Contract Documents and Specifications

B STREET WATER TREATMENT PLANT & NORTH WATER TREATMENT PLANT IMPROVEMENTS

for

The City of Meridian

CITY OF MERIDIAN

Prepared by

BURK-KLEINPETER, INC.

ENGINEERING • PLANNING • ENVIRONMENTAL

2121 5th Street, Suite 210
Meridian, MS 39301
(601) 482-5092
WWW.BKIUSA.COM

City of Meridian Bid No. 20-03
DWSIRLF Project No. DWI-L380005-01
BKI Project No. TU.17.019
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City of Meridian

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B Street Water Treatment Plant &
North Water Treatment Plant Improvements
City of Meridian

ENGINEER CERTIFICATION

The following Contract Documents and Technical Specifications have been prepared under my direct supervision and guidance in conjunction with the Plans and for the explicit use by the Owner and Contractors for Bidding and construction of the Project:

B Street Water Treatment Plant & North Water Treatment Plant Improvements

EC-1       DWSIRLF Project No. DWI-L380005-01
# B Street Water Treatment Plant & North Water Treatment Plant Improvements
City of Meridian

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B Street Water Treatment Plant &
North Water Treatment Plant Improvements
City of Meridian

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ADVERTISEMENT FOR BIDS

City of Meridian     601 23rd Avenue, Meridian, MS 39301

(Owner)     (Address)

Separate Sealed Bids for the Construction of (detailed description) B Street Water Treatment Plant (BWTP) & North Water Treatment Plant (NWTP) Improvements which includes the following: at BWTP, removal and replacement of approximately 3,800 cubic feet of filter sand, approximately 4,800 cubic feet of filter anthracite, approximately 2,800 square feet of filter underdrain, and 32 valves and actuators, installation of an air scour system, a backwash pump, controls, and a protective coating on the filter walls and piping; at NWTP, removal and replacement of valves and actuators. ______ will be received by the ______ City of Meridian ______ herein called the “owner” at the office of Purchasing at City Hall until 11:00 AM local time Tuesday, February 11, 2020 and then at said office publicly opened and read aloud.

(Date)

The PLANS, SPECIFICATIONS AND CONTRACT DOCUMENTS may be examined at the following locations:

1. City of Meridian 601 23rd Ave, Meridian MS 39301 (Call - Eugene Perry) 601-485-1938 (City Clerk’s Office, Chancery Clerk’s or Loan Recipient’s Office)

2. MSDH/DWSRF 570 E Woodrow Wilson Jackson MS (Call – Colleen Cook) 601-576-7518

3. Burk-Kleinpeter, Inc. 2121 5th St, Ste 210 Meridian, MS 39301 (Call - Cheryl Reed) 601-482-5092 (Consulting Engineer’s Office)

Hard copies of the PLANS, SPECIFICATIONS AND CONTRACT DOCUMENTS may be obtained from the Consulting Engineer for a nonrefundable price of $150.00 for each set.

The BID SCHEDULE may be examined at the following locations:

A. Mississippi Procurement Technical Assistance Program (MPTAP)
   Mississippi Development Authority, Minority & Small Business Development
   Woolfolk Building
   501 North West Street, Suite B 01
   Jackson, MS 39201
   Contact: Carlyn McGee, 601-359-3448

B. Contract Procurement Center closest to your project area; Natalie Purvis 601-531-3194

Minority and women’s business enterprises are solicited to bid on this contract as prime contractors and are encouraged to make inquiries regarding potential subcontracting opportunities and equipment, material and/or supply needs.

This contract is funded in whole or in part by funds from the Consolidated Appropriations Act of 214 (H.R. 3547); therefore, this project must comply with the American Iron and Steel requirements of the Act.

Any contract or contracts awarded under this invitation for bids are expected to be funded in whole or in part by anticipated funds from the Drinking Water Systems Improvements Revolving Loan Fund (DWSIRLF) Loan Program from the State of Mississippi. Neither the State of Mississippi, the Local Governments and Rural Water Systems Improvements Board, nor any of their employees is or will be a party to this invitation for bids or any resulting or related contracts. This procurement will be subject to all applicable sections of the Mississippi Code of 1972, Annotated, as they apply to local governments, in accordance with Appendix D of the DWSIRLF Program Regulations.
ARTICLE 1 – DEFINED TERMS

1.01 Terms used in these Instructions to Bidders have the meaning 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 bidding procedures are to be administered.
2.01 Refer to the Advertisement for Bids for information on receipt of Bids.

ARTICLE 3 – LOCATION AND DESCRIPTION OF PROJECT

3.01 The City of Meridian B Street Water Treatment Plant (BWTP) is located at 1598 B Street, Meridian, MS 39302. The City of Meridian North Water Treatment Plant (NWTP) is located at 4609 48th Place, Meridian MS 39305.

3.02 The BWTP has one filter basin with eight filter cells. The filter media, underdrain system and troughs will be removed and replaced. The surface wash sprayer arms and water supply piping will be removed. The filter cells will be cleaned, the concrete will be repaired, level sensors will be installed in each cell and a protective coating will be installed on the filter basin walls. The valves and pneumatic actuators in the pipe gallery will be replaced with new electronically actuated valves and the controls will be upgraded. The existing control panels will be removed and replaced. The backwash system will be upgraded to include blowers, air scour piping, a new backwash pump, a magnetic flow meter and new controls. Various electrical modifications will be made to support the changes above. The filter piping in the pipe gallery will be cleaned and recoated as an additive alternate.

3.03 The NWTP has two pipe galleries. The pneumatic valve actuators for the major filter valves will be removed and replaced with electronic actuators and integrated into the existing control system. Various electrical modifications will be made to support the changes being made as described above.

3.04 The BWTP and NWTP are an operating treatment plants and the Contractor must coordinate their activities with the plant operators in order to maintain the plant functions while allowing for various parts of the plant to be shut down for short periods to make the necessary improvements.

ARTICLE 4 – COPIES OF BIDDING DOCUMENTS

4.01 Refer to the Advertisement for Bids for information on location where Bidders may examine and obtain the Bidding Documents.

4.02 Complete set of Bidding Documents shall be used in preparing Bids; neither Owner nor Engineer assumes any responsibility for errors or misinterpretations resulting from the use of incomplete sets of Bidding Documents.

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

ARTICLE 5 – QUALIFICATIONS OF BIDDERS

5.01 Bidders shall be experienced in the kind of Work to be performed, shall have the necessary equipment therefor, and shall possess sufficient capital to properly execute the Work within the time allowed. Bids received from Bidders who have previously failed to complete
work within the time required, or who have previously performed similar work in an unsatisfactory manner, may be rejected. A Bid may be rejected if Bidder cannot show the Bidder has the necessary ability, plant, and equipment to commence the Work at the time prescribed and thereafter to prosecute and complete the Work at a rate or within the times specified. A Bid may be rejected if Bidder is already obligated for the performance of other work, which would delay the commencement, prosecution, or completion of the Work.

5.02 To demonstrate qualifications to perform the Work, Bidder shall complete and submit with its Bid the Bidder Qualifications Statement which is bound to the Project Manual. Bidders may be asked to and shall furnish data to demonstrate Bidder’s qualifications.

5.03 Bids will be received only from contractors licensed or registered by the State of Mississippi, who have a current Certificate of Responsibility as issued by the Mississippi State Board of Contractors, and who hold a Municipal and Public Works classification.

ARTICLE 6 – EXAMINATION OF BIDDING DOCUMENTS, OTHER RELATED DATA, AND SITE

6.01 Subsurface and Physical Conditions

A. Neither Owner nor Engineer has performed explorations of subsurface conditions in connection with preparation of the Bidding Documents nor have Owner nor Engineer utilized any investigation that may be been performed by others.

6.02 Underground Facilities – Physical Conditions

A. Information and data shown or indicated in the Bidding 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.

6.03 Hazardous Environmental Conditions

A. Owner has no knowledge of a Hazardous Environmental Condition at the Site.

6.04 Provisions concerning responsibilities for the adequacy of data, furnished to prospective Bidders with respect to subsurface conditions, other physical conditions, and Underground Facilities, and possible changes in the Bidding Documents due to differing or unforeseen subsurface or physical conditions appear in Paragraphs 5.03, 5.04, and 5.05 of the General Conditions. Provisions concerning responsibilities for the adequacy of data furnished to prospective Bidders with respect to a Hazardous Environmental Condition at the Site, if any, and possible changes in the Contract Documents due to any Hazardous Environmental Condition uncovered or revealed at the Site which was not shown or indicated on the Drawings or Specifications or identified in the Contract Documents to be within the scope of the Work appear in Paragraph 5.06 of the General Conditions.

6.05 Other Related Data (Not Used)
6.06 On request, and to the extent Owner has control over the Site, and schedule permitting, the Owner will provide Bidder access to the Site to perform such additional examinations, investigations, explorations, tests, and studies as Bidder deems necessary for preparing and submitting a successful Bid. Owner will not have any obligation to grant such access if doing so is not practical because of existing operations, security or safety concerns, or restraints on Owner’s authority regarding the Site.

6.07 Bidder shall conduct the required Site visit during normal working hours and shall not disturb any ongoing operations at the Site.

6.08 Reference is made to Supplementary Conditions for identification of the general nature of other work to be performed at the Site by Owner or others (such as utilities and other prime contractors) that relates to the Work for which a Bid is to be submitted. On request, Owner will provide to Bidder, for examination, access to or copies of the contract documents for such other work.

6.09 It is the responsibility of Bidder, before submitting a Bid to:

A. examine and carefully study the Bidding Documents, the other related data identified in the Bidding Documents;

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

C. become familiar with and satisfy Bidder as to the Laws and Regulations that may affect cost, progress and performance of the Work;

D. carefully study all:

1. reports of explorations and tests of subsurface conditions at or contiguous to the Site and all drawings of physical conditions relating to existing surface or subsurface structure at the Site (except Underground Facilities), if any, that have been identified in the Supplementary Conditions in Paragraph SC-5.03 as containing reliable “technical data”, and

2. reports and drawings of Hazardous Environmental Conditions identified at the Site, if any, that have been identified in the Supplementary Conditions in Paragraph SC-5.06 as containing reliable “technical data”;

E. consider the information know to Bidder; information commonly known to contractors doing business in the locality of the Site; information and observations obtained from visits to the Site; the Bidding Documents; and the Site-related reports and drawings identified in Bidding Documents with respect to the effect of such information, observation, and documents on

1. the cost, progress and performance of the Work;
2. the means, methods, techniques, sequences and procedures of construction to be employed by Bidder, including applying any specific means, methods, techniques, sequences and procedures of construction expressly required by the Bidding Documents; and

3. Bidder's safety precautions and programs;

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

G. become aware of the general nature of 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. promptly give Engineer written notice of all conflicts, errors, ambiguities, and discrepancies that Bidder discovers in the Bidding Documents and confirm that the written resolution thereof by Engineer is acceptable to Bidder; and

I. determine that the Bidding documents are generally sufficient to indicate and convey understanding of all terms and conditions for the performance of the Work.

6.10 The submission of a Bid will constitute an incontrovertible representation by Bidder the Bidder has complied with every requirement of this Article 6, that without exception the Bid is premised upon performing the Work required by the Bidding documents and applying any specific means, methods, techniques, sequences, or procedures of construction that may be shown or indicated or expressly required by the Bidding Documents, that Bidder has given Engineer written notice of all conflicts, errors, ambiguities, and discrepancies that Bidder has discovered in the Bidding Documents and the written resolutions thereof by Engineer are acceptable to Bidder, and that the Bidding documents are generally sufficient to indicate and convey understanding of all terms and conditions for performing the Work.

ARTICLE 7 – PRE-BID CONFERENCE

7.01 A mandatory Pre-Bid conference will be held at 1:00 pm local time on January 28, 2020 at the City of Meridian North Water Treatment Plant, 4609 48th Place, Meridian, MS 39305. Representatives of Owner and Engineer will be present to discuss the Project. Bidders are strongly encouraged to attend and participate at the conference. Engineer will transmit to all prospective Bidders of record such Addenda, as Engineer considers necessary in response to questions raised at the Pre-Bid conference. Oral statements may not be relied upon and will not be binding or legally effective.

ARTICLE 8 – SITE AND OTHER AREAS

8.01 The site is defined in the Bidding Documents. Easements for permanent structures or permanent changes in existing facilities are to be obtained and paid for by Owner unless otherwise provided in the Bidding Documents. All additional lands and access thereto
required for temporary construction facilities, construction equipment, or storage of materials and equipment, to be incorporated into the Work are to be obtained and paid for by Contractor.

ARTICLE 9 – INTERPRETATIONS AND ADDENDA

9.01 All questions about the meaning or intent of the bidding Documents shall be submitted to Engineer in writing. To receive consideration, questions must be received by Engineer at least ten (10) days prior to the date for opening of Bids. If interpretations or clarifications are considered necessary, the Engineer’s response to such questions will be issued by Addenda, mailed or delivered to all parties recorded by Engineer as having received the Bidding documents for receipt not later than three (3) days prior to the date for the opening of Bids. Electronic transmission of Addenda by email will be an acceptable method for delivery. Only questions answered by Addenda will be binding. Oral and other interpretations or clarifications will be without legal effect.

9.02 Addenda may also be issued to clarify, correct, or change the Bidding Documents as deemed advisable by Owner or Engineer. Such Addenda, if any, will be issued in the manner and within the time period stated in Paragraph 9.01 of these Instructions to Bidders.

ARTICLE 10 – BID SECURITY

10.01 A Bid shall be accompanied by Bid Security made payable to Owner in the amount of 5 percent of Bidder’s maximum Bid price and in the form of certified or bank check or Bid Bond.

10.02 Bid Bond shall be on the form bound in the Project Manual. Bid Bond shall be issued by a surety complying with the requirements of Paragraph 6.01.B and 6.01.C of the General Conditions.

10.03 The Bid Security of the Successful Bidder will be retained until such Bidder has executed the Contract Document, furnished the required contract security, and completed with the other conditions of the Notice of Award, whereupon the Bid security will be returned. If the Successful Bidder fails to sign and deliver the Contract Documents and furnish the required contract security within ten (10) days after the Notice of Award, Owner may annul the Notice of Award and the Bid security of that Bidder will be forfeited to the Owner as liquidated damages for such failure. Such forfeiture shall be Owner's sole exclusive remedy.

10.04 The Bid security of the three lowest Bidders may be retained by Owner until the earlier of the seventh day after the Effective Date of the Agreement or the sixty-first day after the Bid opening whereupon the Bid security furnished by such Bidders will be returned. The Bid security of Bidders whom Owner believes do not have a reasonable chance of receiving an award will be returned within fourteen days of the Bid opening.

ARTICLE 11 – CONTRACT TIMES
11.01 The number of days within which the Work is to be Substantially Completed and also completed and ready for final payment (The Contract Times) are set forth in the agreement.

ARTICLE 12 – LIQUIDATED AND SPECIAL DAMAGES

12.01 Provisions for liquidated and special damages, if any, are set forth in the Agreement.

ARTICLE 13 – SUBSTITUTE AND “OR EQUAL” ITEMS

13.01 The Contract, if awarded, will be on the basis of materials and equipment specified or described in the Bidding Documents without consideration of possible substitute or “or-equal” items. Whenever it is specified or described in the Bidding Documents that a substitute or “or-equal” item of material or equipment may be furnished or used by Contractor if accepted by Engineer, application for such acceptance will not be considered by Engineer until after the Effective Date of the Agreement. The procedure for submittal of any such application by Contractor and consideration by Engineer is set forth in the General Conditions which may be supplemented in the General Requirements.

ARTICLE 14 – SUBCONTRACTORS, SUPPLIERS, AND OTHERS

14.01 If the Supplementary Conditions require the identity of certain Subcontractors, Suppliers, individuals, or entities to be submitted to Owner in advance of a specified date prior to the Effective Date of the Agreement, the apparent Successful Bidder, and any other Bidder so requested, shall within five days after Bid opening submit to Owner a list of all such Subcontractors, Suppliers, other individuals, and entities proposed for those portions of the Work for which such identification is required. Such list shall be accompanied by an experience statement with pertinent information regarding similar projects and other evidence of qualifications for each such Subcontractor, Supplier, individual, and entity if requested by Owner. If Owner or Engineer, after due investigation, has reasonable objection to any proposed Subcontractor, Supplier, individual, or entity, Owner may, before the Notice of Award is given, request the apparent Successful Bidder to submit an acceptable substitute without an increase in Bid price.

