Field quality-control reports.

1.7 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For finishes to include in maintenance manuals.

1.8 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Acoustical Metal Pans: (10) Ten Full-size units.
 - 2. Suspension System Components: (20) Twenty feet.
 - 3. Hold-Down Clips: (10) Ten.

1.9 QUALITY ASSURANCE

- A. Acoustical Testing Agency Qualifications: An independent testing laboratory or an NVLAP-accredited laboratory, with the experience and capability to conduct the testing indicated. NVLAP-accredited laboratories must document accreditation, based on a "Certificate of Accreditation" and a "Scope of Accreditation" listing the test methods specified.
- B. Source Limitations:
 - 1. Acoustical Ceiling Pans: Obtain each type from single source from single manufacturer.
 - 2. Suspension Systems: Obtain each type from single source from single manufacturer.
- C. Source Limitations for Acoustical Metal Pan Ceilings: Obtain each combination of acoustical metal pans and exposed suspension systems from one source with resources to provide products of consistent quality in appearance, physical properties, and performance.
- D. Surface-Burning Characteristics: Complying with ASTM E 1264 for [Class A] <Insert class> materials as determined by testing identical products according to ASTM E 84 by UL or another testing and inspecting agency acceptable to authorities having jurisdiction.
- E. Seismic Standard: Provide acoustical metal pan ceilings designed and installed to withstand the effects of earthquake motions according to the following:
 - 1. Standard for Ceiling Suspension Systems Requiring Seismic Restraint: Comply with ASTM E 580.

2. CISCA's Recommendations for Acoustical Ceilings: Comply with CISCA's "Recommendations for Direct-Hung Acoustical Tile and Lay-in Panel Ceilings - Seismic Zones 0-2."
3. CISCA's Guidelines for Systems Requiring Seismic Restraint: Comply with CISCA's "Guidelines for Seismic Restraint of Direct-Hung Suspended Ceiling Assemblies - Seismic Zones 3 & 4."
4. UBC Standard 25-2, "Metal Suspension Systems for Acoustical Tile and for Lay-in Panel Ceilings."
5. SEI/ASCE 7, "Minimum Design Loads for Buildings and Other Structures": Section 9, "Earthquake Loads."
6. <Insert requirement of authorities having jurisdiction>.

1.10 DELIVERY, STORAGE, AND HANDLING

- A. Deliver acoustical metal pans, suspension system components, and accessories to Project site in original, unopened packages and store them in a fully enclosed, conditioned space where they will be protected against damage from moisture, humidity, temperature extremes, direct sunlight, surface contamination, and other causes.
- B. Handle acoustical metal pans, suspension system components, and accessories carefully to avoid damaging units and finishes in any way.

1.11 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install acoustical metal pan ceilings until spaces are enclosed and weathertight, wet work in spaces is complete and dry, work above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

1.12 COORDINATION

- A. Coordinate layout and installation of acoustical metal pans and suspension system with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression system, and partition assemblies.

PART 2 - PRODUCTS

2.1 ACOUSTICAL METAL CEILING PANS

- A. Match existing.
- B. Low-Emitting Materials: Acoustical metal pan ceilings shall comply with the testing and product requirements of the California Department of Health Services'

"Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

- B. Acoustical Metal Pan Standard: Provide manufacturer's standard acoustical metal pans of configuration indicated that comply with ASTM E 1264 classifications as designated by types, acoustical ratings, and light reflectances unless otherwise indicated.
1. Mounting Method for Measuring NRC: Type E-400; plenum mounting in which face of test specimen is 15-3/4 inches (400 mm) away from test surface per ASTM E 795.
- C. Sheet Metal Characteristics: For metal components exposed to view in the completed Work, provide materials with smooth, flat surfaces without blemishes. Do not use materials with exposed pitting, seam marks, roller marks, roughness, stains, or discolorations.
1. Steel Sheet: Commercial-quality, cold-rolled, carbon-steel sheet; stretcher leveled; with protective coating complying with ASTM C 635.
 - a. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 twenty-five percent.
 - b. Painted Finishes: Electrolytic zinc-coated steel complying with ASTM A 591/A 591M, 40Z (12G) coating, surface treatment as recommended by finish manufacturer for type of use and finish indicated.
 - c. Chemical/Mechanical Finishes: Uncoated steel sheet complying with ASTM A 1008/A 1008M with luster or bright finish as required by finisher for applying electroplating or other metallic-finishing processes.
- E. Sound-Absorbent Pads: Provide width and length to completely fill concealed surface of pan, with surface-burning characteristics for flame-spread index of 25 or less and smoke-developed index of 50 or less, as determined by testing per ASTM E 84, and to comply with the following requirements:
1. Plastic Sheet-Wrapped Mineral-Fiber Insulation: Pads consisting of nonrigid, PVC plastic sheet encapsulating unfaced mineral-fiber insulation complying with ASTM C 553, Type I, II, or III, and as follows:
 - a. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than (20) twenty percent by weight.
 - b. Mineral-Fiber Type and Thickness: Glass fiber; 1 inch (25 mm).
 - c. Mineral-Fiber Density: 1 lb/cu. ft. (16 kg/cu. m).
 2. Spacer Grids: Provide manufacturer's standard galvanized-steel grid units that provide an air cushion between metal pans and insulation pads and that act to improve sound absorption.
 3. Sound Attenuation Panels: Provide manufacturer's standard galvanized-steel unperforated metal backing unit that acts as a sound-attenuating pan to reduce the travel of sound through ceiling plenum into adjoining rooms.
 - a. Sound-Absorbent Pads: Provide secondary sound-absorbent pads, same as specified for primary pads, for placement over sound attenuation pan to reduce plenum sound.

2.2 STEEL PANS FOR ACOUSTICAL METAL PAN CEILING

- A. Steel Pans:
 - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following that offer a panel that matches existing:
 - a. American Decorative Ceilings;
 - b. Armstrong World Industries, Inc.;
 - c. Ceilings Plus;
 - d. Chicago Metallic Corporation;
 - e. Hunter Douglas Architectural Products, Inc.;
 - f. Simplex Ceilings, a division of Intalite Inc.;
 - g. Steel Ceilings Inc.;
 - h. USG Interiors, Inc.;

2.3 METAL SUSPENSION SYSTEMS

- A. Match existing.
- B. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content is not less than (25) twenty-five percent.
- C. Metal Suspension System Standard: Provide manufacturer's standard metal suspension systems of types, structural classifications, and finishes indicated that comply with applicable ASTM C 635 requirements.
- D. Suspension Systems: Provide systems complete with carriers, runners, splice sections, connector clips, alignment clips, leveling clips, hangers, molding, trim, retention clips, load-resisting struts, and other suspension components required to support ceiling units and other ceiling-supported construction.
- E. Attachment Devices: Size for five times the design load indicated in ASTM C 635, Table 1, "Direct Hung," unless otherwise indicated. Comply with seismic design requirements.
 - 1. Anchors in Concrete: Anchors of type and material indicated below, with holes or loops for attaching hangers of type indicated and with capability to sustain, without failure, a load equal to (5) five times that imposed by ceiling construction, as determined by testing per ASTM E 488 or ASTM E 1512 as applicable, conducted by a qualified testing and inspecting agency.
 - a. Type: Postinstalled expansion or Postinstalled bonded anchors.
 - b. Corrosion Protection: Carbon-steel components zinc plated to comply with ASTM B 633, Class Fe/Zn 5 (0.005 mm) for Class SC 1 service condition.
 - c. Corrosion Protection: Stainless-steel components complying with ASTM F 593 and ASTM F 594, Group 1 Alloy 304 or 316 for bolts; Alloy 304 or 316 for anchor.

- d. Corrosion Protection: Components fabricated from nickel-copper-alloy rods complying with ASTM B 164 for UNS No. N04400 alloy.
 2. Power-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hangers of type indicated, and with capability to sustain, without failure, a load equal to (10) ten times that imposed by ceiling construction, as determined by testing per ASTM E 1190, conducted by a qualified testing and inspecting agency.
- F. Wire Hangers, Braces, and Ties: Provide wires complying with the following requirements:
1. Zinc-Coated, Carbon-Steel Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper.
 2. Stainless-Steel Wire: ASTM A 580/A 580M, Type 304, nonmagnetic.
 3. Nickel-Copper-Alloy Wire: ASTM B 164, nickel-copper-alloy UNS No. N04400.
 4. Size: Select wire diameter so its stress at 3 times the hanger design load indicated in ASTM C 635, Table 1, Direct Hung will be less than yield stress of wire, but provide not less than 0.135-inch- (3.5-mm diameter wire).
- G. Hanger Rods or Flat Hangers: Mild steel, zinc coated or protected with rust-inhibitive paint.
- H. Angle Hangers: Angles with legs not less than 7/8 inch (22 mm) wide; formed with 0.04-inch- (1.0-mm-) thick, galvanized-steel sheet complying with ASTM A 653/A 653M, G90 (Z275) coating designation; with bolted connections and 5/16-inch- (8-mm-) diameter bolts.
- I. Hold-Down Clips: Manufacturer's standard hold-down clips spaced to secure acoustical metal pans in place at each pan.
- J. Exposed Metal Edge Moldings and Trim: Provide exposed members as indicated or as required to comply with seismic requirements of authorities having jurisdiction, to conceal edges of and penetrations through ceiling, to conceal edges of pans and runners, for fixture trim and adapters, for fasciae at changes in ceiling height, and for other conditions; of metal and finish matching acoustical metal pan ceiling units, unless otherwise indicated.
1. For Circular Penetrations of Ceiling: Fabricate edge moldings to diameter required to fit penetration exactly.

2.4 ACOUSTICAL SEALANT

- A. Acoustical Sealant for Exposed and Concealed Joints: Manufacturer's standard nonsag, paintable, nonstaining latex sealant, with a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24), that complies with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emis-

sions from Various Sources Using Small-Scale Environmental Chambers," complying with ASTM C 834 and effective in reducing airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Pecora Corporation; AC-20 FTR Acoustical and Insulation Sealant.
 - b. USG Corporation; SHEETROCK Acoustical Sealant.
 - c. Equivalent by other manufacturer.

2.5 GENERAL FINISH REQUIREMENTS

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
 1. High-Humidity Finish: Comply with ASTM C 635 requirements for "Coating Classification for Severe Environment Performance" where high-humidity finishes are indicated.
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.6 GALVANIZED-STEEL SHEET FINISHES

- A. Color-Coated Finish: Manufacturer's standard powder-coat baked paint complying with coating manufacturer's written instructions for surface preparation, pretreatment, application, baking, and minimum dry film thickness.

2.7 STEEL SHEET FINISHES

- A. Electroplated Finish: Electroplating process complying with finish manufacturer's written instructions for surface preparation, pretreatment, process, and minimum thickness to produce a coating uniform in appearance and free of blisters, pits, roughness, nodules, burning, cracks, unplated areas, and other visible defects.
- B. Bright-Reflective Finish: Manufacturer's standard chemical/mechanical bright-reflective metallic finish complying with finish manufacturer's written instructions for surface preparation, pretreatment, process, protective coating, and minimum thickness to produce a finish uniform in appearance and free of blisters, pits, roughness, nodules, burning, cracks, unfinished areas, and other visible defects.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, including structural framing to which acoustical metal pan ceilings attach or abut, with Installer present, for compliance with requirements specified in this and other Sections that affect ceiling installation and anchorage and with requirements for installation tolerances and other conditions affecting performance of acoustical metal pan ceilings.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Measure each ceiling area and establish layout of acoustical metal pans to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width pans at borders, and comply with layout shown on reflected ceiling plans and Coordination Drawings.