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

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

ARTICLE 15 – PREPARATION OF BID
15.01 A Bid shall be made on the Bid Form bound in the Project Manual. The Bid Form shall not be altered in any way.

15.02 All blanks in the Bid Form shall be completed by typewriter or hand-printing in black ink. All bid items requested in the Bid Form, including alternate bid prices and unit prices for separate items of the Work, must be bid. If a gross sum of bid items is requested in the Bid Form, the gross sum shall be provided by the bidder.

15.03 A Bid shall be executed as stated below.

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

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

C. A Bid by joint venture shall be executed by each joint venturer in the manner indicated on the Bid Form. The official address of the joint venture shall be indicated.

D. A Bid by a corporation shall be executed in the corporate name by an officer of the corporation and shall be accompanied by a certified copy of a resolution of the board of directors authorizing the person signing the Bid to do so on behalf of the corporation. The corporate seal shall be affixed and attested by the secretary or an assistant secretary of the corporation. The state of incorporation and the office corporate address shall be indicated.

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

F. All names shall be printed in ink below the signature.

G. If applicable, the Bid shall contain evidence of Bidder’s authority and qualification to do business in the state where the Project is located.

H. Contractor’s license or registration number, if any, shall be entered in the space provided on the Bid Form.

15.04 The Bid shall contain an acknowledgement of the receipt of all Addenda, the numbers of which shall be filled in at the space provided in the Bid Form.

15.05 Postal and e-mail addresses and telephone number for communications regarding the Bid shall be indicated.

15.06 In addition to the Bid Form, the following listed documents, which are bound in the Project Manual shall be submitted with the Bid. Each document shall be executed in the manner described in paragraph 15.03 unless another manner is indicated.

A. Bid Security Form.
B. Bidder Qualification Statement.

C. Non-collusive Bidding Certification (if required by statute).

ARTICLE 16 – BASIS OF BIDS; COMPARISON OF BIDS

16.01 Unit Prices

A. For each unit price item on the Bid Form, Bidder shall enter the unit price Bid, and shall enter the computation of the respective quantity times the Bidder’s unit price for that item. Bidder shall compute and enter in the space provided on the Bid Form, the total of the products of quantity and unit price Bid for each unit price item.

B. For determination of the apparent low Bidder, Bids will be compared on the basis of the total of the products of the estimated quantity of each item and unit price Bid for each item.

16.02 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.

16.03 For each allowance Bidder shall include, elsewhere in its Bid, all costs set forth in Paragraph 11.02 of the General Conditions to complete the Work associated with the material, equipment or other designated items to be furnished under cash allowance(s).

ARTICLE 17 – SUBMITTAL OF BID

17.01 A Bid shall be received no later than the date and time prescribed and at the place indicated in the Advertisement for Bids.

17.02 Bids shall be submitted on the bid form provided, sealed in an opaque envelope with the following plainly marked on the outside of the envelope:

1. Company Name and Address
2. Bid Name and Number
3. Bidder License Number
4. Opening Date
5. “B STREET WATER TREATMENT PLANT & NORTH WATER TREATMENT PLANT IMPROVEMENTS – BID #20-03 – February 11, 2020”

Bid shall be accompanied by Bid security and other required documents.

17.03 All Bids must be signed by an authorized officer or agent of the company submitting bid. All signatures shall be in blue ink. DO NOT fax bid submittal.

17.04 Any bidder who finds a discrepancy in or omission from the specifications, or is in doubt as to their meaning, or feels that the specifications are discriminatory, shall notify the City Purchasing Agent in writing not later than five (5) days prior to the scheduled opening of bid. Exceptions taken do not obligate the City to change the specifications.
17.05 The Mississippi State Board of Contractors is responsible for issuing Certificates of Responsibility to Contractors. To be awarded a Contract for public work, Sections 31-3-15 and 31-3-21 of the Mississippi Code 1972, Annotated requires a Contractor to have a current Certificate of Responsibility at bid time and during the entire length of the job. The Certificate of Responsibility number issued becomes a significant item in all public bidding.

1. Bid Under $50,000: If a Contractor submits a bid not exceeding $50,000, no Certificate of Responsibility number is required; however, a notation stating the bid does not exceed $50,000 must appear on the face of the envelope, or a Certificate of Responsibility number.

2. Bid over $50,000: Each Contractor submitting a bid in excess of $50,000 must show its Certificate of Responsibility number on the bid and on the face of the envelope containing the bid.

17.06 If the Bid is sent by mail or other delivery method, the sealed envelope containing the Bid shall be enclosed in a separate envelope plainly marked on the outside with the notation “BID ENCLOSED”. A mailed Bid shall be addressed in the Advertisement for Bids.

17.07 The submission of a bid shall be considered an agreement to all the terms, conditions, and specifications provided herein and in the various bid documents, unless specifically noted otherwise in the bid.

All items quoted must comply with the specifications. If you are taking exception, indicate those exceptions on company letterhead and attach with this invitation to bid.

Exceptions taken do not obligate the City to change the specifications

ARTICLE 18 – MODIFICATION OR WITHDRAWL OF BID

18.01 Withdrawal Prior to Bid Opening:

A. A Bid may be 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 fixed for the opening of Bids. Upon receipt of such written notice, the unopened Bid will be returned to the Bidder.

18.02 Modification Prior to Bid Opening:

A. If a Bidder wishes to modify its Bid, Bidder must withdraw its initial Bid in the manner specified in Paragraph 18.01.A of these Instructions to Bidders and submit a new Bid.

ARTICLE 19 – OPENING OF BIDS

19.01 Bids will be opened at the time and place where Bids are to be submitted and, unless obviously non-responsive, read aloud publicly. It is the bidder’s responsibility to assure
that the bid is delivered at the proper time and place of the bid opening. An abstract of the Bids will be made available to Bidders after the opening.

19.02 No responsibility will attach the Purchasing Division for the premature opening of a bid not properly addressed and identified. Bidders or their authorized representatives are invited to be present at the opening of the bids.

19.02 Bids received by mail or otherwise after the date and time specified for the opening of Bids will not be accepted and will be returned to the Bidder unopened.

ARTICLE 20 – DISQUALIFICATION OF BIDDERS

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

ARTICLE 21 – BIDS TO REMAIN SUBJECT TO ACCEPTANCE

21.01 All Bids shall 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 that period.

ARTICLE 22 – EVALUATION OF BIDS AND AWARD OF CONTRACT

22.01 Owner reserves the right to reject any or all Bids, including without limitation the right to reject any or all nonconforming, nonresponsive, unbalanced, or conditional Bids. Owner further reserves the right to reject the Bid of any Bidder whom it finds, after reasonable inquiry and evaluation, to be not responsible. Owner also reserves the right to waive any informality not involving price, time or changes in the Work.

22.02 Owner reserves the right to reject any Bid not accompanied by specified documentation and Bid security.

22.03 Owner reserves the right to reject any Bid that, in its sole discretion, is considered to be unbalanced or unreasonable as to the amount bid for any lump sum or unit price item.

22.04 In evaluating Bidders, Owner will consider the qualifications of Bidders, whether or not their Bids comply with prescribed requirement, the alternatives, if any, the lump sum and unit prices, and other data as may be requested in the Bid Form or prior to the Notice of Award.

22.05 Owner may consider the qualifications and experience of Subcontractors, Suppliers, and other individuals or entities proposed for those portions of the Work for which the identity of Subcontractors, Suppliers, and other individuals or entities must be submitted as provided in the Supplementary Conditions.

22.06 Owner may conduct such investigations as Owner deems necessary to establish the responsibility, qualifications, and financial ability of the Bidders to perform the Work in
accordance with the Contract documents. Owner reserves the right to reject the Bid of any Bidder who does not pass any such evaluation to Owner’s satisfaction.

22.07 A Contract may be awarded to the lowest responsive responsible bidder as recommended by the City Purchasing Agent. In determining the lowest and best bid the Owner may consider factors other than the dollar amount of the bid.

22.08 Factors that may be used to assist in determining the lowest and best bid include information relative to the bidder’s: past performance, quality of the bid, past work, skill, facilities for carrying out the contract, honesty and integrity, parts, service, warranty and any and all other relevant and reasonable factors.

22.09 The Owner reserves the right to reject any and/or all bids; waive technicalities, informalities or irregularities in the bids received; solicit new bids; or to choose that bid which is deemed to be in the best interest of the Owner.

22.10 References, from whom comparable work has been performed, shall be used to assist in evaluating each bid.

22.07 If a Contract is to be awarded, Owner will award the Contract to the lowest responsive and responsible Bidder who has neither been disqualified nor rejected pursuant to Article 20 of the Instructions to Bidders or this Article 22.

22.08 Any protest concerning the award of a contract shall be decided by the Purchasing Agent. Protests shall be made in writing to the Office of Purchasing and shall be filed within 48 hours of issuance of Award Notification. A protest is considered filed when received by the Office of Purchasing. The written protest shall include the name and address of the protestor, identification of the procurement, a statement of the specific reasons for the protest and supporting exhibits. The Office of Purchasing will respond to the written protest within seven (7) days. The Purchasing Agent’s decision relative to the protest may be appealed to the City Council.

ARTICLE 23 – CONTRACT SECURITIES

23.01 Performance Bond shall be in the form of Engineers Joint Contract Documents Committee (EJCDC) C-610, “Construction Performance Bond”. Payment Bond shall be in the form of EJCDC C-615, “Construction Payment Bond”. The amounts of and other requirements for Performance and Payment Bonds are stated in Paragraph 6.01 of the General Conditions and in the Supplementary Conditions. The requirements for delivery of Bonds are stated in Paragraph 2.01 of the General Conditions. Additional requirements may be stated in the Supplementary Conditions.

23.02 Successful Bidder shall within five (5) days from the date of the Notice of Award deliver to Owner, for Owner’s review and approval, the Performance Bond and the Payment Bond.

ARTICLE 24 – CONTRACTOR’S INSURANCE
24.01 The requirements for Contractor’s insurance are stated in Article 6 of the General Conditions and in the Supplementary Conditions. The requirements for delivery of certificates of insurance and other evidence of insurance are stated in Paragraph 2.01.B of the General Conditions.

24.02 Successful Bidder shall within five (5) days from the date of the Notice of Award deliver to Owner, for review and approval, the required policies of insurance. Upon approval, the policies will be returned to the Bidder and Bidder shall submit certificates of insurance and other evidence of insurance to the Owner as stated in the General Conditions.

ARTICLE 25 – SIGNING OF AGREEMENT

25.01 After the City Council approves the bid, the City will send a “Notice of Award” to the Successful Contractor along with two unsigned Contracts. Within ten (10) days thereafter, the Successful Contractor shall **sign** and **deliver** both sets of Contracts to Purchasing.

ARTICLE 26 – NOTICE TO PROCEED

26.01 Issuance of the Notice to Proceed shall be as stated in Article 2 of the General Conditions.

ARTICLE 27 – PARTNERING (Not Used)

ARTICLE 28 – SALES AND USE TAXES

28.01 The contractor shall be subject to all applicable Federal, State and Local Taxes. The contractor may contact either or both the Mississippi State Tax Commission in Meridian, MS at 601-483-2273 or the Mississippi State Tax Commission in Clinton, MS at 601-923-7015 for assistance in determining applicable taxes.

ARTICLE 29 – TERMINATIONS

29.01 Termination of Convenience: The City may terminate a contract, in whole or in part whenever the City determines that such termination is in the best interest of the City, without showing cause, upon giving written notice to the Successful Contractor.

The City shall pay all reasonable costs incurred by the Contractor up to the date of termination. However, in no event shall the Contractor be paid any amount that exceeds the price proposed for the work performed. The Contractor will not be reimbursed for any profits which may have been anticipated but which have not been earned up to the date of termination.

29.02 Termination for Default: When the Contractor has not performed or has unsatisfactorily performed the contract, the City may terminate the contract for default.

Upon termination for default, payment may be withheld at the discretion of the City. Failure on the part of a Contractor to fulfill the contractual obligations shall be considered just cause for termination of the contract. The Contractor will be paid for work satisfactorily performed prior to termination less any excess costs incurred by the City in reprocuring and completing of work.
ARTICLE 30 – ADDITIONAL REQUIREMENTS

30.01 **DWSRF Special Requirements:**

A. If all or any portion of the Project to which this contract applies is funded in whole or in part by the proceeds of a loan or loans from the Mississippi State Department of Health (MSDH) through the State Drinking Water Revolving Loan Fund (DWSRF), additional requirements for the Contractor exist (Requirements). These Requirements relate to Project objectives for utilization of Minority Business Enterprises/Women Business Enterprises (MBE/WBE). The Contractor must document efforts made to utilize MBE/WBE firms and submit to MSDH, with a copy to the City within ten (10) days after contract execution, evidence of the positive steps in accordance with the requirements to utilize small minority and women businesses in the procurement of subcontracts.


C. For DWSRF funded projects, special requirements are also set forth in Supplemental General Conditions. If not attached to the contract documents, Contractors should contact the City representative and/or the City's consulting engineer for a copy of all special requirements and conditions.

30.02 **American Iron and Steel Requirements:**

A. This contract is funded in whole or in part by funds from the Consolidated Appropriations Act of 2014 (H.R. 3547). Section 436 states:

(a)(1) None of the funds made available by a State drinking water treatment revolving loan fund as authorized by section 1452 of the Safe Drinking Water Act (42 U.S.C. 300j-12) shall be used for a project for the construction, alteration, maintenance, or repair of a public water system or treatment works unless all of the iron and steel products used in the project are produced in the United States. (2) In this section, the term “iron and steel products” means the following products made primarily of iron or steel: lined or unlined pipes and fittings, manhole covers and other municipal castings, hydrants, tanks, flanges, pipe clamps and restraints, valves, structural steel, reinforced precast concrete, and construction materials.

(b) Subsection (a) shall not apply in any case or category of cases in which the Administrator of the Environmental Protection Agency (in this section referred to as the “Administrator”) finds that –

(1) Applying subsection (a) would be inconsistent with the public interest;
(2) Iron and steel products are not produced in the United States in sufficient and reasonably available quantities and of satisfactory quality; or

(3) Inclusion of iron and steel products in the United States will increase the cost of the overall project by more than 25 percent.

30.03 **Minority Business and Women’s Business Utilization Requirements:**

A. Positive efforts as required in the Drinking Water Systems Improvements Revolving Loan Fund Program Regulations shall be made by BIDDERS to utilize minority owned and women-owned businesses as sources of construction, materials, supplies and services. Such efforts must allow these sources the maximum feasible opportunity to compete for subagreements and contracts. Documentation of efforts made to utilize minority and women-owned firms must be maintained by all BIDDERS.

B. The OWNER’s goal for minority-owned business participation as a percentage of construction cost is 3.1%. The OWNER’s goal for women-owned business participation is 1.1%.

C. The lowest qualified BIDDER must submit to the OWNER within 10 days after BID opening, proof of compliance with the Contract Provisions including required documentation regarding the use of minority and women’s businesses. *(Refer to “Section 4, Utilization of Disadvantaged Business Enterprises” of the “Supplemental General Conditions for Construction of the Drinking Water Systems Improvements Revolving Loan Fund Projects”).*

D. The Supplemental General Conditions provide a list of qualified minority and women’s business enterprises for assisting contractors in their MBE/WBE solicitation efforts.
ARTICLE 1 – BID RECIPIENT

1.01 This Bid is submitted to:

The City of Meridian
601 23rd Avenue
Meridian, MS 39301

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 Project Manual 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 for Bids and Instructions to Bidders, including without limitation those dealing with the disposition of Bid security. This Bid will remain subject to acceptance for 60 days after the Bid opening, or for such period of time that the 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, other related data identified in the Bidding Documents, if any, and the following Addenda, receipt of all of which is hereby acknowledged.

<table>
<thead>
<tr>
<th>Addendum No.</th>
<th>Date Received</th>
<th>Addendum No.</th>
<th>Date Received</th>
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</tbody>
</table>

B. Bidder has visited the Site(s) 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 Laws and Regulations that may affect cost, progress, and performance of the Work.

D. Bidder has carefully studied all:

1. Reports of explorations and test of subsurface conditions at or contiguous to the Site and all drawings of physical conditions relating to existing surface or subsurface structures at or contiguous to the Site (except Underground Facilities), if any, that have been identified in the Supplementary Conditions in SC-5.03 as containing reliable “technical data”, and

2. Reports and drawings of Hazardous Environmental Conditions identified at the Site, if any, that have been identified in SC-5.06 as containing reliable “technical data”.

E. Bidder has considered the information known to Bidder, information commonly known to contractors doing business in the locality of the Site, information and observations obtained from visits to the Site, the Bidding Documents, and the Site-related reports and drawings identified in the Bidding Documents with respect to the effect of such information, observations, and documents on

1. the cost, progress and performance of the Work

2. the means, methods, techniques, sequences and procedures of construction to be employed by Bidder, including applying any specific means, methods, techniques, sequences, and procedures of construction expressly required by the Bidding Documents to be employed by Bidder; and

3. Bidder’s safety precautions and programs.
F. Based on the information and observations referred to in Paragraph 3.01.E, Bidder does not consider that further examinations, investigations, explorations, tests, studied, or data are necessary for the determination of this Bid for performance of the Work at the price(s) bid and within the times required and in accordance with the other terms and conditions of the Bidding Documents.

G. Bidder is aware of the general nature of work (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 given Engineer written notice of all conflicts, errors, ambiguities, and discrepancies that Bidder has discovered in the Bidding Documents, and the written resolution thereof by Engineer is acceptable to Bidder.

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

ARTICLE 4 – BIDDER’S CERTIFICATIONS

4.01 Bidder certifies 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.

C. Bidder has not solicited or induced any individual or entity to refrain from bidding.

D. Bidder has not engaged in corrupt, fraudulent, collusive or coercive practices in competing for the Contract. For the purposes of Paragraph 4.01.D;

1. Corrupt practice means the offering, giving, or soliciting of anything of value likely to influence the action of a public official in the bidding process.

2. Fraudulent practice means an intentional misrepresentation of facts made (a) to influence the bidding process to the detriment of Owner, (b) to establish bid prices at artificial non-competitive levels, or (c) to deprive Owner of the benefits of free and open competition.

3. Collusive practice means to participate in a scheme or arrangement between two or more Bidders, with or without the knowledge of Owner, with a purpose to establish bid prices at artificial, non-competitive levels.
4. Coercive practice means harming or threatening to harm, directly or indirectly, persons or their property to influence their participation in the bidding process or affect the execution of the Contract.

ARTICLE 5 – BASIS OF BID

5.01 Bidder will complete the Work in Accordance with the Contract Documents for the following prices(s): See Bid Form Attachment A - Bid Schedule

Unit prices have been computed in accordance with Paragraph 13.03.A 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 Work items will be based on actual quantities of Unit Price Work, determined as provided in the Contract Documents.

ARTICLE 6 – TIME OF COMPLETION

6.01 Bidder agrees that the Work will be substantially complete and completed and ready for final payment in accordance with Paragraph 15.03.B of the General Conditions on or before the dates or within the number of calendar days stated in the Agreement.

6.02 Bidder accepts the provisions of the Agreement as to liquidated and special damages in the event of failure to complete the Work within the Contract Times.

ARTICLE 7 – ATTACHMENTS TO THIS BID

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

A. Required Bid security in the form of a Bid Bond.

B. Required Bidder Qualifications Statement with supporting data.

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

D. Affidavit of non-collusion.

ARTICLE 8 – DEFINED TERMS

8.01 The terms used in this Bid with initial capital letters have the meanings stated in the Instructions to Bidders and the General and Supplementary Conditions.
ARTICLE 9 – BID SUBMITTAL

9.01 This Bid submitted on __________, 2020 by:

If Bidder is:

AN INDIVIDUAL

Name (typed or printed): ____________________________________________

By ________________________________________________________________

(Individuals Signature)

Doing business as __________________________________________________

License or Registration Number: ______________________________________

Certificate of Responsibility Number: ________________________________

Business Address: __________________________________________________

Phone No.: ___________________ Fax No.: _____________________________

E-mail Address: _____________________________________________________

A PARTNERSHIP

Partnership Name: _________________________________________________

By: ________________________________________________________________

(Signature of General Partner – Attached evidence of authority to sign)

Name (typed or printed): ____________________________________________

License or Registration Number: _____________________________________

Certificate of Responsibility Number: ________________________________

Business Address: __________________________________________________
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: ____________________________________________

Certificate of Responsibility Number: _______________________________________

Business Address: ________________________________________________________

Phone No.: _____________________ Fax No.: _________________________________

E-mail Address: __________________________________________________________
LIMITED LIABILITY COMPANY

By: ____________________________________________

(Firm Name)

___________________________________________

(State of Formation)

By: ____________________________________________

(Signature of Member/Authorized to Sign)

___________________________________________

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

License or Registration Number: ________________________________

Certificate of Responsibility Number: ______________________________

Business Address: ____________________________________________

___________________________________________

Phone No.: ____________________  Fax No.: ________________________

E-mail Address: ________________________________________________
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)

Second Joint Venturer Name: __________________________________________

By: ____________________________

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

Name (typed or printed): ______________________________________________

__________________________________________________________

(Title)

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

Business Address: _____________________________________________

Phone and fax numbers and address of receipt of communications to joint venture:

Joint Venture Address: _____________________________________________

Phone No.: ____________________ Fax No.: _____________________________

E-mail Address: ____________________________________________________

- END OF BID FORM -
### City of Meridian

**B Street Water Treatment Plant & North Water Treatment Plant Improvements**

**Bid Schedule**

January 7, 2020

<table>
<thead>
<tr>
<th>ITEM NO.</th>
<th>APPROX. QTY.</th>
<th>UNIT</th>
<th>ITEM DESCRIPTION</th>
<th>UNIT</th>
<th>PRICE</th>
<th>AMOUNT</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>BASE BID ITEMS</strong></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td><strong>General, Site Preparation</strong></td>
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<td></td>
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</tr>
<tr>
<td>1</td>
<td>1</td>
<td>LS</td>
<td>Mobilization and Demobilization</td>
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</tr>
<tr>
<td>2</td>
<td>1</td>
<td>LS</td>
<td>Removal and Disposal of Filter Media (8 Basins, Less than Approximately 300 CY)</td>
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<tr>
<td>3</td>
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<td>LS</td>
<td>Removal of Existing Underdrain System</td>
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<tr>
<td>4</td>
<td>100</td>
<td>CY</td>
<td>Disposal of Existing Underdrain System</td>
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<tr>
<td>5</td>
<td>33</td>
<td>EACH</td>
<td>Remove Existing Valve &amp; Actuator</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>400</td>
<td>LS</td>
<td>Remove Existing Piping</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Filter Basin Improvements</strong></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>50</td>
<td>CY</td>
<td>New Subfloor w/Sand Foundation</td>
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<td></td>
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<tr>
<td>8</td>
<td>1</td>
<td>LS</td>
<td>New Underdrain Equipment</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>9</td>
<td>3,840</td>
<td>CYIP</td>
<td>Filter Sand</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>10</td>
<td>4,800</td>
<td>CYIP</td>
<td>Filter Anthracite</td>
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<td>11</td>
<td>7,500</td>
<td>SF</td>
<td>Filter Basin Coating</td>
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<td><strong>B Street Plant Improvements</strong></td>
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<td>12</td>
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<td>Blowers</td>
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<td>13</td>
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<td>LS</td>
<td>Blower Equipment Pads</td>
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<td>14</td>
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<td>LS</td>
<td>Louvers, wall penetration and duct work</td>
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<tr>
<td>15</td>
<td>30</td>
<td>LF</td>
<td>6&quot; Dia. Schedule. 10, 304 S.S. Piping</td>
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<td>16</td>
<td>215</td>
<td>LF</td>
<td>8&quot; Dia. Schedule. 10, 304 S.S. Piping</td>
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<td>LS</td>
<td>6&quot; &amp; 8&quot;Schedule. 10, 304 S.S. Pipe Fittings</td>
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<td>18</td>
<td>8</td>
<td>EACH</td>
<td>6&quot; Butterfly Valve - Air Service</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>19</td>
<td>2</td>
<td>EACH</td>
<td>8&quot; Butterfly Valve - Air Service</td>
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<tr>
<td>20</td>
<td>2</td>
<td>EACH</td>
<td>8&quot; Wafer Check Valve</td>
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<td>21</td>
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<td>EACH</td>
<td>6&quot; Butterfly Valve with Electronic Actuator</td>
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<tr>
<td>22</td>
<td>8</td>
<td>EACH</td>
<td>10&quot; Butterfly Valve with Electronic Actuator</td>
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<tr>
<td>23</td>
<td>16</td>
<td>EACH</td>
<td>16&quot; Butterfly Valve with Electronic Actuator</td>
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<td>24</td>
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<td>EACH</td>
<td>Filtered Water Control Valve (Rate of Flow)</td>
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<td>25</td>
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<td>LS</td>
<td>New Backwash Pump w/VFD Controller Panel</td>
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<td>26</td>
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<td>LS</td>
<td>New Backwash Piping and Valves</td>
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<td></td>
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<tr>
<td>27</td>
<td>9</td>
<td>EACH</td>
<td>Flow Meters</td>
<td></td>
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<tr>
<td>28</td>
<td>9</td>
<td>EACH</td>
<td>Level Sensors/Indicators</td>
<td></td>
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<tr>
<td>ITEM NO.</td>
<td>APPROX. QTY.</td>
<td>UNIT</td>
<td>ITEM DESCRIPTION</td>
<td>PRICE</td>
<td>AMOUNT</td>
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<tr>
<td>29</td>
<td>1</td>
<td>LS</td>
<td>Control Panels and RIO for Filter Backwash</td>
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<td>30</td>
<td>1</td>
<td>LS</td>
<td>Blower Control Panel</td>
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<td>31</td>
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<td>32</td>
<td>1</td>
<td>EACH</td>
<td>18” Butterfly Valve with Electronic Actuator</td>
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<td>33</td>
<td>8</td>
<td>EACH</td>
<td>Electronic Actuator for Existing 6” Butterfly Valve</td>
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<td>34</td>
<td>8</td>
<td>EACH</td>
<td>Electronic Actuator for Existing 8” Butterfly Valve</td>
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<td>35</td>
<td>8</td>
<td>EACH</td>
<td>Electronic Actuator for Existing 18” Butterfly Valve</td>
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<tr>
<td>36</td>
<td>1</td>
<td>LS</td>
<td>Electrical</td>
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**TOTAL BASE BID**

**ALTERNATE BID ITEMS**

Alternate No. 1

| 101     | 8,000        | SF   | B Street Plant Pipe and Wall Coating                                           |       |        |

**TOTAL ALTERNATE NO. 1 BID**

**TOTAL BASE BID + ALTERNATE NO. 1 BID**

Alternate No. 2

| 201     | 10           | EACH | Slide Gates                                                                    |       |        |

**TOTAL ALTERNATE NO. 2 BID**

**TOTAL BASE BID + ALTERNATE NO. 1 BID + ALTERNATE NO.2 BID**
STATE OF MISSISSIPPI

CITY OF MERIDIAN

BEFORE ME, the undersigned authority, personally came and appeared, _______________________________________

(Name of Authorized Representative of Bidder)

who after being by me duly sworn, deposed and said that he is the fully authorized representative

of ____________________________________

(hereinafter referred to as bidder), the party who submitted a bid for B Street Water Treatment Plant & North Water Treatment Plant Improvements, DWSIRLF Project No. DWI-L380005-01 which bid was received by the City of Meridian on Tuesday, February 11, 2020 at 11:00 am and said affiant further said:

(1) That bidder employed no person, corporation, firm, association, or other organization, either directly or indirectly, to secure the public contract under which he received payment, other than persons regularly employed by the bidder whose services in connection with the construction of the public building or project or in securing the public contract were in the regular course of their duties for bidder; and

(2) That no part of the contract price received by bidder was paid or will be paid to any persons, corporation, firm, association, or other organization for soliciting the contract, other than the payment of their normal compensation to persons regularly employed by the bidder whose services in connection with construction of the public building or project were in the regular course of their duties for bidder.

(3) Said bid is genuine and the bidder has not colluded, conspired or agreed, directly or indirectly, with any other bidder to offer a sham or collusive bid.

(4) Said bidder has not in any manner, directly or indirectly, agreed with any other person to fix the bid price of affiant or any other bidder, or to fix any overhead profit or cost element of said bid price, or that of any other bidder, or to induce any other person to refrain from bidding.

(5) Said bid is not intended to secure an unfair advantage of benefit from the City of Meridian or in favor of any person interested in the proposed contract.

(6) All statements contained in said bid are true and correct.

AFFIDAVIT
(7) Neither affiant nor any member of his company has divulged information regarding said bid or any data relative thereto to any other person, firm or corporation.

________________________________
Authorized Signature

SWORN TO AND SUBSCRIBED
BEFORE ME THIS ________________
DAY OF ______________________, 2020

_______________________________________
NOTARY PUBLIC
BID BOND

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

BIDDER (Name and Address):

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

OWNER (Name and Address):

BID

Bid Due Date:
Description (Project Name—Include Location):

BOND

Bond Number:
Date:
Penal sum ________________________________ $ ________________________________

(Words) (Figures)

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

BIDDER

Bidder’s Name and Corporate Seal
By:

Signature
Print Name
Title

SURETY

Surety’s Name and Corporate Seal
By:

Signature (Attach Power of Attorney)
Print Name
Title

Attest:

Signature
Title

Note: Addresses are to be used for giving any required notice.
Provide execution by any additional parties, such as joint venturers, if necessary.
1. Bidder and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors, and assigns to pay to Owner upon default of Bidder the penal sum set forth on the face of this Bond. Payment of the penal sum is the extent of Bidder’s and Surety’s liability. Recovery of such penal sum under the terms of this Bond shall be Owner’s sole and exclusive remedy upon default of Bidder.

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

3. This obligation shall be null and void if:
   
   3.1 Owner accepts Bidder’s Bid and Bidder delivers within the time required by the Bidding Documents (or any extension thereof agreed to in writing by Owner) the executed Agreement required by the Bidding Documents and any performance and payment bonds required by the Bidding Documents, or
   
   3.2 All Bids are rejected by Owner, or
   
   3.3 Owner fails to issue a Notice of Award to Bidder within the time specified in the Bidding Documents (or any extension thereof agreed to in writing by Bidder and, if applicable, consented to by Surety when required by Paragraph 5 hereof).

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

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

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

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

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

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

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

11. The term “Bid” as used herein includes a Bid, offer, or proposal as applicable.
BIDDER QUALIFICATION STATEMENT

SUBMITTED BY:

Name of Organization: ____________________________________________________________
(Print or Type Name of Bidder)

Name of Individual: ______________________________________________________________

Title: _________________________________________________________________________

Business Address: __________________________________________________________________

______________________________________________________________________________

Telephone No.: __________________________________________________________________

Fax No.: _______________________________________________________________________

E-mail Address: __________________________________________________________________

Bidder’s Website: __________________________________________________________________

If address and phone number given above is for a branch office, provide address and phone
number of principal home office:

Principal Home Office Address: __________________________________________________________________

______________________________________________________________________________

Principal Home Office Telephone No.: __________________________________________________________________

Gentlemen:

The undersigned certifies under oath the truth and correctness of all statements and of all answers
to questions made hereinafter.