3.3 INSTALLATION

- A. Install acoustical metal pan ceilings to comply with ASTM C 636 and UBC Standard 25-2 and seismic requirements indicated, per manufacturer's written instructions and CISCA's "Ceiling Systems Handbook."
- B. Suspend ceiling hangers from building's structural members and as follows:
 - 1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structure or of ceiling suspension system.
 - 2. Splay hangers only where required to miss obstructions; offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
 - 3. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with location of hangers at spacings required to support standard suspension system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices.
 - 4. Secure wire hangers to ceiling suspension members and to supports above with a minimum of three tight turns. Connect hangers directly either to structures or to inserts, eye screws, or other devices that are secure and appropriate for substrate and that will not deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.
 - 5. Secure flat, angle, channel, and rod hangers to structure, including intermediate framing members, by attaching to inserts, eye screws, or other devices that are secure and appropriate for both structure to which hangers are attached and type of hanger involved.
 - 6. Do not support ceilings directly from permanent metal forms or floor deck. Fasten hangers to cast-in-place hanger inserts, postinstalled mechanical or

- adhesive anchors, or power-actuated fasteners that extend through forms into concrete.
7. When steel framing does not permit installation of hanger wires at spacing required, install carrying channels or other supplemental support for attachment of hanger wires.
 8. Do not attach hangers to steel deck tabs.
 9. Do not attach hangers to steel roof deck. Attach hangers to structural members.
 10. Space hangers not more than 48 inches (1200 mm) o.c. along each member supported directly from hangers unless otherwise indicated; provide hangers not more than 8 inches (200 mm) from ends of each member.
 11. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards and publications.
- C. Secure bracing wires to ceiling suspension members and to supports with a minimum of four tight turns. Suspend bracing from building's structural members as required for hangers, without attaching to permanent metal forms, steel deck, or steel deck tabs. Fasten bracing wires into concrete with cast-in-place or postinstalled anchors.
- D. Install edge moldings and trim of type indicated at perimeter of acoustical ceiling area and where necessary to conceal edges of acoustical metal pans.
1. Apply acoustical sealant in a continuous ribbon concealed on back of vertical legs of moldings before they are installed.
 2. Screw attach moldings to substrate at intervals not more than 16 inches (400 mm) o.c. and not more than 3 inches (75 mm) from ends, leveling with ceiling suspension system to a tolerance of 1/8 inch in 12 feet (3.2 mm in 3.6 m). Miter corners accurately and connect securely.
 3. Do not use exposed fasteners, including pop rivets, on moldings and trim.
- E. Install suspension system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.
- F. Cut acoustical metal pan units for accurate fit at borders and at interruptions and penetrations by other work through ceilings. Stiffen edges of cut units as required to eliminate evidence of buckling or variations in flatness exceeding referenced standards for stretcher-leveled metal sheet.
- G. Install acoustical metal pans in coordination with suspension system and exposed moldings and trim.
1. For lay-in square-edge pans, install pans with edges fully hidden from view by flanges of suspension system runners and moldings.
 2. For lay-in reveal-edge pans on suspension system runners, install pans with bottom of reveal in firm contact with top surface of runner flanges.

3. For lay-in reveal-edge pans on suspension system members with box-shaped flanges, install pans with reveal surfaces in firm contact with suspension system surfaces and panel faces flush with bottom face of runners.
 4. For clip-in pans, position pans according to manufacturer's written instructions.
 5. For snap-in pans, fit adjoining units to form flush, tight joints.
 6. Align joints in adjacent courses to form uniform, straight joints parallel to room axis in both directions unless otherwise indicated.
 7. Fit adjoining units to form flush, tight joints.
 8. Install directionally patterned or textured metal pans in directions indicated.
 9. Install sound-absorbent fabric layers in perforated metal pans.
 10. Install sound-absorbent pads in perforated metal pans over metal spacer grids.
- H. Install sound attenuation panels in areas indicated by reflected ceiling plans or room finish schedules. Lay panels directly on ceiling system and close major openings to form complete coverage in required areas. Lay second sound-absorbent pads on sound attenuation panels.
- I. Install hold-down clips where indicated.

3.4 CLEANING

- A. Clean exposed surfaces of acoustical metal pan ceilings, including trim and edge moldings after removing strippable, temporary protective covering, if any. Comply with manufacturer's written instructions for stripping of temporary protective covering, cleaning, and touchup of minor finish damage. Remove and replace ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage, including dented and bent units.

+ + END OF SECTION + +

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SECTION 09910

PAINTING

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

- A. Provide all labor, materials, equipment and services for furnishing and installing the finishes as indicated on drawings and schedules, and as herein specified.
- B. Work includes painting and finishing of interior and exterior exposed items and surfaces throughout project, except as otherwise indicated. Surface preparation, priming and coats of paint specified are in addition to shop-priming and surface treatment specified under other sections of work.
- C. Work includes field painting of exposed bare and covered pipes and ducts (including color coding), and of hangers, exposed steel and iron work, and primed metal surfaces of equipment installed under mechanical and electrical work, except as otherwise indicated. In addition, the Contractor shall provide for the use of deep tone colors to be applied in selected areas as wall graphics, stripes and visual accents. The areas and colors shall be selected by the Architect-Engineer and shall not exceed 15% of the total wall surface area to be painted.
- D. "Paint" as used herein means all coating systems materials, including primers, emulsions, enamels, stains, sealers and fillers, and other applied materials whether used as prime, intermediate or finish coats.
- E. Surfaces to be Painted: Except where natural finish of material is specifically noted as a surface not to be painted, paint exposed surfaces whether or not colors are designated in "schedules". Where items or surfaces are not specifically mentioned, paint the same as similar adjacent materials or areas. If color or finish is not designated, Architect-Engineer will select these from standard colors or finishes available.
- F. Following categories of work are not included as part of field- applied finish work.
 - 1. Pre-Finished Items: Unless otherwise indicated, do not include painting when factory-finishing or installer-finishing is specified for such items as (but not limited to) toilet enclosures, prefinished partition systems, acoustic materials, architectural woodwork and casework, and finish mechanical and electrical equipment, including light fixtures, switchgear, and distribution cabinets.
 - 2. Concealed Surfaces: Unless otherwise indicated, painting is not required on surfaces such as walls or ceilings in concealed areas and generally inaccessible areas, furred areas, pipe spaces, and duct shafts.

3. Finished Metal Surfaces: Unless otherwise indicated, metal surfaces of anodized aluminum, stainless steel, chromium plate, copper, bronze and similar finished materials will not require finish painting.
 4. Operating Parts: Unless otherwise indicated, moving parts of operating units, mechanical and electrical parts, such as valve and damper operators, linkages, sinkages, sensing devices, motor and fan shafts will not require finish painting.
- G. Following categories of work are included under other sections of these specifications.
1. Shop Priming: Unless otherwise specified, shop priming of ferrous metal items is included under various sections for structural steel, metal fabrications, hollow metal work and similar items.
 2. Unless otherwise specified, shop priming of fabricated components such as architectural woodwork, wood casework and shop-fabricated or factory-built mechanical and electrical equipment or accessories is included under other sections of these Specifications.
- H. Do not paint over any code-required labels, such as Underwriters' Laboratories and Factory Mutual, or any equipment identification, performance rating, name, or nomenclature plates.
- I. PVC plastic process piping shall not be painted, but shall be stenciled and labeled or tagged for identification surfaces. Each type of process piping using PVC pipe shall be installed using the same color pipe.
- J. Repainting of existing structures, tanks, piping, and all other existing items shall not be part of this Contract unless otherwise noted. Areas that have been directly altered or damaged by construction shall be repainted to match existing conditions using the appropriate painting system.

1.02 RELATED DOCUMENTS

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

1.03 SUBMITTALS

- A. Product Data: Submit manufacturer's technical information including paint label analysis and application instructions for each material proposed for use.
- B. Samples: Prior to beginning work, submit color chips for surfaces to be painted. Use representative colors when preparing samples for review. Submit samples for Architect-Engineer's review of color and texture only. Provide a listing of material and application for each coat of each finish sample.

1.04 QUALITY ASSURANCE

- A. Single Source Responsibility: Provide primers and other undercoat paint produced by same manufacturer as finish coats. Use only thinners approved by paint manufacturer, and use only within recommended limits.
- B. Coordination of Work: Review other sections of these Specifications in which prime paints are to be provided to ensure compatibility of total coatings systems for various substrates. Upon request from other trades, furnish information or characteristics of finish materials provided for use, to ensure compatible prime coats are used.

1.05 DELIVERY AND STORAGE

- A. Deliver materials to job site in original, new and unopened packages and containers bearing manufacturer's name and label, and following information:
 - 1. Name or title of material.
 - 2. Fed. Spec. number, if applicable.
 - 3. Manufacturer's stock number, batch number, and date of manufacturer.
 - 4. Manufacturer's name.
 - 5. Contents by volume, for major pigment and vehicle constituents.
 - 6. Thinning instructions.
 - 7. Application instructions.
 - 8. Color name and number.
- B. Store materials not in actual use in tightly covered containers. Maintain containers used in storage of paint in a clean condition, free of foreign materials and residue. Protect from freezing where necessary. Keep storage area neat and orderly. Remove oily rags and waste daily. Take all precautions to ensure that workmen and work areas are adequately protected from fire hazards and health hazards resulting from handling, mixing and application of paints.

1.06 JOB CONDITIONS

- A. Apply water-base paints only when temperature of surfaces to be painted and surrounding air temperatures are between 50 degrees F (10 degrees C) and 90 degrees F (32 degrees C), unless otherwise permitted or restricted by paint manufacturer's printed instructions.
- B. Apply solvent-thinned paints only when temperature of surfaces to be painted and surrounding air temperatures are between 45 degrees F (7 degrees C) and 95 degrees F (35 degrees C), unless otherwise permitted or restricted by paint manufacturer's printed instructions.
- C. Do not apply paint in snow, rain, fog or mist, or when relative humidity exceeds 85%, or to damp or wet surfaces, unless otherwise permitted or restricted by paint manufacturer's printed instructions. Painting may be continued during inclement

weather if areas and surfaces to be painted are enclosed and heated within temperature limits specified by paint manufacturer during application and drying periods.

- D. Paint only when the surface temperature is at least 5 degrees F above the dew point, unless otherwise permitted by paint manufacturer's printed instructions.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products which may be incorporated in the work include, but are not limited to, the following:
 - 1. Tnemec Company, Inc. (Tnemec)
 - 2. The Sherwin-Williams Company
 - 3. Carboline

2.02 MATERIALS

- A. Material Quality: Provide best quality grade of various types of coatings as regularly manufactured by acceptable paint materials manufacturers. Materials not displaying manufacturer's identification as a standard, best-grade product will not be acceptable.
- B. Proprietary names used to designate colors or materials are not intended to imply that products of named manufacturers are required to exclusion of equivalent products of other manufacturers.
- C. Color Pigments: Pure, non-fading, applicable types to suit substrates and service indicated.
 - 1. Lead content in pigment, if any, is limited to contain not more than 0.06% lead, as lead metal based on the total non-volatile (dry-film) of paint by weight.

PART 3 - EXECUTION

3.01 INSPECTION

- A. Applicator must examine areas and conditions under which painting work is to be applied and notify Contractor in writing of conditions detrimental to proper and timely completion of work. Do not proceed with work until unsatisfactory conditions have been corrected in a manner acceptable to Applicator.

- B. Starting of painting work will be construed as Applicator's acceptance of surfaces and conditions within any particular area.
- C. Do not paint over dirt, rust, scale, grease, moisture, scuffed surfaces, or conditions otherwise detrimental to formation of a durable paint film.

3.02 SURFACE PREPARATION

- A. General: Perform preparation and cleaning procedures in accordance with paint manufacturer's instructions and as herein specified, for each particular substrate condition.
 - 1. Provide barrier coats over incompatible primers or remove and re-prime as required. Notify Architect-Architect-Engineer in writing of any anticipated problems in using the specified coating systems with substrates primed by others.
 - 2. Remove hardware, hardware accessories, machined surfaces, plates, lighting fixtures, 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 complete painting of items and adjacent surfaces. Following completion of painting of each space or area, reinstall removed items.
 - 3. Clean surfaces to be painted before applying paint or surface treatments. Remove oil and grease prior to mechanical cleaning per SSPC SP-1. Program cleaning and painting so that contaminants from cleaning process will not fall onto wet, newly-painted surfaces.
 - 4. Abrasives for blasting shall be sharp, washed, salt free, angular, and free from feldspar or other constituents that tend to breakdown and remain on the surface.
 - 5. Concrete floors shall be dry as indicated by testing in accordance with ASTM D4263, Standard Test Method for Indicating Moisture in Concrete by the Plastic Sheet Method.
- B. Cementitious Materials: Per ASTM D4261, Standard Practice for Surface Cleaning Concrete Unit Masonry for Coating, prepare cementitious surfaces of concrete block to be painted by removing efflorescence, chalk, dust, dirt, grease, oils, and by roughening as required to remove glaze. Per ASTM D4262, Standard Test Method for pH of Chemically Cleaned or Etched Concrete Surfaces, determine alkalinity of surfaces to be painted by performing appropriate tests. If surfaces are found to be sufficiently alkaline to cause blistering and burning of finish paint, correct this condition before application of paint. Test the surface for moisture and do not paint over surfaces where moisture content exceeds that permitted in manufacturer's printed directions.
- C. Wood: Clean wood surfaces to be painted of dirt, oil, or other foreign substances with scrapers, mineral spirits, and sandpaper, as required. Sandpaper smooth those finished surfaces exposed to view, and dust off. Scrape and clean small, dry, seasoned knots and apply a thin coat of white shellac or other recommended

- knot sealer, before application of priming coat. After priming, fill holes and imperfections in finish surfaces with putty or plastic wood-filler. Sandpaper smooth when dried.
1. Prime, stain, or seal wood required to be job-painted immediately upon delivery to job. Prime edges, ends, faces, undersides, and backsides of such wood, including cabinets, counters, cases, paneling.
 2. When transparent finish is required, use spar varnish for backpriming.
- D. Ferrous Metals: Clean ferrous surfaces, which are not galvanized or shop-coated, of oil, grease, dirt, and other foreign substances by solvent cleaning per SSPC SP-1. Mechanical cleaning shall be in accordance with SSPC-SP6 Commercial Blast Cleaning specifications for non-immersion surfaces and SSPC-SP10 Near White Metal Blast Cleaning for immersion in potable or non-potable water.
- E. Galvanized Surfaces: Clean free of oil and surface contaminants with non-petroleum based solvent.
- F. Shop Primed Surfaces: Prepare shop-applied prime coats wherever damaged or bare as required by other sections of these Specifications. Clean and touch-up with same type shop primer.