(Note: Attach additional sheets as required.)
1.0 Bidder’s General Business Information

1.1 Check if:

☐ Corporation  ☐ Partnership  ☐ Joint Venture  ☐ Other

☐ Limited Liability Company  ☐ Sole Partnership

If Corporation:

A. Date and State of Incorporation

B. List of Executive Officers:

<table>
<thead>
<tr>
<th>Name</th>
<th>Title</th>
<th>Address</th>
</tr>
</thead>
<tbody>
<tr>
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</tbody>
</table>

If Partnership:

A. Date and State of Organization:

B. Current General Partners (name and address for each):

C. Type of Partnership

☐ General  ☐ Publicly Traded  ☐ Limited

☐ Limited Liability  ☐ Other (describe): ____________________________
If Joint Venture:

A. Date and State of Organization:

__________________________________________________________________________

B. Name, Address, Form of Organization, and State of Organization of Each Joint
Venture Partner: (Indicate with an asterisk (*) the managing or controlling Join
Venturer if applicable):

__________________________________________________________________________

__________________________________________________________________________

__________________________________________________________________________

If Limited Liability Company:

A. Date and State of Organization:

__________________________________________________________________________

B. Members:

<table>
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<tr>
<th>Name</th>
<th>Address</th>
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</table>

If Sole Partnership:

A. Date and State of Organization:

__________________________________________________________________________

B. Name and Address of Owner or Owners:

__________________________________________________________________________

__________________________________________________________________________

__________________________________________________________________________

__________________________________________________________________________
If Other Type of Organization:

A. Type of Organization: ____________________________________________

B. Date and State of Organization:
______________________________________________________________

C. Name and Address of Each Owner or Principal:
______________________________________________________________
______________________________________________________________

1.2 Certifications: In addition to the above categories of business entities, indicate whether Bidder’s organization is a:

☐ Disadvantaged Business Enterprise, certified by: ______________________

☐ Minority Business Enterprise, certified by: ______________________

☐ Women’s Business Enterprise, certified by: ______________________

☐ Historically Underutilized Business Zone Small Business Concern, certified by: ______________________

2.0 How many years has your organization been in business as a general contractor?

______________________________________________________________

3.0 If your organizational structure has changed within the past five years, provide data as listed above in Item 1.0 for your previous organization.

4.0 Do you plan to subcontract any part of this project? If so, give details.

5.0 Has any construction contract to which you have been a party been terminated by the Owner; have you ever terminated work on a project prior to its completion for any reason; has any surety which issued a performance bond on your behalf ever completed the work in its own name or financed such completion on your behalf; has any surety expended any monies in connection with a contract for which they furnished a bond on your behalf? If the answer to any portion of this question is “Yes”, furnish details of all such occurrences including name of owner, architect or engineer, and surety, and name and date of project.

6.0 Has any officer or partner of your organization ever been an officer or partner of another organization that had any construction contract terminated by the Owner; terminated work on a project prior to its completion for any reason; had any surety which issued a performance bond complete the work in its own name or financed such completion; or had any surety expend monies in connection with a contract for which they furnished a bond?
If the answer to any portion of this question is “Yes”, furnish details of all such occurrences including name of owner, architect or engineer, and surety, and name and date of project.

7.0 In the last five years, has your organization, or any predecessor organization, failed to substantially complete a project in a timely manner? If the answer to this question is “Yes”, furnish details of all such occurrences including name of owner, architect or engineer, and surety, and name and date of project.

8.0 On Schedule A, attached, list name, location and description of project, owner, architect or engineer, contract price, percent complete and scheduled completions of the major construction projects your organization has in progress on this date. Provide name, address and telephone number of a reference for each project listed.

9.0 On Schedule B, attached, list name, location and description of project, owner, architect or engineer, contract price, date of completion and percent of work with your own forces of major project of the same general nature as this project which your organization has completed in the past five years. Provide name, address and telephone number of a reference for each project listed.

10.0 On Schedule C, attached, list name and construction experience of the principal individuals of your organization directly involved in construction operations.

11.0 Licenses and Registrations:

11.1 Indicate the jurisdiction in which your firm is legally qualified to practice. Indicated license or registration number for each jurisdiction, if applicable and type of license or registration. Attach separate sheet as required.

<table>
<thead>
<tr>
<th>Jurisdiction</th>
<th>License/Registration No.</th>
<th>Type</th>
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</table>

11.2 In the past five years, has Bidder had any business or professional license suspended or revoked?

☐ No  ☐ Yes

If yes, describe on a separate attachment the circumstances, including the jurisdiction and basis for suspension or revocation.
12.0 Provide the following information for your surety:

12.1 Surety Company: ____________________________________________

12.2 Agent: ____________________________________________________
   
   A. Agent Address: _____________________________________________
   
   B. Agent Telephone No.: _______________________________________

12.3 What is your approximate total bonding capacity?

   □ $500,000 to $2,000,000  
   □ $2,000,000 to $5,000,000  
   □ $5,000,000 to $10,000,000  
   □ $10,000,000 or more

13.0 Statement of Potential Conflict of Interest: List below business associations, financial interests, or other circumstances that may create a conflict of interest with other entities that are involved with this Project. Attach additional documentation as required.

   Company Name   Contact Name   Telephone Number
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
14.0 Dated at ________________, this ____________ day of __________________, 2020.

Bidder: __________________________
    (Print or Type Name of Bidder)

By: __________________________
    __________________________

Title: __________________________

Attachments A, B and C

__________________________
(Seal, if Corporation)

__________________________ (Acknowledgement)

__________________________ being duly sworn, deposes and says

that he/she is __________________ of ________________________________;
    __________________________
    (Name of Bidder)

That he/she is duly authorized to make the foregoing affidavit and that he/she makes it on
behalf of:
    ( ) himself/herself; ( ) said partnership; ( ) said corporation;
    ( ) said joint venture; ( ) said limited liability company

Sworn to before me this ____________, day of ____________, 2020, in the County of
    _________________________, State of ________________________.

__________________________
(Notary Public)

My commission expires ________________

__________________________
(Seal)

- END OF BIDDER QUALIFICATIONS STATEMENT-
**SCHEDULE A**

**PROJECTS IN PROGRESS**

<table>
<thead>
<tr>
<th>Name, Location and Description of Project</th>
<th>Owner</th>
<th>Architect or Engineer</th>
<th>Contract Price</th>
<th>Percent Complete</th>
<th>Scheduled Completion Date</th>
<th>Reference/Contact Include Address and Phone No.</th>
</tr>
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<tbody>
<tr>
<td>Name, Location and Description of Project</td>
<td>Owner</td>
<td>Architect or Engineer</td>
<td>Date Completed</td>
<td>Contract Price</td>
<td>Percent with Own Forces</td>
<td>Reference/Contact Include Address and Phone No.</td>
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</table>

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<tr>
<th>Name</th>
<th>Position</th>
<th>Date Started with This Organization</th>
<th>Date Started in Construction</th>
<th>Prior Positions and Experience in Construction</th>
</tr>
</thead>
</table>


THIS AGREEMENT is by and between the City of Meridian, 601 23rd Avenue, Meridian, Mississippi 39301 (hereinafter called Owner) and ________________________________ (hereinafter called Contractor).

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

ARTICLE 1 – WORK

1.01 Contractor shall at its own cost and expense furnish all labor, services, tools, materials, equipment, and incidental necessary to complete all Work as specified or indicated in the Contract Documents to construct all Work as specified or indicated in the Contract Documents to construct the B Street Water Treatment Plant & North Water Treatment Plant Improvements. The Work is generally described in Section 01010 Project Description and Scope of Work.

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:

B Street Water Treatment Plant & North Water Treatment Plant Improvements

- The Work to be performed under this Contract includes but is not limited to the following:
  - At the B Street Water Treatment Plant, in all eight (8) cells of the filter basin, removal and replacement of filter media, removal and replacement of underdrain system, removal and replacement of steel troughs and hangers, removal of surface wash sprayer arms and water supply piping, cleaning and repairs to the filter basin concrete, installation of a new underdrain system with air scour, installation of level sensors and installation of a protective coating on the basin walls.
  - At the B Street Water Treatment Plant, in the pipe gallery and adjacent to the filter basin, replacement/addition of butterfly valves with electronic valve actuators and controls, installation of positive displacement blowers, air...
scour piping and controls, removal and replacement of backwash pump, wall and pipe coating in the pipe gallery.

- At the B Street Water Treatment Plant, replacement of slide gates
- At the North Water Treatment Plant, replacement of pneumatic valve actuators with electronic valve actuators in the pipe gallery.

ARTICLE 3 – ENGINEER

3.01 The Project has been designed by Burk-Kleinpeter, Inc. (hereinafter called Engineer), which is to act as Owner’s representative, assume all duties and responsibilities and have the rights and authority assigned to Engineer in the Contract Documents in connection with 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 completions 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 shall be substantially completed within 270 calendar days after the date when the Contract Times commence to run as provided in Paragraph 4.01 of the General Conditions and completed and ready for final payment in accordance with Paragraph 15.06 of the General Conditions within 150 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 as stated in Paragraph 4.01.A above and that Owner will suffer financial loss, apart from the costs described in Paragraph 4.04.A, if the Work is not substantially completed within the time specified in Paragraph 4.02.A for Substantial Completion, plus any extensions thereof allowed in accordance with Article 11 of the General Conditions. Owner and contractor also recognize the delays, expense and difficulties involved in proving in a legal or arbitration proceeding the actual loss suffered by Owner if the Work is not substantially completed on time. Accordingly, instead of requiring any such proof, Owner and Contractor agree that as liquidated damages for delay (but not as a penalty) Contractor shall pay Owner $500.00 for each day that expires after the time specified in Paragraph 4.02.A above for Substantial Completion (adjusted for changes thereof, if any, made in accordance with Article 11 of the General Conditions) until the Work is substantially complete.

4.04 Special Damages
A. In addition to the amount provided for liquidated damages, Contractor shall pay Owner the actual costs reasonably incurred by Owner for engineering and inspection forces employed by Owner relative to the Work for each day that expires after the days specified in Paragraph 4.02.A for Substantial Completion (adjusted for changes thereof, if any, made in accordance with Article 11 of the General Conditions) until the Work is substantially complete.

B. After Substantial Completion, if Contractor shall neglect, refuse or fail to complete the remaining Work within the Contract Time or proper extension thereof, if any, granted by Owner, Contractor shall pay Owner the actual costs reasonably incurred by Owner for engineering and inspection forces employed by Owner relative to the Work for each day that expires after the time specified in Paragraph 4.02.A for Work to be completed and ready for final payment (adjusted for extensions thereof, if any, made in accordance with Article 11 of the General Conditions) until the Work is completed and ready for final payment.

4.05 Owner may deduct liquidated damages and special damages as determined by the provisions of this Article 4 from progress payments due Contractor under this Agreement.

ARTICLE 5 – ACCEPTANCE OF MATERIALS OR SERVICES

5.01 The material and/or services provided under this contract shall remain the property of the successful contractor until a physical inspection and actual usage of this material and/or services is made and thereafter accepted to the satisfaction of the Owner.

5.02 Materials and/or services must comply with all the terms herein. In the event the material and/or service supplied to the Owner is found to be defective or does not conform to the specifications, the Owner reserves the right to cancel the order upon written notice to the contractor. Materials shall be returned to the contractor at his expense.

ARTICLE 6 – CONTRACT PRICE

6.01 Owner shall pay Contractor, in current funds, for completion of the Work in accordance with the Contract Documents the prices stated in Contractor’s Bid, which Bid is attached hereto and identified as Exhibit 1 of this Agreement. As provided in Paragraph 13.03 of the General Conditions, estimated quantities are not guaranteed, and determination of actual quantities and classifications are to be made by Engineer as provided in Paragraph 13.03 of the General Conditions. Unit prices have been computed as provided in Paragraph 13.03 of the General Conditions.

ARTICLE 7 – PAYMENT PROCEDURES

7.01 Submittal and Processing of Payments
A. Contractor shall submit Applications for Payment in accordance with Article 15 of the General Conditions. Applications for Payment will be processed as provided in the General Conditions.

7.02 Progress Payments: 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. Contractor’s Applications for Payment will be due on the 15th day of each month during performance of the Work as provided in Paragraph 6.02.A.1. All progress payments will be on the basis of progress of the Work measured by the Schedule of Values provided for in Paragraph 2.03 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. A progress payment will not be made whenever the value of the Work completed since the last previous payment is less than $5,000.00.

1. Prior to Substantial Completion

   a. Progress payments will be in the amount of 95 percent of the Work completed (with the balance being retainage), less the aggregate of payments previously made and less such amounts as Engineer shall determine, or Owner may withhold, in accordance with Paragraph 15.01 of the General Conditions. If the Work has been 50 percent completed as determined by the Engineer, and if the character and progress of the Work have been satisfactory to Owner and Engineer, Owner may determine that as long as the character and progress remain satisfactory, there will be no retainage on account of the Work subsequently completed, in which case the remaining progress payments prior to Substantial Completion will be an amount equal to 100 percent of the value of the Work completed, less the aggregate payments previously made and less such amounts as Engineer shall determine, or Owner may withhold, in accordance with Paragraph 15.01 of the General Conditions; and

   b. 95 percent of the cost of materials and equipment not incorporated in the Work by suitably stored (with the balance being retainage).

2. Upon Substantial Completion, Owner shall pay an amount sufficient to increase total payments to Contractor to 95 percent of the Work completed, less such amounts as Engineer shall estimate as the value of Work to be completed or corrected as shown on the tentative list of items to be completed or corrected as attached to the certificate of Substantial Completion.

7.03 Final Payment:

A. Upon final completion and acceptance of the Work in accordance with Paragraph 15.06 of the General Conditions, Owner shall pay the remainder of the Contract Price as recommended by Engineer as provide in said Paragraph 15.06.
ARTICLE 8 – INTEREST

8.01 All monies not paid when due hereunder shall bear interest at the rate specified by Mississippi State law.

ARTICLE 9 – CONTRACTOR’S REPRESENTATIVE

9.01 As part of the inducement for Owner to enter into this Agreement, Contractor makes the following representations:

A. The 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 the Laws and Regulations that may affect cost, progress, and performance of the Work.

D. Contractor has considered the information known to Contractor; information commonly known to contractors doing business in the locality of the Site; information and observations from visits to the Site; the Contract Documents; and the Site-related reports and drawings identified in the Contract Documents, with respect to the effect of such information, observations, and documents on:

1. the cost, progress, and performance of the Work;

2. the means, methods, techniques, sequences and procedures of constructions to be employed by Contractor, including applying the specific means, methods, techniques, sequences, and procedures of construction expressly required by the Contract Documents, and;

3. Contractor’s safety precautions and programs.

E. Based on the information and observations referred to in Paragraph 8.01.D above, Contractor does not consider that further examinations, investigations, explorations, tests, studies or data are necessary for the performance of the Work at the Contract Price, within the Contract Times and in accordance with the other terms and conditions of the Contract Documents.

F. Contractor is aware of the general nature of work to be performed by Owner and other at the Site that relates to the Work as indicated in the Contract Documents.

G. 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.
H. The Contract Documents are generally sufficient to indicated and convey understanding of all terms and conditions for the performance of the Work.

ARTICLE 10 – CONTRACT DOCUMENTS

10.01 The Contract Documents consist of the following:

A. This Agreement (pages 1 to 9, inclusive).
B. Performance Bond (pages 1 to 3, inclusive).
C. Payment Bond (pages 1 to 3, inclusive).
D. General Conditions (pages 1 to 66, inclusive).
E. Supplementary Conditions (pages 1 to 8, inclusive).
F. Specifications, as listed in the Table of Contents of the Project Manual.
G. The Drawings comprising a set entitled “B Street Water Treatment Plant & North Water Treatment Plant Improvements”, dated November 19 and including the following.

1. Title Sheet
2. Sheets numbered C0.1 through C1.3
3. Sheets numbered S1.0 through S4.0
4. Sheets numbered M.00 through M.27
5. Sheets numbered I1.0 through I1.8
6. Sheets numbered E1.0 through E17.0
H. Addenda consisting of Numbers ____ to ____ , inclusive.
I. Exhibits to this Agreement enumerated as follows:

1. Exhibit 1, Contractor’s Bid (pages 1 through 10 with Attached Bid Schedule, inclusive).
J. The following, which may be delivered or issued on or after the Effective Date of this Agreement, and are not attached hereto:

1. Notice to Proceed
2. Work Change Directive(s)
3. Change Order(s)
10.02 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 not Contract Documents other than those listed in the Article 9.

10.03 The Contract Documents may only be amended or supplemented as provided in Paragraph 3.04 of the General Conditions.

ARTICLE 11 – MISCELLANEOUS

11.01 Terms

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

11.02 Assignment of Contract

A. No assignment by a party hereto of any rights under or interests in the Contract will be binding on another party hereto without the written consent of the party sought to be bound; and, specifically but without limitation, monies that may become due and monies that are due may not be assigned without such consent (except to the extent that the effect of this restriction may be limited by law), and unless specifically stated to the contrary in any written consent to an assignment, not assignment will realist or discharge the assignor from any duty or responsibility under the Contract Documents.

11.03 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.

11.04 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.

11.05 Waiver

A. The waiver by the Owner of any breach or violation of any term, covenant, or conditions 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 fees by the Owner which may become due hereunder shall not be deemed to be a waiver of any preceding breach of violation by Contractor of any term, covenant, or condition of this Agreement or of any applicable Law or Regulation.

11.06 Contractor's Certifications

A. Contractor certifies that it has not engaged in corrupt, fraudulent, collusive, or coercive practices in competing for or in executing the Contract. For the purposes of the Paragraph 10.06:

1. “corrupt practice” means the offering, giving, receiving, or soliciting of anything of value likely to influence the action of a public official in the bidding process or in the Contract execution;

2. “fraudulent practice” means and intentional misrepresentation of facts made to:
   a. influence the bidding process or the execution of the Contract to the detriment of Owner,
   b. establish Bid or Contract prices at artificial non-competitive levels, or
   c. deprive Owner of the benefits of free and open competition.

3. “collusive practice” means a scheme or arrangement between two or more Bidders, with or without the knowledge of Owner, a purpose of which is to establish Bid prices at artificial, non-competitive levels; and

4. “coercive practice” means harming or threatening to harm directly or indirectly persons or their property to influence their participation in the bidding process or affect the execution of the Contract.

IN WITNESS WHEREOF, Owner and Contractor have signed this Agreement. Counterparts have been delivered to Owner and Contractor. All portions of the Contract Documents have been identified by Owner and Contractor or on their behalf.

This Agreement will be effective on ________________, 2018 (which is the Effective Date of the Agreement).

Owner: ____________________________  Contractor: ____________________________
By: ______________________________  By: ______________________________
Title: ____________________________  Title: ____________________________
Attest ___________________________ Attest ___________________________

Title: ___________________________ Title: ___________________________

Address for giving notices

_________________________________________________

_________________________________________________

Address for giving notices

_________________________________________________

_________________________________________________

- END OF AGREEMENT –
PERFORMANCE BOND

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

OWNER (name and address):

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

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

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

CONTRACTOR AS PRINCIPAL  SURETY

Contractor’s Name and Corporate Seal  Surety’s Name and Corporate Seal

By:  
   Signature  
   Print Name  
   Title  

Attest:  
   Signature  
   Title

By:  
   Signature (attach power of attorney)  
   Print Name  
   Title

Attest:  
   Signature  
   Title

Notes: (1) Provide supplemental execution by any additional parties, such as joint venturers. (2) Any singular reference to Contractor, Surety, Owner, or other party shall be considered plural where applicable.
1. The Contractor and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors, and assigns to the Owner for the performance of the Construction Contract, which is incorporated herein by reference.

2. If the Contractor performs the Construction Contract, the Surety and the Contractor shall have no obligation under this Bond, except when applicable to participate in a conference as provided in Paragraph 3.

3. If there is no Owner Default under the Construction Contract, the Surety’s obligation under this Bond shall arise after:

   3.1 The Owner first provides notice to the Contractor and the Surety that the Owner is considering declaring a Contractor Default. Such notice shall indicate whether the Owner is requesting a conference among the Owner, Contractor, and Surety to discuss the Contractor’s performance. If the Owner does not request a conference, the Surety may, within five (5) business days after receipt of the Owner’s notice, request such a conference. If the Surety timely requests a conference, the Owner shall attend. Unless the Owner agrees otherwise, any conference requested under this Paragraph 3.1 shall be held within ten (10) business days of the Surety’s receipt of the Owner’s notice. If the Owner, the Contractor, and the Surety agree, the Contractor shall be allowed a reasonable time to perform the Construction Contract, but such an agreement shall not waive the Owner’s right, if any, subsequently to declare a Contractor Default;

   3.2 The Owner declares a Contractor Default, terminates the Construction Contract and notifies the Surety; and

   3.3 The Owner has agreed to pay the Balance of the Contract Price in accordance with the terms of the Construction Contract to the Surety or to a contractor selected to perform the Construction Contract.

4. Failure on the part of the Owner to comply with the notice requirement in Paragraph 3.1 shall not constitute a failure to comply with a condition precedent to the Surety’s obligations, or release the Surety from its obligations, except to the extent the Surety demonstrates actual prejudice.

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

   5.1 Arrange for the Contractor, with the consent of the Owner, to perform and complete the Construction Contract;

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

   5.3 Obtain bids or negotiated proposals from qualified contractors acceptable to the Owner for a contract for performance and completion of the Construction Contract, arrange for a contract to be prepared for execution by the Owner and a contractor selected with the Owners concurrence, to be secured with performance and payment bonds executed by a qualified surety equivalent to the bonds issued on the Construction Contract, and pay to the Owner the amount of damages as described in Paragraph 7 in excess of the Balance of the Contract Price incurred by the Owner as a result of the Contractor Default; or

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

   5.4.1 After investigation, determine the amount for which it may be liable to the Owner and, as soon as practicable after the amount is determined, make payment to the Owner; or

   5.4.2 Deny liability in whole or in part and notify the Owner, citing the reasons for denial.

6. If the Surety does not proceed as provided in Paragraph 5 with reasonable promptness, the Surety shall be deemed to be in default on this Bond seven days after receipt of an additional written notice from the Owner to the Surety demanding that the Surety perform its obligations under this Bond, and the Surety shall be entitled to enforce any remedy available to the Owner. If the Surety proceeds as provided in Paragraph 5.4, and the Owner refuses the payment or the Surety has denied liability, in whole or in part, without further notice the Owner shall be entitled to enforce any remedy available to the Owner.

7. If the Surety elects to act under Paragraph 5.1, 5.2, or 5.3, then the responsibilities of the Surety to the Owner shall not be greater than those of the Contractor under the Construction Contract, and the responsibilities of the Owner to the Surety shall not be greater than those of the Owner under the Construction Contract. Subject to the commitment by the Owner to pay the Balance of the Contract Price, the Surety is obligated, without duplication for:

   7.1 the responsibilities of the Contractor for correction of defective work and completion of the Construction Contract;

   7.2 additional legal, design professional, and delay costs resulting from the Contractor’s Default, and resulting from the actions or failure to act of the Surety under Paragraph 5; and

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

8. If the Surety elects to act under Paragraph 5.1, 5.3, or 5.4, the Surety’s liability is limited to the amount of this Bond.

9. The Surety shall not be liable to the Owner or others for obligations of the Contractor that are unrelated to the Construction Contract, and the Balance of the Contract Price shall not be reduced or set off on account of any such unrelated obligations. No right of action shall accrue on this Bond to any person or entity other than the Owner or its heirs, executors, administrators, successors, and assigns.
10. The Surety hereby waives notice of any change, including changes of time, to the Construction Contract or to related subcontracts, purchase orders, and other obligations.

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

12. Notice to the Surety, the Owner, or the Contractor shall be mailed or delivered to the address shown on the page on which their signature appears.

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

14. Definitions

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

14.2 Construction Contract: The agreement between the Owner and Contractor identified on the cover page, including all Contract Documents and changes made to the agreement and the Contract Documents.

14.3 Contractor Default: Failure of the Contractor, which has not been remedied or waived, to perform or otherwise to comply with a material term of the Construction Contract.

14.4 Owner Default: Failure of the Owner, which has not been remedied or waived, to pay the Contractor as required under the Construction Contract or to perform and complete or comply with the other material terms of the Construction Contract.

14.5 Contract Documents: All the documents that comprise the agreement between the Owner and Contractor.

15. If this Bond is issued for an agreement between a contractor and subcontractor, the term Contractor in this Bond shall be deemed to be Subcontractor and the term Owner shall be deemed to be Contractor.

16. Modifications to this Bond are as follows:
PAYMENT BOND

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

OWNER (name and address):

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

BOND
   Bond Number:
   Date (not earlier than the Effective Date of the Agreement of the Construction Contract):
   Amount:
   Modifications to this Bond Form: □ None □ See Paragraph 18

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

CONTRACTOR AS PRINCIPAL

__________________________________ (seal)
Contractor’s Name and Corporate Seal

By: ________________________________
   Signature

______________________________
Print Name

______________________________
Title

Attest: ________________________________
   Signature

______________________________
Title

SURETY

__________________________________ (seal)
Surety’s Name and Corporate Seal

By: ________________________________
   Signature (attach power of attorney)

______________________________
Print Name

______________________________
Title

Attest: ________________________________
   Signature

______________________________
Title

Notes: (1) Provide supplemental execution by any additional parties, such as joint venturers. (2) Any singular reference to Contractor, Surety, Owner, or other party shall be considered plural where applicable.
1. The Contractor and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors, and assigns to the Owner to pay for labor, materials, and equipment furnished for use in the performance of the Construction Contract, which is incorporated herein by reference, subject to the following terms.

2. If the Contractor promptly makes payment of all sums due to Claimants, and defends, indemnifies, and holds harmless the Owner from claims, demands, liens, or suits by any person or entity seeking payment for labor, materials, or equipment furnished for use in the performance of the Construction Contract, then the Surety and the Contractor shall have no obligation under this Bond.

3. If there is no Owner Default under the Construction Contract, the Surety’s obligation to the Owner under this Bond shall arise after the Owner has promptly notified the Contractor and the Surety (at the address described in Paragraph 13) of claims, demands, liens, or suits against the Owner or the Owner’s property by any person or entity seeking payment for labor, materials, or equipment furnished for use in the performance of the Construction Contract, and tendered defense of such claims, demands, liens, or suits to the Contractor and the Surety.

4. When the Owner has satisfied the conditions in Paragraph 3, the Surety shall promptly and at the Surety’s expense defend, indemnify, and hold harmless the Owner against a duly tendered claim, demand, lien, or suit.

5. The Surety’s obligations to a Claimant under this Bond shall arise after the following:
   
   5.1 Claimants who do not have a direct contract with the Contractor,
   
   5.1.1 have furnished a written notice of non-payment to the Contractor, stating with substantial accuracy the amount claimed and the name of the party to whom the materials were, or equipment was, furnished or supplied or for whom the labor was done or performed, within ninety (90) days after having last performed labor or last furnished materials or equipment included in the Claim; and
   
   5.1.2 have sent a Claim to the Surety (at the address described in Paragraph 13).
   
   5.2 Claimants who are employed by or have a direct contract with the Contractor have sent a Claim to the Surety (at the address described in Paragraph 13).

6. If a notice of non-payment required by Paragraph 5.1.1 is given by the Owner to the Contractor, that is sufficient to satisfy a Claimant’s obligation to furnish a written notice of non-payment under Paragraph 5.1.1.

7. When a Claimant has satisfied the conditions of Paragraph 5.1 or 5.2, whichever is applicable, the Surety shall promptly and at the Surety’s expense take the following actions:

   7.1 Send an answer to the Claimant, with a copy to the Owner, within sixty (60) days after receipt of the Claim, stating the amounts that are undisputed and the basis for challenging any amounts that are disputed; and
   
   7.2 Pay or arrange for payment of any undisputed amounts.

   7.3 The Surety’s failure to discharge its obligations under Paragraph 7.1 or 7.2 shall not be deemed to constitute a waiver of defenses the Surety or Contractor may have or acquire as to a Claim, except as to undisputed amounts for which the Surety and Claimant have reached agreement. If, however, the Surety fails to discharge its obligations under Paragraph 7.1 or 7.2, the Surety shall indemnify the Claimant for the reasonable attorney’s fees the Claimant incurs thereafter to recover any sums found to be due and owing to the Claimant.

8. The Surety’s total obligation shall not exceed the amount of this Bond, plus the amount of reasonable attorney’s fees provided under Paragraph 7.3, and the amount of this Bond shall be credited for any payments made in good faith by the Surety.

9. Amounts owed by the Owner to the Contractor under the Construction Contract shall be used for the performance of the Construction Contract and to satisfy claims, if any, under any construction performance bond. By the Contractor furnishing and the Owner accepting this Bond, they agree that all funds earned by the Contractor in the performance of the Construction Contract are dedicated to satisfy obligations of the Contractor and Surety under this Bond, subject to the Owner’s priority to use the funds for the completion of the work.

10. The Surety shall not be liable to the Owner, Claimants, or others for obligations of the Contractor that are unrelated to the Construction Contract. The Owner shall not be liable for the payment of any costs or expenses of any Claimant under this Bond, and shall have under this Bond no obligation to make payments to or give notice on behalf of Claimants, or otherwise have any obligations to Claimants under this Bond.

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

12. No suit or action shall be commenced by a Claimant under this Bond other than in a court of competent jurisdiction in which suit or action is commenced, the Surety shall promptly and at the Surety’s expense take the following actions:
the state in which the project that is the subject of the Construction Contract is located or after the expiration of one year from the date (1) on which the Claimant sent a Claim to the Surety pursuant to Paragraph 5.1.2 or 5.2, or (2) on which the last labor or service was performed by anyone or the last materials or equipment were furnished by anyone under the Construction Contract, whichever of (1) or (2) first occurs. If the provisions of this paragraph are void or prohibited by law, the minimum period of limitation available to sureties as a defense in the jurisdiction of the suit shall be applicable.

13. Notice and Claims to the Surety, the Owner, or the Contractor shall be mailed or delivered to the address shown on the page on which their signature appears. Actual receipt of notice or Claims, however accomplished, shall be sufficient compliance as of the date received.

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

15. Upon requests by any person or entity appearing to be a potential beneficiary of this Bond, the Contractor and Owner shall promptly furnish a copy of this Bond or shall permit a copy to be made.

16. Definitions

16.1 Claim: A written statement by the Claimant including at a minimum:

1. The name of the Claimant;
2. The name of the person for whom the labor was done, or materials or equipment furnished;
3. A copy of the agreement or purchase order pursuant to which labor, materials, or equipment was furnished for use in the performance of the Construction Contract;
4. A brief description of the labor, materials, or equipment furnished;
5. The date on which the Claimant last performed labor or last furnished materials or equipment for use in the performance of the Construction Contract;
6. The total amount earned by the Claimant for labor, materials, or equipment furnished as of the date of the Claim;
7. The total amount of previous payments received by the Claimant; and
8. The total amount due and unpaid to the Claimant for labor, materials, or equipment furnished as of the date of the Claim.

16.2 Claimant: An individual or entity having a direct contract with the Contractor or with a subcontractor of the Contractor to furnish labor, materials, or equipment for use in the performance of the Construction Contract. The term Claimant also includes any individual or entity that has rightfully asserted a claim under an applicable mechanic’s lien or similar statute against the real property upon which the Project is located. The intent of this Bond shall be to include without limitation in the terms of “labor, materials, or equipment” that part of the water, gas, power, light, heat, oil, gasoline, telephone service, or rental equipment used in the Construction Contract, architectural and engineering services required for performance of the work of the Contractor and the Contractor’s subcontractors, and all other items for which a mechanic’s lien may be asserted in the jurisdiction where the labor, materials, or equipment were furnished.

16.3 Construction Contract: The agreement between the Owner and Contractor identified on the cover page, including all Contract Documents and all changes made to the agreement and the Contract Documents.

16.4 Owner Default: Failure of the Owner, which has not been remedied or waived, to pay the Contractor as required under the Construction Contract or to perform and complete or comply with the other material terms of the Construction Contract.