3.03 MATERIALS PREPARATION

- A. Mix and prepare painting materials in accordance with manufacturer's directions.
- B. Maintain containers used in mixing and application of paint in a clean condition, free of foreign materials and residue.
- C. Stir materials before application to produce a mixture of uniform density, and stir as required during application. Do not stir surface film into material. Remove film and, if necessary, strain material before using.

3.04 APPLICATION

- A. General: Apply paint in accordance with manufacturer's directions. Use applicators and techniques best suited for substrate and type of material being applied.
 1. Painting requirements, surface treatments, and finishes, are indicated in "schedules" of the contract documents and as noted in Paragraph 3.11 hereinafter.
 2. Provide finish coats which are compatible with prime paints used.
 3. Apply additional coats when undercoats, stains or other conditions show through final coat of paint, until paint film is of uniform finish, color and appearance. Give special attention to insure that surfaces, including edges, corners, crevices, welds, and exposed fasteners receive a dry film thickness equivalent to that of flat surfaces.

4. Paint surfaces behind movable equipment and furniture same as similar exposed surfaces. Paint surfaces behind permanently- fixed equipment or furniture with prime coat only before final installation of equipment.
 5. Paint interior surfaces of ducts, where visible through registers or grilles, with a flat, non-specular black paint.
 6. Paint back sides of access panels, and removable or hinged covers to match exposed surfaces.
 7. Finish exterior doors on tops, bottoms and side edges same as exterior faces, unless otherwise indicated.
 8. Sand lightly between each succeeding enamel or varnish coat.
 9. Omit first coat (primer) on metal surfaces which have been shop-primed and touch-up painted, unless otherwise indicated.
- B. Scheduling Painting: Apply 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. 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 application of another coat of paint does not cause lifting or loss of adhesion of the undercoat.
- C. Minimum Coating Thickness: Apply materials at not less than manufacturer's recommended spreading rate, to establish a total dry film thickness as indicated or, if not indicated, as recommended by coating manufacturer. NOTE: PA-2 is only for large flat surfaces.
- D. Mechanical and Electrical Work: Painting of mechanical and electrical work is limited to those items exposed in mechanical equipment rooms and in occupied spaces.
1. Mechanical items to be painted include, but are not limited to, the following:
 - a. Piping, pipe hangers, supplementary steel and supports except galvanized surfaces.
 - b. Heat exchangers.
 - c. Tanks.
 - d. Ductwork, insulation.
 - e. Motor, mechanical equipment, and supports.
 - f. Accessory items.
 2. Electrical items to be painted include, but are not limited to, the following:
 - a. Conduits and fittings except galvanized surfaces.
 - b. Switchgear (touch up only).
 - c. Hanger and support except galvanized surfaces.
- E. Prime Coats: Apply prime coat of material which is required to be painted or finished, and which has not been prime coated by others. Recoat primed and sealed surfaces where there is evidence of suction spots or unsealed areas in first coat, to assure a finish coat with no burn- through or other defects due to insufficient sealing.

- F. Pigmented (Opaque) Finishes: Completely cover to provide an opaque, smooth surface of uniform finish, color, appearance and coverage. Cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness or other surface imperfections will not be acceptable. Holiday test coated steel in immersion areas in accordance with NACE International SP0188-2007 Discontinuity (Holiday) Testing of New Protective Coatings on Conductive Substrates.
- G. Transparent (Clear) Finishes: Use multiple coats to produce glass-smooth surface film of even luster. Provide a finish free of laps, cloudiness, color irregularity, runs, brush marks, orange peel, nail holes, or other surface imperfections. Provide satin finish for final coats, unless otherwise indicated.
- H. Completed Work: Match approved samples for color, texture and coverage. Remove, refinish or repaint work not in compliance with specified requirements.

3.05 FIELD QUALITY CONTROL

- A. The right is reserved by Owner to invoke the following material testing procedure at any time, and any number of times during period of field painting:
 - 1. Engage services of an independent testing laboratory to sample paint being used. Samples of materials delivered to project site will be taken, identified and sealed, and certified in presence of Contractor.
 - 2. Testing laboratory will perform appropriate tests for any or all of following characteristics: Abrasion resistance, apparent reflectivity, flexibility, washability, absorption, accelerated weathering, dry opacity, accelerated yellowness, recoating, skinning, color retention, alkali resistance and quantitative materials analysis.
- B. If test results show that material being used does not comply with specified requirements, Contractor may be directed to stop painting work, and remove non-complying paint; pay for testing; repaint surfaces coated with rejected paint; remove rejected paint from previously painted surfaces if, upon repainting with specified paint, the two coatings are non-compatible.

3.06 CLEAN-UP AND PROTECTION

- A. Clean-Up: During progress of work, remove from site discarded paint materials, rubbish, cans and rags at end of each work day.
- B. Upon completion of painting work, clean window glass and other paint-spattered surfaces. Remove spattered paint by proper methods of washing and scraping, using care not to scratch or otherwise damage finished surfaces.
- C. Protection: Protect work of other trades, whether to be painted or not, against damage by painting and finishing work. Correct any damage by cleaning, repairing or replacing, and repainting, as acceptable to Architect-Architect-

Engineer. Provide "Wet Paint" signs as required to protect newly-painted finishes. Remove temporary protective wrappings provided by others for protection of their work, after completion of painting operations. At completion of work of other trades, touch-up and restore all damaged or defaced painted surfaces.

3.07 PAINTING SYSTEMS

A. Ferrous Metals, Structural, Tanks, Pipe and Equipment

1. Exterior, Non-Immersion

	Tnemec	Dry Mils	Sherwin Williams	Dry Mils	Carboline	Dry Mils
Surface Prep	SSPC-SP6 Commercial Blast Cleaning		SSPC-SP6 Commercial Blast Cleaning		SSPC-SP6 Commercial Blast Cleaning	
1st Coat	91H20	2.5 – 3.5	Corothane I Galvapac NSF	2.5 – 3.5	Carbozinc 859	2.5 – 3.5
2nd Coat	N69 High-Build Epoxoline	4.0 – 6.0	Macropoxy 646	4.0 – 6.0	Carboguard 893 SG	4.0 – 6.0
3rd Coat	1074 Endura -Shield	2.0 – 3.0	Acrolon 218 HS	2.0 – 3.0	Carbothane 134 HG	2.0 – 3.0

2. Interior, Non-Immersion

	Tnemec	Dry Mils	Sherwin Williams	Dry Mils	Carboline	Dry Mils
Surface Prep	SSPC-SP6 Commercial Blast Cleaning		SSPC-SP6 Commercial Blast Cleaning		SSPC-SP6 Commercial Blast Cleaning	
1st Coat	91H20	2.5 – 3.5	Corothane I Galvapac NSF	2.5 – 3.5	Carbozinc 859	2.0 – 3.0
2nd Coat	N69 High-Build Epoxoline	4.0 – 6.0	Macropoxy 646	4.0 – 6.0	Carboguard 893 SG	4.0 – 6.0
3rd Coat	N69 High-Build Epoxoline	2.0 – 3.0	Macropoxy 646	2.0 – 3.0	Carboguard 893 SG	2.0 – 3.0

3. Immersion, Potable or Non-Potable Water

	Tnemec	Dry Mils	Sherwin Williams	Dry Mils	Carboline	Dry Mils
Surface Prep	SSPC-SP10 Near-White Blast Cleaning		SSPC-SP10 Near-White Blast Cleaning		SSPC-SP10 Near-White Blast Cleaning	
1st Coat	N140	4.0 – 6.0	Macropoxy 646 PW	4.0 – 6.0	Carboguard 61	4.0 – 6.0
2nd Coat	N140	4.0 – 6.0	Macropoxy 646 PW	4.0 – 6.0	Carboguard 61	4.0 – 6.0
3rd Coat	N140	4.0 – 6.0	Macropoxy 646 PW	4.0 – 6.0	Carboguard 61	4.0 – 6.0

4. Factory Primed Interior (Refer to Piping Specifications)

	Tnemec	Dry Mils	Sherwin Williams	Dry Mils	Carboline	Dry Mils
Surface Prep	Surface Shall be Clean / Dry		Surface Shall be Clean / Dry		Surface Shall be Clean / Dry	
Touch up	N69 High-Build Epoxoline		Macropoxy 646		Carboguard 893 SG	
1st Coat	N69 High-Build Epoxoline	4.0 – 6.0	Macropoxy 646	4.0 – 6.0	Carboguard 893 SG	4.0 – 6.0
2nd Coat	N69 High-Build Epoxoline	4.0 – 6.0	Macropoxy 646	4.0 – 6.0	Carboguard 893 SG	4.0 – 6.0

5. Factory Primed, Exterior (Refer to Piping Specifications)

	Tnemec	Dry Mils	Sherwin Williams	Dry Mils	Carboline	Dry Mils
Surface Prep	Surface Shall be Clean / Dry		Surface Shall be Clean / Dry		Surface Shall be Clean / Dry	
Touch up	N69 Hi-Build Epoxoline		Macropoxy 646		Carboguard 893 SG	
1st Coat	N69 Hi-Build Epoxoline	4.0 – 6.0	Macropoxy 646	4.0 – 6.0	Carboguard 893 SG	4.0 – 6.0
2nd Coat	1074 Endura -Shield	2.0 – 3.0	Acrolon 218 HS, B65 Series	2.0 – 3.0	Carbothane 134 HG	2.0 – 3.0

6. Primed Steel (Doors, Frames, etc.) - Exterior

	Tnemec	Dry Mils	Sherwin Williams	Dry Mils	Carboline	Dry Mils
Surface Prep	Surface Shall be Clean / Dry		Surface Shall be Clean / Dry		Surface Shall be Clean / Dry	
Touch-up	N69 High-Build Epoxoline		Macropoxy 646		Carboguard 893 SG	
1st Coat	N 69 High-Build Epoxoline	4.0 – 6.0	Macropoxy 646	2.0 – 3.0	Carboguard 893 SG	4.0 – 6.0
2nd Coat	1074 Endura -Shield	2.0 – 3.0	Acrolon 218 HS	2.0 – 3.0	Carbothane 134 HG	2.0 – 3.0

7. Buried

	Tnemec	Dry Mils	Sherwin Williams	Dry Mils	Carboline	Dry Mils
Surface Prep	SSPC-SP6 Commercial Blast Cleaning		SSPC-SP6 Commercial Blast Cleaning		SSPC-SP6 Commercial Blast Cleaning	
1st Coat	Hi-Build Tnemec-Tar	16.0 – 20.0	Hi-Mil Sher-Tar Epoxy	16.0 – 24.0	Bitumastic 300M	16.0 – 24.0

B. Galvanized Steel - Pipe and Miscellaneous Fabrications

1. Exterior, Non-Immersion

	Tnemec	Dry Mils	Sherwin Williams	Dry Mils	Carboline	Dry Mils
Surface Prep	SSPC-SP1 Solvent Cleaning		SSPC-SP1 Solvent Cleaning		SSPC-SP1 Solvent Cleaning	
1st Coat	N69 Hi-Build Epoxoline	4.0 – 6.0	Macropoxy 646	2.0 – 3.0	Carboguard 893 SG	4.0 – 6.0
2nd Coat	1074 Endura -Shield	2.0 – 3.0	Acrolon 218 HS	2.0 – 3.0	Carbothane 134 HG	2.0 – 3.0

2. Interior, Non-Immersion (Doors, Frames, etc.)

	Tnemec	Dry Mils	Sherwin Williams	Dry Mils	Carboline	Dry Mils
Surface Prep	SSPC-SP1 Solvent Cleaning		SSPC-SP1 Solvent Cleaning		SSPC-SP1 Solvent Cleaning	
1st Coat	N69 Hi-Build Epoxoline	4.0 – 6.0	Macropoxy 646	2.0 – 3.0	Carboguard 893 SG	4.0 – 6.0
2nd Coat	N69 Hi-Build Epoxoline	4.0 – 6.0	Macropoxy 646	2.0 – 3.0	Carboguard 893 SG	2.0 – 3.0

3. Immersion, Potable or Non-Potable Water

	Tnemec	Dry Mils	Sherwin Williams	Dry Mils	Carboline	Dry Mils
Surface Prep	SSPC-SP16 Brush-Off Blast Cleaning		SSPC-SP16 Brush-Off Blast Cleaning		SSPC-SP16 Brush-Off Blast Cleaning	
1st Coat	20-1255 Potapox	4.0 – 6.0	Macropoxy 646 NSF	4.0 – 6.0	Carboguard 61	4.0 – 6.0
2nd Coat	20-11 WH Potapox	4.0 – 6.0	Macropoxy 646 NSF	4.0 – 6.0	Carboguard 61	4.0 – 6.0

C. Porous Masonry - Concrete Masonry Units

1. Interior

	Tnemec	Dry Mils	Sherwin Williams	Dry Mils	Carboline	Dry Mils
Surface Prep	Surface Shall be Clean / Dry		Surface Shall be Clean / Dry		Surface Shall be Clean / Dry	
1st Coat	130 Envirofill (Spray and Back Roll to Fill Porosity)	80 - 100 sf/gal.	Pro-Industrial Hi-Bild Waterbased Catalyzed Epoxy	80-100 sf/gal	Carboline Sanitile 100	80 - 100 sf/gal
2nd Coat	113 H.B. Tneme-Tufcoat	2.0 – 3.0	Pro-Industrial Hi-Bild Waterbased Catalyzed Epoxy	2.0–3.0	Sanitile 255	2.0 – 3.0
3rd Coat	113 H.B. Tneme-Tufcoat	2.0 – 3.0	Pro-Industrial Hi-Bild Waterbased Catalyzed Epoxy	2.0–3.0	Sanitile 255	2.0 – 3.0

2. Exterior

	Tnemec	Dry Mils	Sherwin Williams	Dry Mils	Carboline	Dry Mils
Surface Prep	Surface Shall be Clean / Dry		Surface Shall be Clean / Dry		Surface Shall be Clean / Dry	
1st Coat	Series 156 Enviro-Crete	6.0 – 8.0*	Loxon XP	6.0-8.0*	Flexxide Elastomer	6.0 - 8.0*
2nd Coat	Series 156 Enviro-Crete	6.0 – 8.0*	Loxon XP	6.0-8.0*	Flexxide Elastomer	6.0 – 8.0*

*Coats must be sufficient to fill the porosity of the block face and create a pinhole-free surface.

D. Cast-In-Place Concrete

1. Concrete Walls & Precast Concrete Ceilings (Interior)

	Tnemec	Dry Mils	Sherwin Williams	Dry Mils	Carboline	Dry Mils
Surface Prep	SSPC-SP13 Abrasive Blast		SSPC-SP13 Abrasive Blast		SSPC-SP13 Abrasive Blast	
1st Coat	113 H.B. Tneme Tuf-coat	4.0–6.0	Pro-Industrial Hi-Bild Waterbased Catalyzed Epoxy	4.0 – 6.0	Sanitile 255	2.0 – 3.0
2nd Coat	113 H.B. Tneme Tuf-coat	4.0–6.0	Pro-Industrial Hi-Bild Waterbased Catalyzed Epoxy	4.0 – 6.0	Sanitile 255	2.0 – 3.0

2. Concrete Walls, Exterior & Non-Potable

	Tnemec	Dry Mils	Sherwin Williams	Dry Mils	Carboline	Dry Mils
Surface Prep	Surface Shall be Clean / Dry		Surface Shall be Clean / Dry		Surface Shall be Clean / Dry	
1st Coat	Series 156 Enviro-Crete	125 sf/gal	Loxon Masonry Primer	125 sf/gal	Flexxide Elastomere	125 sf/gal
2nd Coat	Series 156 Enviro-Crete	200 sf/gal	Loxon Masonry Coating	200 sf/gal	Flexxide Elastomere	200 sf/gal

3. Concrete Floors (Where noted on the drawings or specified)

	Tnemec	Dry Mils	Sherwin Williams	Dry Mils	Carboline	Dry Mils
Surface Prep	SSPC-SP13, Severe Service Abrasive Blast		SSPC-SP13, Severe Service Abrasive Blast		SSPC-SP13, Severe Service Abrasive Blast	
1st Coat	N 66 Epoxoline	3.0 – 5.0	Macropoxy 646	3.0 – 5.0	Carboguard 60	4.0 – 6.0
2nd Coat	N 66 Epoxoline	4.0 – 6.0	Macropoxy 646	4.0 – 6.0	Carboguard 60	4.0 – 6.0
3rd Coat	N 66 Epoxoline	4.0 – 6.0	Macropoxy 646	4.0 – 6.0	Carboguard 60	4.0 – 6.0

4. Concrete Tanks & Basins

	Tnemec	Dry Mils	Sherwin Williams	Dry Mils	Carboline	Dry Mils
Surface Prep	SSPC-SP13, Severe Service Abrasive Blast		SSPC-SP13, Severe Service Abrasive Blast		SSPC-SP13, Severe Service Abrasive Blast	
1st Coat	N140	4.0 – 6.0	Macropoxy 646 PW	4.0 – 6.0	Carboguard 61	4.0 – 6.0
2nd Coat	N140	4.0 – 6.0	Macropoxy 646PW	4.0 – 6.0	Carboguard 61	4.0 – 6.0
3rd Coat	N140	4.0 – 6.0	Macropoxy 646PW	4.0 – 6.0	Carboguard 61	4.0 – 6.0

5. a. Chemical Containment Areas – Acid Exposure

	Tnemec	Dry Mils	Sherwin Williams	Dry Mils	Carboline	Dry Mils
Surface Prep	SSPC-SP13, Severe Service Abrasive Blast		SSPC-SP13, Severe Service Abrasive Blast		SSPC-SP13, Severe Service Abrasive Blast	
1st Coat	Series 120-5002 Vinyl Ester	12 – 18	CoroBond Vinyl Ester Primer	3.5 – 4.0	Semstone 800	8.0 – 10.0
2nd Coat	Series 120-5002 Vinyl Ester	12 - 18	CorCote VEN FF	15.0 – 20.0	Semstone 870 (aggregate-filled)	25.0 – 30.0
3rd Coat			CorCote VEN FF with Wax Solution	15.0 – 20.0	Semstone 870	15.0 – 20.0

5. b. Chemical Containment Areas - Other

	Tnemec	Dry Mils	Sherwin Williams	Dry Mils	Carboline	Dry Mils
Surface Prep	SSPC-SP13, Severe Service Abrasive Blast		SSPC-SP13, Severe Service Abrasive Blast		SSPC-SP13, Severe Service Abrasive Blast	
1st Coat	201 Epoxoprime	6.0 – 8.0	CoroBond 100	6.0 – 8.0	Semstone 110	8.0 – 10.0
2nd Coat	275 Stranlock	25.0 – 40.0	CorCote HCR Flake-Filled	15.0 – 20.0	Semstone 145 SL	25 mils (Broadcast Silica)
3rd Coat	282 Tneme-Glaze	8.0 – 12.0	CorCote HCR	15.0 – 20.0	Semstone 145 SL	15.0 – 25.0

E. Wood - Interior or Exterior

	Tnemec	Dry Mils	Sherwin Williams	Dry Mils	Carboline	Dry Mils
Surface Prep	Surface Shall be Clean / Dry		Surface Shall be Clean / Dry		Surface Shall be Clean / Dry	
1st Coat	151-1051 Elasto-Grip FC	1.0 – 1.5	Multi-Purpose Latex Primer	1.0 – 1.5	Carbocrylic 120	1.0 – 2.0
2nd Coat	1029 Tufcryl	2.0-3.0 - 3.5	DTM Acrylic Coating	2.0 – 3.0	Carbocrylic 3359 DTM	2.0 – 3.0
3rd Coat	1029 Tufcryl	2.0 – 3.0	DTM Acrylic Coating	2.0 – 3.0	Carbocrylic 3359 DTM	2.0 – 3.0

F. Insulated Pipe

	Tnemec	Dry Mils	Sherwin Williams	Dry Mils	Carboline	Dry Mils
Surface Prep	Surface Shall be Clean / Dry		Surface Shall be Clean / Dry		Surface Shall be Clean / Dry	
1st Coat	1029Tneme-Cryl	2.0 – 3.0	DTM Primer/Finish, B66W1	2.0 – 3.0	Carbocrylic 120	1.0 – 2.0
2nd Coat	1029 Tneme-Cryl	2.0 – 3.0	DTM Primer/Finish, B66W1	2.0 – 3.0	Carbocrylic 3359 DTM	2.0 – 3.0

G. Gypsum Board

1. Interior Drywall - Architectural

	Tnemec	Dry Mils	Sherwin Williams	Dry Mils	Carboline	Dry Mils
Surface Prep	Surface Shall be Clean / Dry		Surface Shall be Clean / Dry		Surface Shall be Clean / Dry	
1st Coat	151-1051 Elasto-Grip FC	1.0 – 1.5	PrepRite 200 Printer	1.0 – 1.5	Carbocrylic 120	1.0 – 2.0
2nd Coat	6-Color Tneme-Cryl	2.0 – 3.0	ProMar 200 F, SF, EgShel	1.0 – 1.5	Carbocrylic 3359 DTM	2.0 – 3.0

2. Interior Drywall - Severe Exposure

	Tnemec	Dry Mils	Sherwin Williams	Dry Mils	Carboline	Dry Mils
Surface Prep	Surface Shall be Clean / Dry		Surface Shall be Clean / Dry		Surface Shall be Clean / Dry	
Prime Coat	151-1051 Elasto-Grip FC	1.0 – 1.5	PrepRite 200 Primer	1.0 – 1.5	Sanitile 120	1.0 – 2.0
1st Coat	113 H.B. Tneme-Tufcoat	2.0 – 3.0	Pro-Industrial Hi-Bild Waterbased Catalyzed Epoxy	2.0 – 3.0	Carboline Sanitile 255	2.0 – 3.0
2nd Coat	113 H.B. Tneme-Tufcoat	2.0 – 3.0	Pro-Industrial Hi-Bild Waterbased Catalyzed Epoxy	2.0 – 3.0	Carboline Sanitile 255	2.0 – 3.0

H. PVC Piping – See color coding below.

I. Aluminum Windows, Doors, Handrails & Grating – Do Not Paint

J. Fiberglass Reinforced Plastic Doors & Windows, Handrails & Grating – Do Not Paint

K. FRP panels, stainless steel panels, and instruments shall not be painted.

3.08 PIPING COLOR CODE

A. To facilitate identification of piping in plants and pumping stations it is recommended that the following color scheme be utilized:

WATER LINES

Raw Water	Olive Green
Settled Water	Light Blue
Filtered, Finished or Potable Water	Dark Blue

CHEMICAL LINES

Alum or Primary Coagulant (PACl)	Orange w/ green band
Ammonia	White
Carbon Slurry	Black
Caustic	Yellow w/ green band
Chlorine	Yellow
Copper Sulfate	Black w/ blue band
Corrosion Inhibitor (K-5)	Light green w/ red band
Lime Slurry	Light Green
Ferric Sulfate	Orange w/ black band

Fluoride	Light Blue w/ red band
Polymers or Coagulant Aid	Orange
Potassium Permanganate	Violet
Soda Ash	Light Green w/ orange band
Sodium Hypochlorite	Yellow w/ red band
Sulfur Dioxide	Light Green w/ yellow band
Other Chemical Lines	Yellow (stenciled as directed by CCA)

WASTE LINES

Backwash Waste	Light Brown
Sewer (Sanitary or Other)	Dark Gray
Sludge	Dark Brown

OTHER

Compressed Air	Dark Green
Gas	Red
Other Lines	Light Gray
Electrical Conduits & Junction Boxes	Orange (stenciled as directed by CCA)

- B. All banding to be 2-inches wide and four feet on center.
- C. Sample, drain, vent, metering, blowoff, decant, hot lines and all other pumps and equipment shall be painted the same color combination as the piping system from which the line originates unless specified otherwise above. The additional pertinent text shall be applied to the pipe.
- D. Insulated pipe, jacketed with canvas, shall be painted with the color combination specified above.
- E. Insulated pipe, jacketed with aluminum and/or stainless steel shall have the jacket unpainted. When valves and fittings for such lines are not insulated, the valves and fittings shall be color coded.
- F. Building service lines such as plumbing lines, HVAC lines, and electrical conduit, shall not be color coded but shall be painted the same color as the background construction as directed CCA.