16.5 Contract Documents: All the documents that comprise the agreement between the Owner and Contractor.

17. If this Bond is issued for an agreement between a contractor and subcontractor, the term Contractor in this Bond shall be deemed to be Subcontractor and the term Owner shall be deemed to be Contractor.

18. Modifications to this Bond are as follows:
STANDARD GENERAL CONDITIONS
OF THE CONSTRUCTION CONTRACT

City of Meridian

B Street Water Treatment Plant &
North Water Treatment Plant Improvements

DWSIRLF Project No. DWI-L380005-01
# STANDARD GENERAL CONDITIONS OF THE CONSTRUCTION CONTRACT

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ARTICLE 1 – DEFINITIONS AND TERMINOLOGY

1.01 Defined Terms

A. Wherever used in the Bidding Requirements or Contract Documents, a term printed with initial capital letters, including the term’s singular and plural forms, will have the meaning indicated in the definitions below. In addition to terms specifically defined, terms with initial capital letters in the Contract Documents include references to identified articles and paragraphs, and the titles of other documents or forms.

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

2. **Agreement**—The written instrument, executed by Owner and Contractor, that sets forth the Contract Price and Contract Times, identifies the parties and the Engineer, and designates the specific items that are Contract Documents.

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

4. **Bid**—The offer of a Bidder submitted on the prescribed form setting forth the prices for the Work to be performed.

5. **Bidder**—An individual or entity that submits a Bid to Owner.

6. **Bidding Documents**—The Bidding Requirements, the proposed Contract Documents, and all Addenda.

7. **Bidding Requirements**—The advertisement or invitation to bid, Instructions to Bidders, Bid Bond or other Bid security, if any, the Bid Form, and the Bid with any attachments.

8. **Change Order**—A document which is signed by Contractor and Owner and authorizes an addition, deletion, or revision in the Work or an adjustment in the Contract Price or the Contract Times, or other revision to the Contract, issued on or after the Effective Date of the Contract.

9. **Change Proposal**—A written request by Contractor, duly submitted in compliance with the procedural requirements set forth herein, seeking an adjustment in Contract Price or Contract Times, or both; contesting an initial decision by Engineer concerning the requirements of the Contract Documents or the acceptability of Work under the Contract Documents; challenging a set-off against payments due; or seeking other relief with respect to the terms of the Contract.

10. **Claim**—(a) A demand or assertion by Owner directly to Contractor, duly submitted in compliance with the procedural requirements set forth herein: seeking an adjustment in Contract Price or Contract Times, or both; contesting an initial decision by Engineer concerning the requirements of the Contract Documents or the acceptability of Work under the Contract Documents; contesting Engineer’s decision regarding a Change Proposal; seeking resolution of a contractual issue that Engineer has declined to address; or seeking other relief with respect to the terms of the Contract; or (b) a demand or assertion by Contractor directly to Owner, duly submitted in compliance with the procedural requirements set forth herein, contesting Engineer’s decision
regarding a Change Proposal; or seeking resolution of a contractual issue that Engineer has declined to address. A demand for money or services by a third party is not a Claim.

11. **Constituent of Concern**—Asbestos, petroleum, radioactive materials, polychlorinated biphenyls (PCBs), hazardous waste, and any substance, product, waste, or other material of any nature whatsoever that is or becomes listed, regulated, or addressed pursuant to (a) the Comprehensive Environmental Response, Compensation and Liability Act, 42 U.S.C. §§9601 et seq. (“CERCLA”); (b) the Hazardous Materials Transportation Act, 49 U.S.C. §§5101 et seq.; (c) the Resource Conservation and Recovery Act, 42 U.S.C. §§6901 et seq. (“RCRA”); (d) the Toxic Substances Control Act, 15 U.S.C. §§2601 et seq.; (e) the Clean Water Act, 33 U.S.C. §§1251 et seq.; (f) the Clean Air Act, 42 U.S.C. §§7401 et seq.; or (g) any other federal, state, or local statute, law, rule, regulation, ordinance, resolution, code, order, or decree regulating, relating to, or imposing liability or standards of conduct concerning, any hazardous, toxic, or dangerous waste, substance, or material.

12. **Contract**—The entire and integrated written contract between the Owner and Contractor concerning the Work.

13. **Contract Documents**—Those items so designated in the Agreement, and which together comprise the Contract.

14. **Contract Price**—The money that Owner has agreed to pay Contractor for completion of the Work in accordance with the Contract Documents.

15. **Contract Times**—The number of days or the dates by which Contractor shall: (a) achieve Milestones, if any; (b) achieve Substantial Completion; and (c) complete the Work.

16. **Contractor**—The individual or entity with which Owner has contracted for performance of the Work.

17. **Cost of the Work**—See Paragraph 13.01 for definition.

18. **Drawings**—The part of the Contract that graphically shows the scope, extent, and character of the Work to be performed by Contractor.

19. **Effective Date of the Contract**—The date, indicated in the Agreement, on which the Contract becomes effective.

20. **Engineer**—The individual or entity named as such in the Agreement.

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

22. **Hazardous Environmental Condition**—The presence at the Site of Constituents of Concern in such quantities or circumstances that may present a danger to persons or property exposed thereto. The presence at the Site of materials that are necessary for the execution of the Work, or that are to be incorporated in the Work, and that are controlled and contained pursuant to industry practices, Laws and Regulations, and the requirements of the Contract, does not establish a Hazardous Environmental Condition.
23. **Laws and Regulations; Laws or Regulations**—Any and all applicable laws, statutes, rules, regulations, ordinances, codes, and orders of any and all governmental bodies, agencies, authorities, and courts having jurisdiction.

24. **Liens**—Charges, security interests, or encumbrances upon Contract-related funds, real property, or personal property.

25. **Milestone**—A principal event in the performance of the Work that the Contract requires Contractor to achieve by an intermediate completion date or by a time prior to Substantial Completion of all the Work.

26. **Notice of Award**—The written notice by Owner to a Bidder of Owner’s acceptance of the Bid.

27. **Notice to Proceed**—A written notice by Owner to Contractor fixing the date on which the Contract Times will commence to run and on which Contractor shall start to perform the Work.

28. **Owner**—The individual or entity with which Contractor has contracted regarding the Work, and which has agreed to pay Contractor for the performance of the Work, pursuant to the terms of the Contract.

29. **Progress Schedule**—A schedule, prepared and maintained by Contractor, describing the sequence and duration of the activities comprising the Contractor’s plan to accomplish the Work within the Contract Times.

30. **Project**—The total undertaking to be accomplished for Owner by engineers, contractors, and others, including planning, study, design, construction, testing, commissioning, and start-up, and of which the Work to be performed under the Contract Documents is a part.

31. **Project Manual**—The written documents prepared for, or made available for, procuring and constructing the Work, including but not limited to the Bidding Documents or other construction procurement documents, geotechnical and existing conditions information, the Agreement, bond forms, General Conditions, Supplementary Conditions, and Specifications. The contents of the Project Manual may be bound in one or more volumes.

32. **Resident Project Representative**—The authorized representative of Engineer assigned to assist Engineer at the Site. As used herein, the term Resident Project Representative or “RPR” includes any assistants or field staff of Resident Project Representative.

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

34. **Schedule of Submittals**—A schedule, prepared and maintained by Contractor, of required submittals and the time requirements for Engineer’s review of the submittals and the performance of related construction activities.

35. **Schedule of Values**—A schedule, prepared and maintained by Contractor, allocating portions of the Contract Price to various portions of the Work and used as the basis for reviewing Contractor’s Applications for Payment.

36. **Shop Drawings**—All drawings, diagrams, illustrations, schedules, and other data or information that are specifically prepared or assembled by or for Contractor and
submitted by Contractor to illustrate some portion of the Work. Shop Drawings, whether approved or not, are not Drawings and are not Contract Documents.

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

38. **Specifications**—The part of the Contract that consists of written requirements for materials, equipment, systems, standards, and workmanship as applied to the Work, and certain administrative requirements and procedural matters applicable to the Work.

39. **Subcontractor**—An individual or entity having a direct contract with Contractor or with any other Subcontractor for the performance of a part of the Work.

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

41. **Successful Bidder**—The Bidder whose Bid the Owner accepts, and to which the Owner makes an award of contract, subject to stated conditions.

42. **Supplementary Conditions**—The part of the Contract that amends or supplements these General Conditions.

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

44. **Technical Data**—Those items expressly identified as Technical Data in the Supplementary Conditions, with respect to either (a) subsurface conditions at the Site, or physical conditions relating to existing surface or subsurface structures at the Site (except Underground Facilities) or (b) Hazardous Environmental Conditions at the Site. If no such express identifications of Technical Data have been made with respect to conditions at the Site, then the data contained in boring logs, recorded measurements of subsurface water levels, laboratory test results, and other factual, objective information regarding conditions at the Site that are set forth in any geotechnical or environmental report prepared for the Project and made available to Contractor are hereby defined as Technical Data with respect to conditions at the Site under Paragraphs 5.03, 5.04, and 5.06.

45. **Underground Facilities**—All underground pipelines, conduits, ducts, cables, wires, manholes, vaults, tanks, tunnels, or other such facilities or attachments, and any encasements containing such facilities, including but not limited to those that convey electricity, gases, steam, liquid petroleum products, telephone or other communications, fiber optic transmissions, cable television, water, wastewater, storm water, other liquids or chemicals, or traffic or other control systems.

46. **Unit Price Work**—Work to be paid for on the basis of unit prices.

47. **Work**—The entire construction or the various separately identifiable parts thereof required to be provided under the Contract Documents. Work includes and is the
result of performing or providing all labor, services, and documentation necessary to produce such construction; furnishing, installing, and incorporating all materials and equipment into such construction; and may include related services such as testing, start-up, and commissioning, all as required by the Contract Documents.

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

### 1.02 Terminology

**A.** The words and terms discussed in the following paragraphs are not defined but, when used in the Bidding Requirements or Contract Documents, have the indicated meaning.

**B. Intent of Certain Terms or Adjectives:**

1. The Contract Documents include the terms “as allowed,” “as approved,” “as ordered,” “as directed” or terms of like effect or import to authorize an exercise of professional judgment by Engineer. In addition, the adjectives “reasonable,” “suitable,” “acceptable,” “proper,” “satisfactory,” or adjectives of like effect or import are used to describe an action or determination of Engineer as to the Work. It is intended that such exercise of professional judgment, action, or determination will be solely to evaluate, in general, the Work for compliance with the information in the Contract Documents and with the design concept of the Project as a functioning whole as shown or indicated in the Contract Documents (unless there is a specific statement indicating otherwise). The use of any such term or adjective is not intended to and shall not be effective to assign to Engineer any duty or authority to supervise or direct the performance of the Work, or any duty or authority to undertake responsibility contrary to the provisions of Article 10 or any other provision of the Contract Documents.

**C. Day:**

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

**D. Defective:**

1. The word “defective,” when modifying the word “Work,” refers to Work that is unsatisfactory, faulty, or deficient in that it:
   
   a. does not conform to the Contract Documents; or
   
   b. does not meet the requirements of any applicable inspection, reference standard, test, or approval referred to in the Contract Documents; or
   
   c. has been damaged prior to Engineer’s recommendation of final payment (unless responsibility for the protection thereof has been assumed by Owner at Substantial Completion in accordance with Paragraph 15.03 or 15.04).

**E. Furnish, Install, Perform, Provide:**

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

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

4. If the Contract Documents establish an obligation of Contractor with respect to specific services, materials, or equipment, but do not expressly use any of the four words “furnish,” “install,” “perform,” or “provide,” then Contractor shall furnish and install said services, materials, or equipment complete and ready for intended use.

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

ARTICLE 2 – PRELIMINARY MATTERS

2.01 Delivery of Bonds and Evidence of Insurance

A. **Bonds:** When Contractor delivers the executed counterparts of the Agreement to Owner, Contractor shall also deliver to Owner such bonds as Contractor may be required to furnish.

B. **Evidence of Contractor’s Insurance:** When Contractor delivers the executed counterparts of the Agreement to Owner, Contractor shall also deliver to Owner, with copies to each named insured and additional insured (as identified in the Supplementary Conditions or elsewhere in the Contract), the certificates and other evidence of insurance required to be provided by Contractor in accordance with Article 6.

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

2.02 Copies of Documents

A. Owner shall furnish to Contractor four printed copies of the Contract (including one fully executed counterpart of the Agreement), and one copy in electronic portable document format (PDF). Additional printed copies will be furnished upon request at the cost of reproduction.

B. Owner shall maintain and safeguard at least one original printed record version of the Contract, including Drawings and Specifications signed and sealed by Engineer and other design professionals. Owner shall make such original printed record version of the Contract available to Contractor for review. Owner may delegate the responsibilities under this provision to Engineer.

2.03 Before Starting Construction

A. **Preliminary Schedules:** Within 10 days after the Effective Date of the Contract (or as otherwise specifically required by the Contract Documents), Contractor shall submit to Engineer for timely review:
1. a preliminary Progress Schedule indicating the times (numbers of days or dates) for starting and completing the various stages of the Work, including any Milestones specified in the Contract;

2. a preliminary Schedule of Submittals; and

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

2.04 Preconstruction Conference; Designation of Authorized Representatives

A. Before any Work at the Site is started, a conference attended by Owner, Contractor, Engineer, and others as appropriate will be held to establish a working understanding among the parties as to the Work and to discuss the schedules referred to in Paragraph 2.03.A, procedures for handling Shop Drawings, Samples, and other submittals, processing Applications for Payment, electronic or digital transmittals, and maintaining required records.

B. At this conference Owner and Contractor each shall designate, in writing, a specific individual to act as its authorized representative with respect to the services and responsibilities under the Contract. Such individuals shall have the authority to transmit and receive information, render decisions relative to the Contract, and otherwise act on behalf of each respective party.

2.05 Initial Acceptance of Schedules

A. At least 10 days before submission of the first Application for Payment a conference, attended by Contractor, Engineer, and others as appropriate, will be held to review for acceptability to Engineer as provided below the schedules submitted in accordance with Paragraph 2.03.A. Contractor shall have an additional 10 days to make corrections and adjustments and to complete and resubmit the schedules. No progress payment shall be made to Contractor until acceptable schedules are submitted to Engineer.

1. The Progress Schedule will be acceptable to Engineer if it provides an orderly progression of the Work to completion within the Contract Times. Such acceptance will not impose on Engineer responsibility for the Progress Schedule, for sequencing, scheduling, or progress of the Work, nor interfere with or relieve Contractor from Contractor’s full responsibility therefor.

2. Contractor’s Schedule of Submittals will be acceptable to Engineer if it provides a workable arrangement for reviewing and processing the required submittals.

3. Contractor’s Schedule of Values will be acceptable to Engineer as to form and substance if it provides a reasonable allocation of the Contract Price to the component parts of the Work.

2.06 Electronic Transmittals

A. Except as otherwise stated elsewhere in the Contract, the Owner, Engineer, and Contractor may transmit, and shall accept, Project-related correspondence, text, data, documents, drawings, information, and graphics, including but not limited to Shop Drawings and other submittals, in electronic media or digital format, either directly, or through access to a secure Project website.
B. If the Contract does not establish protocols for electronic or digital transmittals, then Owner, Engineer, and Contractor shall jointly develop such protocols.

C. When transmitting items in electronic media or digital format, the transmitting party makes no representations as to long term compatibility, usability, or readability of the items resulting from the recipient’s use of software application packages, operating systems, or computer hardware differing from those used in the drafting or transmittal of the items, or from those established in applicable transmittal protocols.

ARTICLE 3 – DOCUMENTS: INTENT, REQUIREMENTS, REUSE

3.01 Intent

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

B. It is the intent of the Contract Documents to describe a functionally complete project (or part thereof) to be constructed in accordance with the Contract Documents.

C. Unless otherwise stated in the Contract Documents, if there is a discrepancy between the electronic or digital versions of the Contract Documents (including any printed copies derived from such electronic or digital versions) and the printed record version, the printed record version shall govern.