3.09 STENCILING

- A. The Contractor shall supply all materials and labor necessary for stenciling of legends on pipes. The legend shall show the name of the contents. Review by the CCA of legends will be required. Names shall be "plainly visible" in all capital letters of approved size and type. Arrows showing direction of flow shall also be stenciled on pipes. The legends shall be applied on piping on every run and

located not more than 8 feet apart and, in general, at each valve and piece of equipment. The size and location of the legend shall be in general accordance with ANSI A13.1-1981 "Scheme for the Identification of Piping Systems". All visible piping 6" in diameter and larger shall be color-coded and stenciled. "Stick-on" labels are not acceptable.

- B. Text shall be applied on piping in the middle of pipe runs for runs under 50 feet or in one room, whichever is the least distance. On runs greater than 50 feet, text shall be applied at third points in the run and no more than 35 feet apart.

3.10 PLASTIC IDENTIFICATION MARKERS

- A. All visible piping 3/4" and greater and less than 6" which is accessible for maintenance operations shall be color-coded and identified with semi-rigid plastic identification markers equal to SETMARK Pipe Markers as manufactured by Seton Name Plate Corporation, New Haven, Conn.; T & B/Westline, Los Angeles, California; or equal. Direction of flow arrows are to be included on each marker, unless otherwise specified.
- B. Each marker background is to be appropriately color coded with a clearly printed legend to identify the contents of the pipe in conformance with the "Scheme for the Identification of Piping Systems" (ANSI A 13.1 - 1981).
- C. For pipes under 3/4" O.D. (too small for color bands and legends), brass identification tags 1-1/2" in diameter with depressed 1/4" high black-filled letters above 1/3" blackfilled numbers shall be fastened securely at specified locations.
- D. All electrical conduits, which are accessible for maintenance operations, shall be identified with semi-rigid identification markers similar to those specified above.
- E. Each marker background is to be color-coded with a clearly printed legend to identify the conductor. Size of markers and sizes of lettering to generally conform with the "Scheme for Identification of Piping Systems" (ANSI A 13.1 - 1981)
- F. Locations for pipe and electrical markers to be as follows:
 - 1. Adjacent to each valve and fitting (except on plumbing fixtures and equipment).
 - 2. At each branch and riser take-off.
 - 3. At each pipe passage through wall, floor and ceiling construction.
 - 4. At each pipe passage to underground.
 - 5. On all horizontal pipe runs-marked every 25 feet.

3.11 PAINT SCHEDULE

All items at the Project site shall be painted in accordance with these Specifications and Drawings. The following paint schedule is provided only to assist the Owner and

Contractor in selection of the appropriate paint system and is not intended to be a complete list of items to be painted.

A. Paint Application Schedule

	<u>Location and/or Description</u>	<u>System</u>
1.	Existing Chemical Feed Building	
a.	Block Walls.....	C.1
b.	Drywall Ceiling.....	G.2
c.	Doors and Frames, Exterior.....	A.6
d.	Doors and Frames, Interior.....	B.2
e.	Equipment.....	A
2.	Existing Filter & Administration Building	
a.	Block Walls.....	C.1
b.	Drywall Walls.....	G.2
c.	Door and Frames, Exterior.....	A.6
d.	Doors and Frames, Interior.....	B.2
e.	Cast-In-Place Concrete.....	D
f.	Equipment & Piping.....	A
3.	PT/GAC Building	
a.	Block Walls.....	Do Not Paint
b.	Miscellaneous Steel.....	A.2
c.	Doors and Frames, Exterior.....	A.6
d.	Doors and Frames, Interior.....	B.2
e.	Equipment.....	A
f.	Cast-In-Place Concrete.....	Do Not Paint
4.	GAC Feed Pump Station	
a.	Block Walls.....	Do Not Paint
b.	Doors and Frames, Exterior.....	A.6
c.	Doors and Frames, Interior.....	B.2
d.	Equipment.....	A
e.	Cast-In-Place Concrete.....	Do Not Paint

++ END OF SECTION ++

SECTION 10200

LOUVERS AND VENTS

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. Fixed, extruded-aluminum louvers.
 - 2. Adjustable, extruded-aluminum louvers.
 - 3. Wall vents (brick vents).
- B. Related Sections:
 - 1. Section 04810 "Unit Masonry Assemblies" for building wall vents (brick vents) into masonry.
 - 2. Section 08110 "Steel Doors and Frames" for louvers in hollow-metal doors.
 - 3. Section 08211 "Flush Wood Doors" for louvers in flush wood doors.
 - 4. Section 09911 "Exterior Painting" for field painting louvers.
 - 5. Section 15900 "HVAC Instrumentation and Controls" for electric, electronic, and pneumatic control of adjustable louvers.

1.3 DEFINITIONS

- A. Louver Terminology: Definitions of terms for metal louvers contained in AMCA 501 apply to this Section unless otherwise defined in this Section or in referenced standards.
- B. Horizontal Louver: Louver with horizontal blades; i.e., the axes of the blades are horizontal.
- C. Vertical Louver: Louver with vertical blades; i.e., the axes of the blades are vertical.
- D. Drainable-Blade Louver: Louver with blades having gutters that collect water and drain it to channels in jambs and mullions, which carry it to bottom of unit and away from opening.

- E. Storm-Resistant Louver: Louver that provides specified wind-driven rain performance, as determined by testing according to AMCA 500-L.

1.4 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Design louvers, including comprehensive engineering analysis by a qualified professional engineer, using structural[and seismic] performance requirements and design criteria indicated.
- B. Structural Performance: Louvers shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated without permanent deformation of louver components, noise or metal fatigue caused by louver blade rattle or flutter, or permanent damage to fasteners and anchors. Wind pressures shall be considered to act normal to the face of the building.
 - 1. See structural Drawings for more detail.
- C. Seismic Performance: See Structural Drawings.
- D. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes, without buckling, opening of joints, overstressing of components, failure of connections, or other detrimental effects.
 - 1. Temperature Change (Range): 120 deg F (67 deg C) material surfaces.
- E. Louver Performance Ratings: Provide louvers complying with requirements specified, as demonstrated by testing manufacturer's stock units identical to those provided, except for length and width according to AMCA 500-L.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
 - 1. For louvers specified to bear AMCA seal, include printed catalog pages showing specified models with appropriate AMCA Certified Ratings Seals.
- B. Shop Drawings: For louvers and accessories. Include plans, elevations, sections, details, and attachments to other work. Show frame profiles and blade profiles, angles, and spacing.
 - 1. Show weep paths, gaskets, flashing, sealant, and other means of preventing water intrusion.
 - 2. Show mullion profiles and locations.
 - 3. Wiring Diagrams: For power, signal, and control wiring for motorized adjustable louvers.

4. Color chart for initial selection of units with factory applied color finishes.

1.6 INFORMATIONAL SUBMITTALS

- A. Product Test Reports: Based on evaluation of comprehensive tests performed according to AMCA 500-L by a qualified testing agency or by manufacturer and witnessed by a qualified testing agency, for each type of louver and showing compliance with performance requirements specified.

1.7 QUALITY ASSURANCE

- A. Source Limitations: Obtain louvers and vents from single source from a single manufacturer where indicated to be of same type, design, or factory-applied color finish.
- B. Welding: Qualify procedures and personnel according to the following:
 1. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum."
 2. AWS D1.3, "Structural Welding Code - Sheet Steel."
 3. AWS D1.6, "Structural Welding Code - Stainless Steel."
- C. SMACNA Standard: Comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" for fabrication, construction details, and installation procedures.
- D. UL and NEMA Compliance: Provide motors and related components for motor-operated louvers that are listed and labeled by UL and comply with applicable NEMA standards.

1.8 PROJECT CONDITIONS

- A. Field Measurements: Verify actual dimensions of openings by field measurements before fabrication.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Aluminum Extrusions: ASTM B 221 (ASTM B 221M), Alloy 6063-T5, T-52, or T6.
- B. Aluminum Sheet: ASTM B 209 (ASTM B 209M), Alloy 3003 or 5005 with temper as required for forming, or as otherwise recommended by metal producer for required finish.
- C. Aluminum Castings: ASTM B 26/B 26M, Alloy 319.

- D. Galvanized-Steel Sheet: ASTM A 653/A 653M, G90 (Z275) zinc coating, mill phosphatized.
- E. Fasteners: Use types and sizes to suit unit installation conditions.
 - 1. Use Phillips flat-head screws for exposed fasteners unless otherwise indicated.
 - 2. For fastening aluminum, use 300 series stainless-steel fasteners.
 - 3. For fastening galvanized steel, use 300 series stainless-steel fasteners.
 - 4. For color-finished louvers, use fasteners with heads that match color of louvers.
- F. Postinstalled Fasteners for Concrete and Masonry: Torque-controlled expansion anchors, made from stainless-steel components, with capability to sustain, without failure, a load equal to 4 times the loads imposed, for concrete, or 6 times the load imposed, for masonry, as determined by testing per ASTM E 488, conducted by a qualified independent testing agency.
- G. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.

2.2 FABRICATION, GENERAL

- A. Assemble louvers in factory to minimize field splicing and assembly. Disassemble units as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.
- B. Vertical Assemblies: Where height of louver units exceeds fabrication and handling limitations, fabricate units to permit field-bolted assembly with close-fitting joints in jambs and mullions, reinforced with splice plates.
 - 1. Continuous Vertical Assemblies: Fabricate units without interrupting blade-spacing pattern unless horizontal mullions are indicated.
 - 2. Horizontal Mullions: Provide horizontal mullions at joints.
- C. Maintain equal louver blade spacing[, including separation between blades and frames at head and sill,] to produce uniform appearance.
- D. Fabricate frames, including integral sills, to fit in openings of sizes indicated, with allowances made for fabrication and installation tolerances, adjoining material tolerances, and perimeter sealant joints.
 - 1. Frame Type: Channel unless otherwise indicated.
- E. Include supports, anchorages, and accessories required for complete assembly.

- F. Provide vertical mullions of type and at spacings indicated, but not more than recommended by manufacturer, or 72 inches (1830 mm) o.c., whichever is less.
1. Fully Recessed Mullions: Where indicated, provide mullions fully recessed behind louver blades. Where length of louver exceeds fabrication and handling limitations, fabricate with close-fitting blade splices designed to permit expansion and contraction.
 2. Semirecessed Mullions: Where indicated, provide mullions partly recessed behind louver blades so louver blades appear continuous. Where length of louver exceeds fabrication and handling limitations, fabricate with interlocking split mullions and close-fitting blade splices designed to permit expansion and contraction.
 3. Exposed Mullions: Where indicated, provide units with exposed mullions of same width and depth as louver frame. Where length of louver exceeds fabrication and handling limitations, provide interlocking split mullions designed to permit expansion and contraction.
 4. Exterior Corners: Prefabricated corner units with mitered and welded blades and with fully recessed mullions at corners.
- G. Provide subsills made of same material as louvers for recessed louvers.
- H. Join frame members to each other and to fixed louver blades with fillet welds, threaded fasteners, or both, as standard with louver manufacturer unless otherwise indicated or size of louver assembly makes bolted connections between frame members necessary.

2.3 FIXED, EXTRUDED-ALUMINUM LOUVERS

- A. Horizontal, Drainable-Blade Louver:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Air Balance Inc.; a Mestek company.
 - b. Airolite Company, LLC (The)).
 - c. American Warming and Ventilating, Inc.; a Mestek company.
 - d. Carnes Company, Inc.
 - e. Cesco Products; a division of Mestek, Inc.
 - f. Construction Specialties, Inc.
 - g. Greenheck Fan Corporation.
 - h. Metal Form Manufacturing Inc.
 - i. Ruskin Company; Tomkins PLC.
 2. Louver Depth: 6 inches (150 mm).
 3. Frame and Blade Nominal Thickness: Not less than 0.080 inch (2.03 mm) for blades and 0.080 inch (2.03 mm) for frames.
 4. Mullion Type: Exposed.

5. Louver Performance Ratings: See Louver schedule.
6. AMCA Seal: Mark units with AMCA Certified Ratings Seal.

2.4 ADJUSTABLE, EXTRUDED-ALUMINUM LOUVERS

- A. Louver Construction and Operation: Provide adjustable louvers with extruded-aluminum frames and blades not less than 0.080-inch (2.03-mm) nominal thickness, and with operating mechanisms to suit louver sizes.
 1. Motor operation with 2-position, spring-return application (with power on, motor opens louver; with power off, spring closes louver); 110-V, 60-Hz motor and limit switch; equipped with frame-mounted switch.
- B. Single-Blade, Adjustable Louver:
 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Air Balance Inc.; a Mestek company.
 - b. Airolite Company, LLC (The).
 - c. American Warming and Ventilating, Inc.; a Mestek company.
 - d. Carnes Company, Inc.
 - e. Cesco Products; a division of Mestek, Inc.
 - f. Construction Specialties, Inc.
 - g. Greenheck Fan Corporation.
 - h. Reliable Products, Inc.
 - i. Ruskin Company; Tomkins PLC.
 2. Louver Depth: 6 inches (150 mm).
 3. Blade Type: Drainable.
 4. Accessories: Equip louvers as follows:
 - a. Vinyl blade-edge gaskets for each louver blade.
 5. Louver Performance Ratings: See Louver schedule.
 6. AMCA Seal: Mark units with AMCA Certified Ratings Seal.

2.5 BLANK-OFF PANELS

- A. Uninsulated, Blank-Off Panels: Metal sheet attached to back of louver.
 1. Aluminum sheet for aluminum louvers, not less than 0.050-inch (1.27-mm) nominal thickness.
 2. Galvanized-steel sheet for galvanized-steel louvers, not less than 0.040-inch (1.02-mm) nominal thickness.
 3. Panel Finish: Same finish applied to louvers.
 4. Attach blank-off panels with sheet metal screws.
- B. Insulated, Blank-Off Panels: Laminated panels consisting of insulating core surfaced on back and front with metal sheets and attached to back of louver.
 1. Thickness: 2 inches (50 mm).

2. Metal Facing Sheets: Aluminum sheet, not less than 0.032-inch (0.81-mm) nominal thickness.
3. Metal Facing Sheets: Galvanized-steel sheet, not less than 0.028-inch (0.71-mm) nominal thickness.
4. Insulating Core: extruded-polystyrene foam.
5. Edge Treatment: Trim perimeter edges of blank-off panels with louver manufacturer's standard extruded-aluminum-channel frames, not less than 0.080-inch (2.03-mm) nominal thickness, with corners mitered and with same finish as panels.
6. Seal perimeter joints between panel faces and louver frames with gaskets or sealant.
7. Panel Finish: Same finish applied to louvers.
8. Attach blank-off panels with sheet metal screws.

2.6 WALL VENTS (BRICK VENTS)

- A. Cast-Aluminum Wall Vents:
 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Airolite Company, LLC (The).
 - b. Greenheck Fan Corporation.
 - c. Hohmann & Barnard, Inc.
 - d. Ruskin Company; Tomkins PLC.
 - e. Sunvent Industries; Division of Sylro Sales Corp.
 2. One-piece, cast-aluminum louvers and frames; with 18-by-14- (1.4-by-1.8-mm-) mesh, aluminum insect screening on inside face; incorporating integral waterstop on inside edge of sill; of load-bearing design and construction.
 3. Dampers: Aluminum blades and frames mounted on inside of wall vents; operated from exterior with Allen wrench in socket-head cap screw. Fabricate operating mechanism from Type 304 stainless-steel components.
 4. Finish: Mill finish.

2.7 FINISHES, GENERAL

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

2.8 ALUMINUM FINISHES

- A. Finish louvers after assembly.
- B. Clear Anodic Finish: AAMA 611, AA-M12C22A41, Class I, 0.018 mm or thicker.

- C. Color Anodic Finish: AAMA 611, AA-M12C22A42/A44, Class I, 0.018 mm or thicker.
 - 1. Color: As selected by Architect from full range of industry colors and color densities.

- D. High-Performance Organic Finish: 2-coat fluoropolymer finish complying with AAMA 2604 and containing not less than 50 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
 - 1. Color and Gloss: As selected by Architect from manufacturer's full range.

2.9 GALVANIZED-STEEL SHEET FINISHES

- A. Finish louvers after assembly.

- B. Surface Preparation: Clean surfaces with nonpetroleum solvent so surfaces are free of oil and other contaminants. After cleaning, apply a conversion coating suited to the organic coating to be applied over it. Clean welds, mechanical connections, and abraded areas and repair according to ASTM A 780.

- C. Baked-Enamel or Powder-Coat Finish: Immediately after cleaning and pretreating, apply manufacturer's standard 2-coat, baked-on finish consisting of prime coat and thermosetting topcoat, with a minimum dry film thickness of 1 mil (0.025 mm) for topcoat. Comply with coating manufacturer's written instructions for applying and baking to achieve a minimum dry film thickness of 2 mils (0.05 mm).
 - 1. Color and Gloss: As selected by Architect from manufacturer's full range.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and openings, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance.

- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Coordinate setting drawings, diagrams, templates, instructions, and directions for installation of anchorages that are to be embedded in concrete or masonry construction. Coordinate delivery of such items to Project site.

3.3 INSTALLATION

- A. Locate and place louvers and vents level, plumb, and at indicated alignment with adjacent work.
- B. Use concealed anchorages where possible. Provide brass or lead washers fitted to screws where required to protect metal surfaces and to make a weathertight connection.
- C. Form closely fitted joints with exposed connections accurately located and secured.
- D. Provide perimeter reveals and openings of uniform width for sealants and joint fillers, as indicated.
- E. Repair finishes damaged by cutting, welding, soldering, and grinding. Restore finishes so no evidence remains of corrective work. Return items that cannot be refinished in the field to the factory, make required alterations, and refinish entire unit or provide new units.
- F. Protect unpainted galvanized and nonferrous-metal surfaces that will be in contact with concrete, masonry, or dissimilar metals from corrosion and galvanic action by applying a heavy coating of bituminous paint or by separating surfaces with waterproof gaskets or nonmetallic flashing.
- G. Install concealed gaskets, flashings, joint fillers, and insulation as louver installation progresses, where weathertight louver joints are required. Comply with Section 07920 "Joint Sealants" for sealants applied during louver installation.

3.4 ADJUSTING AND CLEANING

- A. Test operation of adjustable louvers and adjust as needed to produce fully functioning units that comply with requirements.
- B. Clean exposed surfaces of louvers and vents that are not protected by temporary covering, to remove fingerprints and soil during construction period. Do not let soil accumulate during construction period.
- C. Before final inspection, clean exposed surfaces with water and a mild soap or detergent not harmful to finishes. Thoroughly rinse surfaces and dry.

- D. Restore louvers and vents damaged during installation and construction so no evidence remains of corrective work. If results of restoration are unsuccessful, as determined by Architect, remove damaged units and replace with new units.
1. Touch up minor abrasions in finishes with air-dried coating that matches color and gloss of, and is compatible with, factory-applied finish coating.

+ + END OF SECTION + +

SECTION 10431

SIGNAGE

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Panel signs.

1.3 DEFINITIONS

- A. ADA-ABA Accessibility Guidelines: U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Architectural Barriers Act (ABA) Accessibility Guidelines."

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: Show fabrication and installation details for signs.
 - 1. Show sign mounting heights, locations of supplementary supports to be provided by others, and accessories.
 - 2. Provide message list, typestyles, graphic elements, including tactile characters and Braille, and layout for each sign.
- C. Samples for Initial Selection: Manufacturer's color charts consisting of actual units or sections of units showing the full range of colors available for the following:
 - 1. Aluminum.
 - 2. Acrylic sheet.
 - 3. Polycarbonate sheet.
 - 4. Fiberglass sheet.
 - 5. Die-cut vinyl characters and graphic symbols. Include representative samples of available typestyles and graphic symbols.
- D. Samples for Verification: For each of the following products and for the full range of color, texture, and sign material indicated, of sizes indicated:

1. One full size sign complete.

E. Sign Schedule: Use same designations indicated on Drawings.

1.5 INFORMATIONAL SUBMITTALS

A. Warranty: Special warranty specified in this Section.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For signs to include in maintenance manuals.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: Fabricator of products, an employer of workers trained and approved by manufacturer.

B. Fabricator Qualifications: Shop that employs skilled workers who custom-fabricate products similar to those required for this Project and whose products have a record of successful in-service performance.

C. Source Limitations for Signs: Obtain each sign type indicated from one source from a single manufacturer.

D. Regulatory Requirements: Comply with applicable provisions in ADA-ABA Accessibility Guidelines and ICC/ANSI A117.1.

E. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

1.8 PROJECT CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit installation of signs in exterior locations to be performed according to manufacturers' written instructions and warranty requirements.

B. Field Measurements: Verify recess openings by field measurements before fabrication and indicate measurements on Shop Drawings.

1.9 COORDINATION

A. Coordinate placement of anchorage devices with templates for installing signs.

1.10 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of signs that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Deterioration of metal and polymer finishes beyond normal weathering.
 - b. Deterioration of embedded graphic image colors and sign lamination.
 - 2. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Aluminum Castings: ASTM B 26/B 26M, of alloy and temper recommended by sign manufacturer for casting process used and for use and finish indicated.
- B. Aluminum Sheet and Plate: ASTM B 209 (ASTM B 209M), alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated, and with at least the strength and durability properties of Alloy 5005-H32.
- C. Aluminum Extrusions: ASTM B 221 (ASTM B 221M), alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated, and with at least the strength and durability properties of Alloy 6063-T5.
- D. Brass Castings: ASTM B 584, Alloy UNS No. C85200 (high-copper yellow brass).
- E. Brass, Yellow, Sheet: ASTM B 36/B 36M, Alloy UNS No. C26000.
- F. Bronze Castings: ASTM B 584, Alloy UNS No. C86500 (No. 1 manganese bronze).
- G. Bronze Plate: ASTM B 36/B 36M.
- H. Copper Sheet: ASTM B 152/B 152M.
- I. Steel:
 - 1. Galvanized Steel Sheet: ASTM A 653/A 653M, G90 (Z275) coating, either commercial or forming steel.
 - 2. Steel Sheet: Uncoated, cold-rolled, ASTM A 1008/A 1008M, commercial steel, Type B, exposed or electrolytic zinc-coated, ASTM A 591/A 591M, with steel sheet substrate complying with ASTM A 1008/A 1008M, commercial steel, exposed.

3. Stainless-Steel Sheet: ASTM A 240/A 240M or ASTM A 666, Type 304, 316, stretcher-leveled standard of flatness.
 4. Steel Members Fabricated from Plate or Bar Stock: ASTM A 529/A 529M or ASTM A 572/A 572M, 42,000-psi (290-MPa) minimum yield strength.
 5. For steel exposed to view on completion, provide materials having flat, smooth surfaces without blemishes. Do not use materials whose surfaces exhibit pitting, seam marks, roller marks, rolled trade names, or roughness.
- J. Fiberglass Sheet: Molded, seamless, thermosetting, glass-fiber-reinforced polyester panels with a minimum tensile strength of 15,000 psi (103 MPa) when tested according to ASTM D 638 and with a minimum flexural strength of 30,000 psi (207 MPa) when tested according to ASTM D 790.
- K. Acrylic Sheet: ASTM D 4802, Category A-1 (cell-cast sheet), Type UVA (UV absorbing).
- L. Polycarbonate Sheet: Of thickness indicated, manufactured by extrusion process, coated on both surfaces with abrasion-resistant coating:
1. Impact Resistance: 16 ft-lbf/in. (854 J/m) per ASTM D 256, Method A.
 2. Tensile Strength: 9000 lbf/sq. in. (62 MPa) per ASTM D 638.
 3. Flexural Modulus of Elasticity: 340,000 lbf/sq. in. (2345 MPa) per ASTM D 790.
 4. Heat Deflection: 265 deg F (129 deg C) at 264 lbf/sq. in. (1.82 MPa) per ASTM D 648.
 5. Abrasion Resistance: 1.5 percent maximum haze increase for 100 revolutions of a Taber abraser with a load of 500 g per ASTM D 1044.
- M. Applied Vinyl: Die-cut characters from vinyl film of nominal thickness of 3 mils (0.076 mm) with pressure-sensitive adhesive backing, suitable for exterior applications.

2.2 PANEL SIGNS

- 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:
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. ACE Sign Systems, Inc.
 2. Advance Corporation; Braille-Tac Division.
 3. Allen Industries Architectural Signage
 4. Allenite Signs; Allen Marking Products, Inc.
 5. APCO Graphics, Inc.
 6. ASI-Modulex, Inc.
 7. Best Sign Systems Inc.