D. The Contract supersedes prior negotiations, representations, and agreements, whether written or oral.

E. Engineer will issue clarifications and interpretations of the Contract Documents as provided herein.

3.02 Reference Standards

A. Standards Specifications, Codes, Laws and Regulations

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

2. No provision of any such standard specification, manual, reference standard, or code, or any instruction of a Supplier, shall be effective to change the duties or responsibilities of Owner, Contractor, or Engineer, or any of their subcontractors, consultants, agents, or employees, from those set forth in the part of the Contract Documents prepared by or for Engineer. No such provision or instruction shall be effective to assign to Owner, Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors, any duty or authority to supervise or direct the performance of the Work or any duty or authority to undertake responsibility inconsistent with the provisions of the part of the Contract Documents prepared by or for Engineer.
3.03  Reporting and Resolving Discrepancies

A.  Reporting Discrepancies:

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

2.  Contractor’s Review of Contract Documents: If, before or during the performance of the Work, Contractor discovers any conflict, error, ambiguity, or discrepancy within the Contract Documents, or between the Contract Documents and (a) any applicable Law or Regulation, (b) actual field conditions, (c) any standard specification, manual, reference standard, or code, or (d) any instruction of any Supplier, then Contractor shall promptly report it to Engineer in writing. Contractor shall not proceed with the Work affected thereby (except in an emergency as required by Paragraph 7.15) until the conflict, error, ambiguity, or discrepancy is resolved, by a clarification or interpretation by Engineer, or by an amendment or supplement to the Contract Documents issued pursuant to Paragraph 11.01.

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

B.  Resolving Discrepancies:

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

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

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

3.04  Requirements of the Contract Documents

A.  During the performance of the Work and until final payment, Contractor and Owner shall submit to the Engineer all matters in question concerning the requirements of the Contract Documents (sometimes referred to as requests for information or interpretation—RFIs), or relating to the acceptability of the Work under the Contract Documents, as soon as possible after such matters arise. Engineer will be the initial interpreter of the requirements of the Contract Documents, and judge of the acceptability of the Work thereunder.

B.  Engineer will, with reasonable promptness, render a written clarification, interpretation, or decision on the issue submitted, or initiate an amendment or supplement to the Contract
Documents. Engineer’s written clarification, interpretation, or decision will be final and binding on Contractor, unless it appeals by submitting a Change Proposal, and on Owner, unless it appeals by filing a Claim.

C. If a submitted matter in question concerns terms and conditions of the Contract Documents that do not involve (1) the performance or acceptability of the Work under the Contract Documents, (2) the design (as set forth in the Drawings, Specifications, or otherwise), or (3) other engineering or technical matters, then Engineer will promptly give written notice to Owner and Contractor that Engineer is unable to provide a decision or interpretation. If Owner and Contractor are unable to agree on resolution of such a matter in question, either party may pursue resolution as provided in Article 12.

3.05 Reuse of Documents

A. Contractor and its Subcontractors and Suppliers shall not:

1. have or acquire any title to or ownership rights in any of the Drawings, Specifications, or other documents (or copies of any thereof) prepared by or bearing the seal of Engineer or its consultants, including electronic media editions, or reuse any such Drawings, Specifications, other documents, or copies thereof on extensions of the Project or any other project without written consent of Owner and Engineer and specific written verification or adaptation by Engineer; or

2. have or acquire any title or ownership rights in any other Contract Documents, reuse any such Contract Documents for any purpose without Owner’s express written consent, or violate any copyrights pertaining to such Contract Documents.

B. The prohibitions of this Paragraph 3.05 will survive final payment, or termination of the Contract. Nothing herein shall preclude Contractor from retaining copies of the Contract Documents for record purposes.

ARTICLE 4 – COMMENCEMENT AND PROGRESS OF THE WORK

4.01 Commencement of Contract Times; Notice to Proceed

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

4.02 Starting the Work

A. Contractor shall start to perform the Work on the date when the Contract Times commence to run. No Work shall be done at the Site prior to such date.

4.03 Reference Points

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

4.04 **Progress Schedule**

A. Contractor shall adhere to the Progress Schedule established in accordance with Paragraph 2.05 as it may be adjusted from time to time as provided below.

1. Contractor shall submit to Engineer for acceptance (to the extent indicated in Paragraph 2.05) proposed adjustments in the Progress Schedule that will not result in changing the Contract Times.

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

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

4.05 **Delays in Contractor’s Progress**

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

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

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

1. severe and unavoidable natural catastrophes such as fires, floods, epidemics, and earthquakes;

2. abnormal weather conditions;

3. acts or failures to act of utility owners (other than those performing other work at or adjacent to the Site by arrangement with the Owner, as contemplated in Article 8); and

4. acts of war or terrorism.

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

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

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

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

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

5.01 Availability of Lands

A. Owner shall furnish the Site. Owner shall notify Contractor of any encumbrances or restrictions not of general application but specifically related to use of the Site with which Contractor must comply in performing the Work.

B. Upon reasonable written request, Owner shall furnish Contractor with a current statement of record legal title and legal description of the lands upon which permanent improvements are to be made and Owner’s interest therein as necessary for giving notice of or filing a mechanic’s or construction lien against such lands in accordance with applicable Laws and Regulations.

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

5.02 Use of Site and Other Areas

A. Limitation on Use of Site and Other Areas:

1. Contractor shall confine construction equipment, temporary construction facilities, the storage of materials and equipment, and the operations of workers to the Site, adjacent areas that Contractor has arranged to use through construction easements or otherwise, and other adjacent areas permitted by Laws and Regulations, and shall not unreasonably encumber the Site and such other adjacent areas with construction equipment or other materials or equipment. Contractor shall assume full responsibility for (a) damage to the Site; (b) damage to any such other adjacent areas used for Contractor’s operations; (c) damage to any other adjacent land or areas; and (d) for injuries and losses sustained by the owners or occupants of any such land or areas; provided that such damage or injuries result from the performance of the Work or from other actions or conduct of the Contractor or those for which Contractor is responsible.

2. If a damage or injury claim is made by the owner or occupant of any such land or area because of the performance of the Work, or because of other actions or conduct of the Contractor or those for which Contractor is responsible, Contractor shall (a) take immediate corrective or remedial action as required by Paragraph 7.12, or otherwise; (b) promptly attempt to settle the claim as to all parties through negotiations with
such owner or occupant, or otherwise resolve the claim by arbitration or other dispute resolution proceeding, or at law; and (c) to the fullest extent permitted by Laws and Regulations, indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them from and against any such claim, and against all costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to any claim or action, legal or equitable, brought by any such owner or occupant against Owner, Engineer, or any other party indemnified hereunder to the extent caused directly or indirectly, in whole or in part by, or based upon, Contractor’s performance of the Work, or because of other actions or conduct of the Contractor or those for which Contractor is responsible.

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

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

D. Loading of Structures: Contractor shall not load nor permit any part of any structure to be loaded in any manner that will endanger the structure, nor shall Contractor subject any part of the Work or adjacent structures or land to stresses or pressures that will endanger them.

5.03 Subsurface and Physical Conditions

A. Reports and Drawings: The Supplementary Conditions identify:

1. those reports known to Owner of explorations and tests of subsurface conditions at or adjacent to the Site;
2. those drawings known to Owner of physical conditions relating to existing surface or subsurface structures at the Site (except Underground Facilities); and
3. Technical Data contained in such reports and drawings.

B. Reliance by Contractor on Technical Data Authorized: Contractor may rely upon the accuracy of the Technical Data expressly identified in the Supplementary Conditions with respect to such reports and drawings, but such reports and drawings are not Contract Documents. If no such express identification has been made, then Contractor may rely upon the accuracy of the Technical Data (as defined in Article 1) contained in any geotechnical or environmental report prepared for the Project and made available to Contractor. Except for such reliance on Technical Data, Contractor may not rely upon or make any claim against Owner or Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors, with respect to:

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

5.04 **Differing Subsurface or Physical Conditions**

A. **Notice by Contractor:** If Contractor believes that any subsurface or physical condition that is uncovered or revealed at the Site either:
   1. is of such a nature as to establish that any Technical Data on which Contractor is entitled to rely as provided in Paragraph 5.03 is materially inaccurate; or
   2. is of such a nature as to require a change in the Drawings or Specifications; or
   3. differs materially from that shown or indicated in the Contract Documents; or
   4. is of an unusual nature, and differs materially from conditions ordinarily encountered and generally recognized as inherent in work of the character provided for in the Contract Documents;

   then Contractor shall, promptly after becoming aware thereof and before further disturbing the subsurface or physical conditions or performing any Work in connection therewith (except in an emergency as required by Paragraph 7.15), notify Owner and Engineer in writing about such condition. Contractor shall not further disturb such condition or perform any Work in connection therewith (except with respect to an emergency) until receipt of a written statement permitting Contractor to do so.

B. **Engineer’s Review:** After receipt of written notice as required by the preceding paragraph, Engineer will promptly review the subsurface or physical condition in question; determine the necessity of Owner’s obtaining additional exploration or tests with respect to the condition; conclude whether the condition falls within any one or more of the differing site condition categories in Paragraph 5.04.A above; obtain any pertinent cost or schedule information from Contractor; prepare recommendations to Owner regarding the Contractor’s resumption of Work in connection with the subsurface or physical condition in question and the need for any change in the Drawings or Specifications; and advise Owner in writing of Engineer’s findings, conclusions, and recommendations.

C. **Owner’s Statement to Contractor Regarding Site Condition:** After receipt of Engineer’s written findings, conclusions, and recommendations, Owner shall issue a written statement to Contractor (with a copy to Engineer) regarding the subsurface or physical condition in question, addressing the resumption of Work in connection with such condition, indicating whether any change in the Drawings or Specifications will be made, and adopting or rejecting Engineer’s written findings, conclusions, and recommendations, in whole or in part.

D. **Possible Price and Times Adjustments:**
   1. Contractor shall be entitled to an equitable adjustment in Contract Price or Contract Times, or both, to the extent that the existence of a differing subsurface or physical condition, or any related delay, disruption, or interference, causes an increase or decrease in Contractor’s cost of, or time required for, performance of the Work; subject, however, to the following:
a. such condition must fall within any one or more of the categories described in Paragraph 5.04.A;

b. with respect to Work that is paid for on a unit price basis, any adjustment in Contract Price will be subject to the provisions of Paragraph 13.03; and,

c. Contractor’s entitlement to an adjustment of the Contract Times is conditioned on such adjustment being essential to Contractor’s ability to complete the Work within the Contract Times.

2. Contractor shall not be entitled to any adjustment in the Contract Price or Contract Times with respect to a subsurface or physical condition if:

a. Contractor knew of the existence of such condition at the time Contractor made a commitment to Owner with respect to Contract Price and Contract Times by the submission of a Bid or becoming bound under a negotiated contract, or otherwise; or

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

c. Contractor failed to give the written notice as required by Paragraph 5.04.A.

3. If Owner and Contractor agree regarding Contractor’s entitlement to and the amount or extent of any adjustment in the Contract Price or Contract Times, or both, then any such adjustment shall be set forth in a Change Order.

4. Contractor may submit a Change Proposal regarding its entitlement to or the amount or extent of any adjustment in the Contract Price or Contract Times, or both, no later than 30 days after Owner’s issuance of the Owner’s written statement to Contractor regarding the subsurface or physical condition in question.

5.05 Underground Facilities

A. Contractor’s Responsibilities: The information and data shown or indicated in the Contract Documents with respect to existing Underground Facilities at or adjacent to the Site is based on information and data furnished to Owner or Engineer by the owners of such Underground Facilities, including Owner, or by others. Unless it is otherwise expressly provided in the Supplementary Conditions:

1. Owner and Engineer do not warrant or guarantee the accuracy or completeness of any such information or data provided by others; and

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

   a. reviewing and checking all information and data regarding existing Underground Facilities at the Site;

   b. locating all Underground Facilities shown or indicated in the Contract Documents as being at the Site;

   c. coordination of the Work with the owners (including Owner) of such Underground Facilities, during construction; and
d. the safety and protection of all existing Underground Facilities at the Site, and repairing any damage thereto resulting from the Work.

B. **Notice by Contractor:** If Contractor believes that an Underground Facility that is uncovered or revealed at the Site was not shown or indicated in the Contract Documents, or was not shown or indicated with reasonable accuracy, then Contractor shall, promptly after becoming aware thereof and before further disturbing conditions affected thereby or performing any Work in connection therewith (except in an emergency as required by Paragraph 7.15), identify the owner of such Underground Facility and give written notice to that owner and to Owner and Engineer.

C. **Engineer’s Review:** Engineer will promptly review the Underground Facility and conclude whether such Underground Facility was not shown or indicated in the Contract Documents, or was not shown or indicated with reasonable accuracy; obtain any pertinent cost or schedule information from Contractor; prepare recommendations to Owner regarding the Contractor’s resumption of Work in connection with the Underground Facility in question; determine the extent, if any, to which a change is required in the Drawings or Specifications to reflect and document the consequences of the existence or location of the Underground Facility; and advise Owner in writing of Engineer’s findings, conclusions, and recommendations. During such time, Contractor shall be responsible for the safety and protection of such Underground Facility.

D. **Owner’s Statement to Contractor Regarding Underground Facility:** After receipt of Engineer’s written findings, conclusions, and recommendations, Owner shall issue a written statement to Contractor (with a copy to Engineer) regarding the Underground Facility in question, addressing the resumption of Work in connection with such Underground Facility, indicating whether any change in the Drawings or Specifications will be made, and adopting or rejecting Engineer’s written findings, conclusions, and recommendations in whole or in part.

E. **Possible Price and Times Adjustments:**

1. Contractor shall be entitled to an equitable adjustment in the Contract Price or Contract Times, or both, to the extent that any existing Underground Facility at the Site that was not shown or indicated in the Contract Documents, or was not shown or indicated with reasonable accuracy, or any related delay, disruption, or interference, causes an increase or decrease in Contractor’s cost of, or time required for, performance of the Work; subject, however, to the following:
   
a. Contractor did not know of and could not reasonably have been expected to be aware of or to have anticipated the existence or actual location of the Underground Facility in question;

b. With respect to Work that is paid for on a unit price basis, any adjustment in Contract Price will be subject to the provisions of Paragraph 13.03;

c. Contractor’s entitlement to an adjustment of the Contract Times is conditioned on such adjustment being essential to Contractor’s ability to complete the Work within the Contract Times; and

d. Contractor gave the notice required in Paragraph 5.05.B.

2. If Owner and Contractor agree regarding Contractor’s entitlement to and the amount or extent of any adjustment in the Contract Price or Contract Times, or both, then any such adjustment shall be set forth in a Change Order.
3. Contractor may submit a Change Proposal regarding its entitlement to or the amount or extent of any adjustment in the Contract Price or Contract Times, or both, no later than 30 days after Owner's issuance of the Owner's written statement to Contractor regarding the Underground Facility in question.

5.06 Hazardous Environmental Conditions at Site

A. Reports and Drawings: The Supplementary Conditions identify:

1. those reports and drawings known to Owner relating to Hazardous Environmental Conditions that have been identified at or adjacent to the Site; and

2. Technical Data contained in such reports and drawings.

B. Reliance by Contractor on Technical Data Authorized: Contractor may rely upon the accuracy of the Technical Data expressly identified in the Supplementary Conditions with respect to such reports and drawings, but such reports and drawings are not Contract Documents. If no such express identification has been made, then Contractor may rely on the accuracy of the Technical Data (as defined in Article 1) contained in any geotechnical or environmental report prepared for the Project and made available to Contractor. Except for such reliance on Technical Data, Contractor may not rely upon or make any claim against Owner or Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors with respect to:

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

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

3. any Contractor interpretation of or conclusion drawn from any Technical Data or any such other data, interpretations, opinions or information.

C. Contractor shall not be responsible for removing or remediating any Hazardous Environmental Condition encountered, uncovered, or revealed at the Site unless such removal or remediation is expressly identified in the Contract Documents to be within the scope of the Work.