8. Bunting Graphics, Inc.
 9. Fossil Industries, Inc.
 10. Gemini Incorporated.
 11. Grimco, Inc.
 12. Innerface Sign Systems, Inc.
 13. InPro Corporation
 14. Matthews International Corporation; Bronze Division.
 15. Mills Manufacturing Company.
 16. Mohawk Sign Systems.
 17. Nelson-Harkins Industries.
 18. Seton Identification Products.
 19. Signature Signs, Incorporated.
 20. Supersine Company (The)
 21. Equivalent by other manufacturer.
- C. Interior Panel Signs: Provide smooth sign panel surfaces constructed to remain flat under installed conditions within a tolerance of plus or minus 1/16 inch (1.5 mm) measured diagonally from corner to corner, complying with the following requirements:
1. Size: Minimum 8" x 8".
 2. Laminated, Etched Photopolymer: Raised graphics with Braille 1/32 inch (0.8 mm) above surface with contrasting colors as selected by Architect from manufacturer's full range and laminated to acrylic back.
 3. Edge Condition: Beveled.
 4. Corner Condition: Square.
 5. Mounting: Framed. Extruded aluminum mitred with concealed anchors and welded.
 - a. Wall mounted with concealed anchors.
 - b. Manufacturer's standard anchors for substrates encountered.
 6. Color: As selected by Architect from manufacturer's full range.
 7. Tactile Characters: Characters and Grade 2 Braille raised 1/32 inch (0.8 mm) above surface with contrasting colors.
- D. Panel Sign Frames:
1. Extruded-Aluminum Frames: Mitered with concealed anchors and welded.
 - a. Color: As selected by Architect from manufacturer's full range.
 - b. Depth: 1/2".
 - c. Profile: Square.
 - d. Corner Condition: Square.
 - e. Mounting:
 - 1) Wall mounted with concealed anchors.
 - 2) Manufacturer's standard noncorroding anchors for substrates encountered.
- E. Tactile and Braille Sign: Manufacturer's standard process for producing text and symbols complying with ADA-ABA Accessibility Guidelines and with

ICC/ANSI A117.1. Text shall be accompanied by Grade 2 Braille. Produce precisely formed characters with square-cut edges free from burrs and cut marks; Braille dots with domed or rounded shape.

1. Panel Material: Photopolymer.
2. Raised-Copy Thickness: Not less than 1/32 inch (0.8 mm).

F. Engraved Copy: Machine engrave letters, numbers, symbols, and other graphic devices into panel sign on face indicated to produce precisely formed copy, incised to uniform depth.

1. Engraved Opaque Acrylic Sheet: Fill engraved copy with enamel.

G. Panel Sign Schedule:

1. Provide signage for each room.
 - a. Sign Size: 8" x 8".
 - b. Message Panel Material: As specified.
 - c. Message Panel Finish/Color: as selected by Owner.
 - d. Background Finish/Color: As selected by Owner.
 - e. Character Size: As required by ADA.
 - f. Character Finish/Color: As selected by Owner.
 - g. Panel Sign Frame Finish/Color: As selected by Owner.
 - h. Text/Message: Room name and number.
 - i. Location: At the latch side of each door at height required by the ADA.
 - j. Provide International pictogram at restroom signs in addition to other requirements.

2.3 ACCESSORIES

A. Anchors and Inserts: Provide nonferrous-metal or hot-dip galvanized anchors and inserts for exterior installations and elsewhere as required for corrosion resistance. Use toothed steel or lead expansion-bolt devices for drilled-in-place anchors. Furnish inserts, as required, to be set into concrete or masonry work.

2.4 FABRICATION

A. General: Provide manufacturer's standard signs of configurations indicated.

1. Welded Connections: Comply with AWS standards for recommended practices in shop welding. Provide welds behind finished surfaces without distortion or discoloration of exposed side. Clean exposed welded surfaces of welding flux and dress exposed and contact surfaces.
2. Mill joints to tight, hairline fit. Form joints exposed to weather to exclude water penetration.
3. Preassemble signs in the shop to greatest extent possible. Disassemble signs only as necessary for shipping and handling limitations. Clearly mark units for reassembly and installation, in location not exposed to view after final assembly.

4. Conceal fasteners if possible; otherwise, locate fasteners where they will be inconspicuous.

2.5 FINISHES, GENERAL

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.6 ALUMINUM FINISHES

- A. Clear Anodic Finish: Manufacturer's standard Class 1 clear anodic coating, 0.018 mm or thicker, over a satin (directionally textured) mechanical finish, complying with AAMA 611.

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 work.
- B. Verify that items, including anchor inserts, are sized and located to accommodate signs.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Locate signs and accessories where indicated, using mounting methods of types described and complying with manufacturer's written instructions.
 1. Install signs level, plumb, and at heights indicated, with sign surfaces free of distortion and other defects in appearance.
 2. Interior Wall Signs: Install signs on walls adjacent to latch side of door where applicable. Where not indicated or possible, such as double doors, install signs on nearest adjacent walls. Locate to allow approach within 3

inches (75 mm) of sign without encountering protruding objects or standing within swing of door.

- B. Wall-Mounted Signs: Comply with sign manufacturer's written instructions except where more stringent requirements apply.
 - 1. Two-Face Tape: Mount signs to smooth, nonporous surfaces. Do not use this method for vinyl-covered or rough surfaces.
 - 2. Hook-and-Loop Tapes: Mount signs to smooth, nonporous surfaces.
 - 3. Magnetic Tape: Mount signs to smooth, nonporous surfaces.
 - 4. Silicone-Adhesive Mounting: Attach signs to irregular, porous, or vinyl-covered surfaces.
 - 5. Shim Plate Mounting: Provide 1/8-inch- (3-mm-) thick, concealed aluminum shim plates with predrilled and countersunk holes, at locations indicated, and where other mounting methods are not practicable. Attach plate with fasteners and anchors suitable for secure attachment to substrate. Attach panel signs to plate using method specified above.
 - 6. Mechanical Fasteners: Use nonremovable mechanical fasteners placed through predrilled holes. Attach signs with fasteners and anchors suitable for secure attachment to substrate as recommended in writing by sign manufacturer.
 - 7. Signs Mounted on Glass: Provide matching opaque plate on opposite side of glass to conceal mounting materials.

- C. Bracket-Mounted Signs: Provide manufacturer's standard brackets, fittings, and hardware for mounting signs that project at right angles from walls and ceilings. Attach brackets and fittings securely to walls and ceilings with concealed fasteners and anchoring devices to comply with manufacturer's written instructions.

- D. Dimensional Characters: Mount characters using standard fastening methods to comply with manufacturer's written instructions for character form, type of mounting, wall construction, and condition of exposure indicated. Provide heavy paper template to establish character spacing and to locate holes for fasteners.
 - 1. Flush Mounting: Mount characters with backs in contact with wall surface.
 - 2. Projected Mounting: Mount characters at projection distance from wall surface indicated.

- E. Cast-Metal Plaques: Mount plaques using standard fastening methods to comply with manufacturer's written instructions for type of wall surface indicated.
 - 1. Concealed Mounting: Mount plaques by inserting threaded studs into tapped lugs on back of plaque. Set in predrilled holes filled with quick-setting cement.
 - 2. Face Mounting: Mount plaques using exposed fasteners with rosettes attached through face of plaque into wall surface.

3.3 CLEANING AND PROTECTION

- A. After installation, clean soiled sign surfaces according to manufacturer's written instructions. Protect signs from damage until acceptance by Owner.

++ END OF SECTION ++

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SECTION 10522

FIRE EXTINGUISHER CABINETS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Fire protection cabinets for the following:
 - a. Portable fire extinguishers.
- B. Related Sections:
 - 1. Division 10 Section "Fire Extinguishers."

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for fire protection cabinets.
 - 1. Fire Protection Cabinets: Include roughing-in dimensions, details showing mounting methods, relationships of box and trim to surrounding construction, door hardware, cabinet type, trim style, and panel style.
- B. Shop Drawings: For fire protection cabinets. Include plans, elevations, sections, details, and attachments to other work.
- C. Samples for Initial Selection: For each type of fire protection cabinet indicated.
- D. Samples for Verification: For each type of exposed finish required, prepared on Samples of size indicated below:
 - 1. Size: 6 by 6 inches (150 by 150 mm) square.
- E. Product Schedule: For fire protection cabinets. Coordinate final fire protection cabinet schedule with fire extinguisher schedule to ensure proper fit and function.

1.4 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For fire protection cabinets to include in maintenance manuals.

1.5 QUALITY ASSURANCE

- A. Fire-Rated, Fire Protection Cabinets: Listed and labeled to comply with requirements in ASTM E 814 for fire-resistance rating of walls where they are installed.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

1.6 COORDINATION

- A. Coordinate size of fire protection cabinets to ensure that type and capacity of fire extinguishers indicated are accommodated.
- B. Coordinate size of fire protection cabinets to ensure that type and capacity of fire hoses, hose valves, and hose racks indicated are accommodated.
- C. Coordinate sizes and locations of fire protection cabinets with wall depths.

1.7 SEQUENCING

- A. Apply decals and vinyl lettering on field-painted, fire protection cabinets after painting is complete.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B.
- B. Stainless-Steel Sheet: ASTM A 666, Type 304.
- C. Tempered Float Glass: ASTM C 1048, Kind FT, Condition A, Type I, Quality q3, 3 mm thick, [Class 1 (clear)] [Class 2 (tinted, heat absorbing, and light reducing), bronze tint].

2.2 FIRE PROTECTION CABINET

- A. Cabinet Type: Suitable for fire extinguisher.
 - 1. Products: Subject to compliance with requirements available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Fire End & Croker Corporation;

- b. J. L. Industries, Inc., a division of Activar Construction Products Group;
 - c. Kidde Residential and Commercial Division, Subsidiary of Kidde plc;
 - d. Larsen's Manufacturing Company;
 - e. Modern Metal Products, Division of Technico Inc.;
 - f. Moon-American;
 - g. Potter Roemer LLC;
 - h. Watrous Division, American Specialties, Inc.;
 - i. Equivalent by other manufacturer.
- B. Cabinet Construction: 1-hour fire rated.
- 1. Fire-Rated Cabinets: Construct fire-rated cabinets with double walls fabricated from 0.0428-inch- (1.1-mm-) thick, cold-rolled steel sheet lined with minimum 5/8-inch- (16-mm-) thick, fire-barrier material. Provide factory-drilled mounting holes.
- C. Cabinet Material: Stainless-steel sheet.
- 1. Shelf: Same metal and finish as cabinet.
- D. Semirecessed Cabinet: Cabinet box partially recessed in walls of sufficient depth to suit style of trim indicated; with one-piece combination trim and perimeter door frame overlapping surrounding wall surface with exposed trim face and wall return at outer edge (backbend). Provide where walls are of insufficient depth for recessed cabinets but are of sufficient depth to accommodate semirecessed cabinet installation.
- 1. Rolled-Edge Trim: 4-inch (102-mm) backbend depth.
- E. Cabinet Trim Material: Stainless-steel sheet.
- F. Door Material: Stainless-steel sheet.
- G. Door Style: Center glass panel with frame.
- H. Door Glazing: Tempered float glass (clear).
- I. Door Hardware: Manufacturer's standard door-operating hardware of proper type for cabinet type, trim style, and door material and style indicated.
- 1. Provide ADA compliant projecting door pull and friction latch.
 - 2. Provide concealed hinge permitting door to open 180 degrees.
- J. Accessories:
- 1. Identification: Lettering complying with authorities having jurisdiction for letter style, size, spacing, and location.
 - a. Identify fire extinguisher in fire protection cabinet with the words "FIRE EXTINGUISHER."
 - 1) Location: Applied to cabinet door.

- 2) Application Process: Engraved.
- 3) Lettering Color: Red.
- 4) Orientation: Horizontal.

K. Finishes:

1. Manufacturer's standard baked-enamel paint for the following:
 - a. Exterior of cabinet, door, and trim except for those surfaces indicated to receive another finish.
 - b. Interior of cabinet and door.
2. Stainless Steel: No. 4.

2.3 FABRICATION

- A. Fire Protection Cabinets: Provide manufacturer's standard box (tub) with trim, frame, door, and hardware to suit cabinet type, trim style, and door style indicated.
 1. Weld joints and grind smooth.
 2. Provide factory-drilled mounting holes.
 3. Prepare doors and frames to receive locks.
 4. Install door locks at factory.
- B. Cabinet Doors: Fabricate doors according to manufacturer's standards, from materials indicated and coordinated with cabinet types and trim styles selected.
 1. Fabricate door frames with tubular stiles and rails and hollow-metal design, minimum 1/2 inch (13 mm) thick.
 2. Fabricate door frames of one-piece construction with edges flanged.
 3. Miter and weld perimeter door frames.
- C. Cabinet Trim: Fabricate cabinet trim in one piece with corners mitered, welded, and ground smooth.

2.4 GENERAL FINISH REQUIREMENTS

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Protect mechanical finishes on exposed surfaces of fire protection cabinets from damage by applying a strippable, temporary protective covering before shipping.
- C. Finish fire protection cabinets after assembly.
- D. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.5 STAINLESS-STEEL FINISHES

- A. Surface Preparation: Remove tool and die marks and stretch lines, or blend into finish.
- B. Polished Finishes: Grind and polish surfaces to produce uniform finish, free of cross scratches.
 - 1. Run grain of directional finishes with long dimension of each piece.
 - 2. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.
 - 3. Directional Satin Finish: No. 4.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine walls and partitions for suitable framing depth and blocking where semi-recessed cabinets will be installed.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Prepare recesses for semirecessed fire protection cabinets as required by type and size of cabinet and trim style.

3.3 INSTALLATION

- A. General: Install fire protection cabinets in locations and at mounting heights indicated or, if not indicated, at heights acceptable to authorities having jurisdiction.
 - 1. Fire Protection Cabinets: Pull handle at 48 inches AFF.
- B. Fire Protection Cabinets: Fasten cabinets to structure, square and plumb.
 - 1. Unless otherwise indicated, provide recessed fire protection cabinets. If wall thickness is not adequate for recessed cabinets, provide semirecessed fire protection cabinets.
- C. Identification: Apply decals or vinyl lettering at locations indicated.

3.4 ADJUSTING AND CLEANING

- A. Remove temporary protective coverings and strippable films, if any, as fire protection cabinets are installed unless otherwise indicated in manufacturer's written installation instructions.

- B. Adjust fire protection cabinet doors to operate easily without binding. Verify that integral locking devices operate properly.
- C. On completion of fire protection cabinet installation, clean interior and exterior surfaces as recommended by manufacturer.
- D. Touch up marred finishes, or replace fire protection cabinets that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by fire protection cabinet and mounting bracket manufacturers.
- E. Replace fire protection cabinets that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

+ + END OF SECTION + +

SECTION 10523

FIRE EXTINGUISHERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes portable, hand-carried fire extinguishers.
- B. Related Sections:
 - 1. Division 10 Section "Fire Extinguisher Cabinets."

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include rating and classification, material descriptions, dimensions of individual components and profiles, and finishes for fire extinguisher.
- B. Product Schedule: For fire extinguishers. Coordinate final fire extinguisher schedule with fire protection cabinet schedule to ensure proper fit and function.

1.4 INFORMATIONAL SUBMITTALS

- A. Warranty: Sample of special warranty.

1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For fire extinguishers to include in maintenance manuals.

1.6 QUALITY ASSURANCE

- A. NFPA Compliance: Fabricate and label fire extinguishers to comply with NFPA 10, "Portable Fire Extinguishers."
- B. Fire Extinguishers: Listed and labeled for type, rating, and classification by an independent testing agency acceptable to authorities having jurisdiction.
 - 1. Provide fire extinguishers approved, listed, and labeled by FMG.

1.7 COORDINATION

- A. Coordinate type and capacity of fire extinguishers with fire protection cabinets to ensure fit and function.

1.8 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace fire extinguishers that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Failure of hydrostatic test according to NFPA 10.
 - b. Faulty operation of valves or release levers.
 - 2. Warranty Period: Six (6) years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PORTABLE, HAND-CARRIED FIRE EXTINGUISHERS

- A. Fire Extinguishers: Type, size, and capacity for each fire protection cabinet indicated.
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Amerex Corporation.
 - b. Ansul Incorporated; Tyco International Ltd.
 - c. Badger Fire Protection; a Kidde company.
 - d. Buckeye Fire Equipment Company.
 - e. Fire End & Croker Corporation.
 - f. J. L. Industries, Inc.; a division of Activar Construction Products Group.
 - g. Kidde Residential and Commercial Division; Subsidiary of Kidde plc.
 - h. Larsen's Manufacturing Company.
 - i. Moon-American.
 - j. Pem All Fire Extinguisher Corp.; a division of PEM Systems, Inc.
 - k. Potter Roemer LLC.
 - l. Pyro-Chem; Tyco Safety Products.
 - m. Equivalent by other manufacturer.
 - 3. Valves: Nickel-plated, polished brass body.
 - 4. Handles and Levers: Stainless steel.
 - 5. Instruction Labels: Include pictorial marking system complying with NFPA 10, Appendix B and bar coding for documenting fire extinguisher location, inspections, maintenance, and recharging.

- B. Wet-Chemical Type: UL-rated 2-A:1-B:C:K, 2.5-gal. (9.5-L) nominal capacity, with potassium carbonate-based chemical in stainless-steel container; with pressure-indicating gage.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine fire extinguishers for proper charging and tagging.
 - 1. Remove and replace damaged, defective, or undercharged fire extinguishers.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General: Install fire extinguishers and mounting brackets in locations indicated and in compliance with requirements of authorities having jurisdiction.
 - 1. Mounting Brackets: 48 inches above finished floor to top of fire extinguisher.

+ + END OF SECTION + +

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SECTION 10801

TOILET AND BATH ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Public-use washroom accessories.
 - 2. Underlavatory guards.
 - 3. Custodial accessories.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include the following:
 - 1. Construction details and dimensions.
 - 2. Anchoring and mounting requirements, including requirements for cutouts in other work and substrate preparation.
 - 3. Material and finish descriptions.
 - 4. Features that will be included for Project.
 - 5. Manufacturer's warranty.
- B. Product Schedule: Indicating types, quantities, sizes, and installation locations by room of each accessory required.
 - 1. Identify locations using room designations indicated.
 - 2. Identify products using designations indicated.

1.4 INFORMATIONAL SUBMITTALS

- A. Warranty: Sample of special warranty.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For toilet and bath accessories to include in maintenance manuals.

1.6 QUALITY ASSURANCE

- A. Source Limitations: For products listed together in the same Part 2 articles, obtain products from single source from single manufacturer.

- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

1.7 COORDINATION

- A. Coordinate accessory locations with other work to prevent interference with clearances required for access by people with disabilities, and for proper installation, adjustment, operation, cleaning, and servicing of accessories.
- B. Deliver inserts and anchoring devices set into concrete or masonry as required to prevent delaying the Work.

1.8 WARRANTY

- A. Special Mirror Warranty: Manufacturer's standard form in which manufacturer agrees to replace mirrors that develop visible silver spoilage defects and that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period: 15 Fifteen years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Stainless Steel: ASTM A 666, Type 304, 0.031-inch (0.8-mm) minimum nominal thickness unless otherwise indicated.
- B. Brass: ASTM B 19, flat products; ASTM B 16/B 16M, rods, shapes, forgings, and flat products with finished edges; or ASTM B 30, castings.
- C. Steel Sheet: ASTM A 1008/A 1008M, Designation CS (cold rolled, commercial steel), 0.036-inch (0.9-mm) minimum nominal thickness.
- D. Galvanized-Steel Sheet: ASTM A 653/A 653M, with G60 (Z180) hot-dip zinc coating.
- E. Galvanized-Steel Mounting Devices: ASTM A 153/A 153M, hot-dip galvanized after fabrication.
- F. Fasteners: Screws, bolts, and other devices of same material as accessory unit and tamper-and-theft resistant where exposed, and of galvanized steel where concealed.
- G. Chrome Plating: ASTM B 456, Service Condition Number SC 2 (moderate service).

- H. Mirrors: ASTM C 1503, Mirror Glazing Quality, clear-glass mirrors, nominal 6.0 mm thick.
- I. ABS Plastic: Acrylonitrile-butadiene-styrene resin formulation.

2.2 PUBLIC-USE WASHROOM ACCESSORIES

- A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated in Specifications or comparable product by one of the following:
 - 1. A & J Washroom Accessories, Inc.
 - 2. American Specialties, Inc.
 - 3. Bobrick Washroom Equipment, Inc.
 - 4. Bradley Corporation.
 - 5. GAMCO Specialty Accessories; a division of Bobrick Washroom Equipment, Inc.
 - 6. Tubular Specialties Manufacturing, Inc.
 - 7. Equivalent by other manufacturers.
- B. Toilet Tissue Dispensers:
 - 1. Double-Roll Dispenser: Size to accommodate two separate rolls of core type tissue up to 6 inch diameter.
 - a. Fabrication: Heavy-duty cast aluminum; satin finish. High-impact theft resistant spindles with concealed locking mechanisms. No controlled delivery.
- C. Sanitary Napkin Disposal:
 - 1. Partition-Mounted Sanitary Napkin Disposal Unit:
 - a. Cabinet: Type-304 stainless steel with all-welded construction. Exposed surfaces shall have satin finish.
 - b. Flange: Type-304, 22-gauge (0.8mm) stainless steel with satin finish. Drawn and beveled, one-piece, seamless construction.
 - c. Door: Type-304, 22-gauge (0.8mm) stainless steel with satin finish. Secured to cabinet with a full-length stainless steel piano-hinge. Provide a tumbler lock keyed to match other washroom accessories.
 - d. Disposal Panel: Type-304, 22-gauge (0.8mm) stainless steel with satin finish. Bottom edge hemmed for safety. Panel shall be secured to door with a spring-loaded, full-length stainless steel piano-hinge. Provide the international graphic symbol identifying sanitary napkin disposal on face of panel.
 - e. Provide Bobrick model B-354 or equal.
- D. Combination Paper-Towel Dispenser & Waste Receptacle: Semi-recessed paper towel dispenser and waste receptacle shall be constructed entirely of type-304 stainless steel. Exposed surfaces shall have satin finish. Flange shall be drawn, one-piece seamless beveled construction. Door shall be secured to cabinet with

full-length stainless steel piano hinge and be equipped with a concealed tumbler lock. Rounded towel tray shall have a hemmed opening to dispense paper towels without tearing. Unit shall dispense either 600 C-fold or 800 multifold towels. Removable stainless steel waste receptacle shall be secured to cabinet by tumbler lock; top and bottom edges shall be hemmed for safe handling. Minimum capacity: 12 gal. (45.4 liters).

1. Provide Bobrick Model B-3699, or equal.
- E. Liquid Soap Dispenser: Surface-mounted, stainless steel container with vandal resistant mounting.
1. ADA compliant, with valve operable with less than 5lb. of force.
 2. 40 fl. oz. capacity.
 3. Provide Bobrick Model B-2112 or equal.
- F. Stainless Steel Framed Mirror Units: Fabricate frame with angle shapes of not less than 18 gage (.050 inch), with square corners mitered, welded, and ground smooth. Provide in No. 4 satin polished finish.
1. Provide Bobrick B-290 Series or equal.
- G. Stainless Steel Grab Bars: Provide grab bars with wall thickness not less than 18 gage (.050 inch) and as follows:
1. Mounting: Concealed, manufacturer's standard flanges and anchorages.
 2. Clearance: 1-1/2 inches clearance between wall surface and inside face of bar.
 3. Gripping Surfaces: Manufacturer's standard nonslip texture.
 4. Heavy-Duty Size: Outside diameter of 1-1/2 inches.
 5. Provide Bobrick B-6806 Series or equal.
- H. Stainless Steel Mop/Broom Holder: Mop and broom holder shall be type 304 stainless steel with satin finish. Unit shall be 36" long with 4 spring loaded rubber cam holders. Manufacturer's service and parts manual shall be provided to the building owner / manager upon completion of project.
1. Provide Bobrick Model B-223x36, or equal.
- I. Folding Shower Seat (Handicap Accessible):
1. Provide Bobrick Model B-5171, or equal.
 2. Configuration: L-shaped seat, designed for wheelchair access.
 3. Seat: One-piece, 1/2" (13mm) thick, solid phenolic with matte-finish, ivory-colored, melamine surfaces and black phenolicresin core — cannot delaminate. Integral slots for water drainage. Secured to frame with stainless steel carriage bolts and acorn nuts. Reversible for left- or right-hand installation in the field.
 4. Frame: 18-8 S, type-304, stainless steel with satin finish. 16-gauge (1.6mm), 1-1/4" (30mm) square tubing and 18-gauge (1.2mm), 1" (25mm) diameter seamless tubing.
 5. Base Plate: 18-8 S, type-304, heavy-gauge stainless steel.

2.3 FABRICATION

- A. General: Fabricate units with tight seams and joints, and exposed edges rolled. Hang doors and access panels with full-length, continuous hinges. Equip units for concealed anchorage and with corrosion-resistant backing plates.
- B. Keys: Provide universal keys for internal access to accessories for servicing and resupplying. Provide minimum of (3) three keys to Owner's representative.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install accessories according to manufacturers' written instructions, using fasteners appropriate to substrate indicated and recommended by unit manufacturer. Install units level, plumb, and firmly anchored in locations and at heights indicated.
- B. Grab Bars: Install to withstand a downward load of at least 250 lbf (1112 N), when tested according to ASTM F 446.

3.2 ADJUSTING AND CLEANING

- A. Adjust accessories for unencumbered, smooth operation. Replace damaged or defective items.
- B. Remove temporary labels and protective coatings.
- C. Clean and polish exposed surfaces according to manufacturer's written recommendations.

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