D. Contractor shall be responsible for controlling, containing, and duly removing all Constituents of Concern brought to the Site by Contractor, Subcontractors, Suppliers, or anyone else for whom Contractor is responsible, and for any associated costs; and for the costs of removing and remediating any Hazardous Environmental Condition created by the presence of any such Constituents of Concern.

E. If Contractor encounters, uncovers, or reveals a Hazardous Environmental Condition whose removal or remediation is not expressly identified in the Contract Documents as being within the scope of the Work, or if Contractor or anyone for whom Contractor is responsible creates a Hazardous Environmental Condition, then Contractor shall immediately: (1) secure or otherwise isolate such condition; (2) stop all Work in connection with such condition and in any area affected thereby (except in an emergency as required by Paragraph 7.15); and (3) notify Owner and Engineer (and promptly thereafter confirm such notice in writing). Owner shall promptly consult with Engineer concerning the necessity for Owner to retain a qualified expert to evaluate such condition or take
corrective action, if any. Promptly after consulting with Engineer, Owner shall take such actions as are necessary to permit Owner to timely obtain required permits and provide Contractor the written notice required by Paragraph 5.06.F. If Contractor or anyone for whom Contractor is responsible created the Hazardous Environmental Condition in question, then Owner may remove and remediate the Hazardous Environmental Condition, and impose a set-off against payments to account for the associated costs.

F. Contractor shall not resume Work in connection with such Hazardous Environmental Condition or in any affected area until after Owner has obtained any required permits related thereto, and delivered written notice to Contractor either (1) specifying that such condition and any affected area is or has been rendered safe for the resumption of Work, or (2) specifying any special conditions under which such Work may be resumed safely.

G. If Owner and Contractor cannot agree as to entitlement to or on the amount or extent, if any, of any adjustment in Contract Price or Contract Times, or both, as a result of such Work stoppage or such special conditions under which Work is agreed to be resumed by Contractor, then within 30 days of Owner’s written notice regarding the resumption of Work, Contractor may submit a Change Proposal, or Owner may impose a set-off.

H. If after receipt of such written notice Contractor does not agree to resume such Work based on a reasonable belief it is unsafe, or does not agree to resume such Work under such special conditions, then Owner may order the portion of the Work that is in the area affected by such condition to be deleted from the Work, following the contractual change procedures in Article 11. Owner may have such deleted portion of the Work performed by Owner’s own forces or others in accordance with Article 8.

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

J. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to the failure to control, contain, or remove a Constituent of Concern brought to the Site by Contractor or by anyone for whom Contractor is responsible, or to a Hazardous Environmental Condition created by Contractor or by anyone for whom Contractor is responsible. Nothing in this Paragraph 5.06.J shall obligate Contractor to indemnify any individual or entity from and against the consequences of that individual’s or entity’s own negligence.
K. The provisions of Paragraphs 5.03, 5.04, and 5.05 do not apply to the presence of Constituents of Concern or to a Hazardous Environmental Condition uncovered or revealed at the Site.

ARTICLE 6 – BONDS AND INSURANCE

6.01 Performance, Payment, and Other Bonds

A. Contractor shall furnish a performance bond and a payment bond, each in an amount at least equal to the Contract Price, as security for the faithful performance and payment of all of Contractor's obligations under the Contract. These bonds shall remain in effect until one year after the date when final payment becomes due or until completion of the correction period specified in Paragraph 15.08, whichever is later, except as provided otherwise by Laws or Regulations, the Supplementary Conditions, or other specific provisions of the Contract. Contractor shall also furnish such other bonds as are required by the Supplementary Conditions or other specific provisions of the Contract.

B. All bonds shall be in the form prescribed by the Contract except as provided otherwise by Laws or Regulations, and shall be executed by such sureties as are named in “Companies Holding Certificates of Authority as Acceptable Sureties on Federal Bonds and as Acceptable Reinsuring Companies” as published in Circular 570 (as amended and supplemented) by the Financial Management Service, Surety Bond Branch, U.S. Department of the Treasury. A bond signed by an agent or attorney-in-fact must be accompanied by a certified copy of that individual's authority to bind the surety. The evidence of authority shall show that it is effective on the date the agent or attorney-in-fact signed the accompanying bond.

C. Contractor shall obtain the required bonds from surety companies that are duly licensed or authorized in the jurisdiction in which the Project is located to issue bonds in the required amounts.

D. If the surety on a bond furnished by Contractor is declared bankrupt or becomes insolvent, or its right to do business is terminated in any state or jurisdiction where any part of the Project is located, or the surety ceases to meet the requirements above, then Contractor shall promptly notify Owner and Engineer and shall, within 20 days after the event giving rise to such notification, provide another bond and surety, both of which shall comply with the bond and surety requirements above.

E. If Contractor has failed to obtain a required bond, Owner may exclude the Contractor from the Site and exercise Owner’s termination rights under Article 16.

F. Upon request, Owner shall provide a copy of the payment bond to any Subcontractor, Supplier, or other person or entity claiming to have furnished labor or materials used in the performance of the Work.

6.02 Insurance—General Provisions

A. Owner and Contractor shall obtain and maintain insurance as required in this Article and in the Supplementary Conditions.

B. All insurance required by the Contract to be purchased and maintained by Owner or Contractor shall be obtained from insurance companies that are duly licensed or authorized, in the state or jurisdiction in which the Project is located, to issue insurance policies for the required limits and coverages. Unless a different standard is indicated in the
Supplementary Conditions, all companies that provide insurance policies required under this Contract shall have an A.M. Best rating of A-VII or better.

C. Contractor shall deliver to Owner, with copies to each named insured and additional insured (as identified in this Article, in the Supplementary Conditions, or elsewhere in the Contract), certificates of insurance establishing that Contractor has obtained and is maintaining the policies, coverages, and endorsements required by the Contract. Upon request by Owner or any other insured, Contractor shall also furnish other evidence of such required insurance, including but not limited to copies of policies and endorsements, and documentation of applicable self-insured retentions and deductibles. Contractor may block out (redact) any confidential premium or pricing information contained in any policy or endorsement furnished under this provision.

D. Owner shall deliver to Contractor, with copies to each named insured and additional insured (as identified in this Article, the Supplementary Conditions, or elsewhere in the Contract), certificates of insurance establishing that Owner has obtained and is maintaining the policies, coverages, and endorsements required of Owner by the Contract (if any). Upon request by Contractor or any other insured, Owner shall also provide other evidence of such required insurance (if any), including but not limited to copies of policies and endorsements, and documentation of applicable self-insured retentions and deductibles. Owner may block out (redact) any confidential premium or pricing information contained in any policy or endorsement furnished under this provision.

E. Failure of Owner or Contractor to demand such certificates or other evidence of the other party’s full compliance with these insurance requirements, or failure of Owner or Contractor to identify a deficiency in compliance from the evidence provided, shall not be construed as a waiver of the other party’s obligation to obtain and maintain such insurance.

F. If either party does not purchase or maintain all of the insurance required of such party by the Contract, such party shall notify the other party in writing of such failure to purchase prior to the start of the Work, or of such failure to maintain prior to any change in the required coverage.

G. If Contractor has failed to obtain and maintain required insurance, Owner may exclude the Contractor from the Site, impose an appropriate set-off against payment, and exercise Owner’s termination rights under Article 16.

H. Without prejudice to any other right or remedy, if a party has failed to obtain required insurance, the other party may elect to obtain equivalent insurance to protect such other party’s interests at the expense of the party who was required to provide such coverage, and the Contract Price shall be adjusted accordingly.

I. Owner does not represent that insurance coverage and limits established in this Contract necessarily will be adequate to protect Contractor or Contractor’s interests.

J. The insurance and insurance limits required herein shall not be deemed as a limitation on Contractor’s liability under the indemnities granted to Owner and other individuals and entities in the Contract.
6.03 Contractor’s Insurance

A. Workers’ Compensation: Contractor shall purchase and maintain workers’ compensation and employer’s liability insurance for:

1. claims under workers’ compensation, disability benefits, and other similar employee benefit acts.
2. United States Longshoreman and Harbor Workers’ Compensation Act and Jones Act coverage (if applicable).
3. claims for damages because of bodily injury, occupational sickness or disease, or death of Contractor’s employees (by stop-gap endorsement in monopolist worker’s compensation states).
4. Foreign voluntary worker compensation (if applicable).

B. Commercial General Liability—Claims Covered: Contractor shall purchase and maintain commercial general liability insurance, covering all operations by or on behalf of Contractor, on an occurrence basis, against:

1. claims for damages because of bodily injury, sickness or disease, or death of any person other than Contractor’s employees.
2. claims for damages insured by reasonably available personal injury liability coverage.
3. claims for damages, other than to the Work itself, because of injury to or destruction of tangible property wherever located, including loss of use resulting therefrom.

C. Commercial General Liability—Form and Content: Contractor’s commercial liability policy shall be written on a 1996 (or later) ISO commercial general liability form (occurrence form) and include the following coverages and endorsements:

1. Products and completed operations coverage:
   a. Such insurance shall be maintained for three years after final payment.
   b. Contractor shall furnish Owner and each other additional insured (as identified in the Supplementary Conditions or elsewhere in the Contract) evidence of continuation of such insurance at final payment and three years thereafter.
2. Blanket contractual liability coverage, to the extent permitted by law, including but not limited to coverage of Contractor’s contractual indemnity obligations in Paragraph 7.18.
3. Broad form property damage coverage.
4. Severability of interest.
5. Underground, explosion, and collapse coverage.
6. Personal injury coverage.
7. Additional insured endorsements that include both ongoing operations and products and completed operations coverage through ISO Endorsements CG 20 10 01 and CG 20 37 01 (together); or CG 20 10 07 04 and CG 20 37 07 04 (together); or their equivalent.
8. For design professional additional insureds, ISO Endorsement CG 20 32 07 04, “Additional Insured—Engineers, Architects or Surveyors Not Engaged by the Named Insured” or its equivalent.

D. **Automobile liability:** Contractor shall purchase and maintain automobile liability insurance against claims for damages because of bodily injury or death of any person or property damage arising out of the ownership, maintenance, or use of any motor vehicle. The automobile liability policy shall be written on an occurrence basis.

E. **Umbrella or excess liability:** Contractor shall purchase and maintain umbrella or excess liability insurance written over the underlying employer’s liability, commercial general liability, and automobile liability insurance described in the paragraphs above. Subject to industry-standard exclusions, the coverage afforded shall follow form as to each and every one of the underlying policies.

F. **Contractor’s pollution liability insurance:** Contractor shall purchase and maintain a policy covering third-party injury and property damage claims, including clean-up costs, as a result of pollution conditions arising from Contractor’s operations and completed operations. This insurance shall be maintained for no less than three years after final completion.

G. **Additional insureds:** The Contractor’s commercial general liability, automobile liability, umbrella or excess, and pollution liability policies shall include and list as additional insureds Owner and Engineer, and any individuals or entities identified in the Supplementary Conditions; include coverage for the respective officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of all such additional insureds; and the insurance afforded to these additional insureds shall provide primary coverage for all claims covered thereby (including as applicable those arising from both ongoing and completed operations) on a non-contributory basis. Contractor shall obtain all necessary endorsements to support these requirements.

H. **Contractor’s professional liability insurance:** If Contractor will provide or furnish professional services under this Contract, through a delegation of professional design services or otherwise, then Contractor shall be responsible for purchasing and maintaining applicable professional liability insurance. This insurance shall provide protection against claims arising out of performance of professional design or related services, and caused by a negligent error, omission, or act for which the insured party is legally liable. It shall be maintained throughout the duration of the Contract and for a minimum of two years after Substantial Completion. If such professional design services are performed by a Subcontractor, and not by Contractor itself, then the requirements of this paragraph may be satisfied through the purchasing and maintenance of such insurance by such Subcontractor.

I. **General provisions:** The policies of insurance required by this Paragraph 6.03 shall:

1. include at least the specific coverages provided in this Article.

2. be written for not less than the limits of liability provided in this Article and in the Supplementary Conditions, or required by Laws or Regulations, whichever is greater.

3. contain a provision or endorsement that the coverage afforded will not be canceled, materially changed, or renewal refused until at least 10 days prior written notice has been given to Contractor. Within three days of receipt of any such written notice, Contractor shall provide a copy of the notice to Owner, Engineer, and each other insured under the policy.
4. remain in effect at least until final payment (and longer if expressly required in this Article) and at all times thereafter when Contractor may be correcting, removing, or replacing defective Work as a warranty or correction obligation, or otherwise, or returning to the Site to conduct other tasks arising from the Contract Documents.

5. be appropriate for the Work being performed and provide protection from claims that may arise out of or result from Contractor’s performance of the Work and Contractor’s other obligations under the Contract Documents, whether it is to be performed by Contractor, any Subcontractor or Supplier, or by anyone directly or indirectly employed by any of them to perform any of the Work, or by anyone for whose acts any of them may be liable.

J. The coverage requirements for specific policies of insurance must be met by such policies, and not by reference to excess or umbrella insurance provided in other policies.

6.04 Owner's Liability Insurance

A. In addition to the insurance required to be provided by Contractor under Paragraph 6.03, Owner, at Owner's option, may purchase and maintain at Owner's expense Owner's own liability insurance as will protect Owner against claims which may arise from operations under the Contract Documents.

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

6.05 Property Insurance

A. Builder's Risk: Unless otherwise provided in the Supplementary Conditions, Contractor shall purchase and maintain builder’s risk insurance upon the Work on a completed value basis, in the amount of the full insurable replacement cost thereof (subject to such deductible amounts as may be provided in the Supplementary Conditions or required by Laws and Regulations). This insurance shall:

1. include the Owner and Contractor as named insureds, and all Subcontractors, and any individuals or entities required by the Supplementary Conditions to be insured under such builder’s risk policy, as insureds or named insureds. For purposes of the remainder of this Paragraph 6.05, Paragraphs 6.06 and 6.07, and any corresponding Supplementary Conditions, the parties required to be insured shall collectively be referred to as “insureds.”

2. be written on a builder’s risk “all risk” policy form that shall at least include insurance for physical loss or damage to the Work, temporary buildings, falsework, and materials and equipment in transit, and shall insure against at least the following perils or causes of loss: fire; lightning; windstorm; riot; civil commotion; terrorism; vehicle impact; aircraft; smoke; theft; vandalism and malicious mischief; mechanical breakdown, boiler explosion, and artificially generated electric current; earthquake; volcanic activity, and other earth movement; flood; collapse; explosion; debris removal; demolition occasioned by enforcement of Laws and Regulations; water damage (other than that caused by flood); and such other perils or causes of loss as may be specifically required by the Supplementary Conditions. If insurance against mechanical breakdown, boiler explosion, and artificially generated electric current; earthquake; volcanic activity, and other earth movement; or flood, are not commercially available
under builder’s risk policies, by endorsement or otherwise, such insurance may be provided through other insurance policies acceptable to Owner and Contractor.

3. cover, as insured property, at least the following: (a) the Work and all materials, supplies, machinery, apparatus, equipment, fixtures, and other property of a similar nature that are to be incorporated into or used in the preparation, fabrication, construction, erection, or completion of the Work, including Owner-furnished or assigned property; (b) spare parts inventory required within the scope of the Contract; and (c) temporary works which are not intended to form part of the permanent constructed Work but which are intended to provide working access to the Site, or to the Work under construction, or which are intended to provide temporary support for the Work under construction, including scaffolding, form work, fences, shoring, falsework, and temporary structures.

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

5. extend to cover damage or loss to insured property while in temporary storage at the Site or in a storage location outside the Site (but not including property stored at the premises of a manufacturer or Supplier).

6. extend to cover damage or loss to insured property while in transit.

7. allow for partial occupation or use of the Work by Owner, such that those portions of the Work that are not yet occupied or used by Owner shall remain covered by the builder’s risk insurance.

8. allow for the waiver of the insurer’s subrogation rights, as set forth below.

9. provide primary coverage for all losses and damages caused by the perils or causes of loss covered.

10. not include a co-insurance clause.

11. include an exception for ensuing losses from physical damage or loss with respect to any defective workmanship, design, or materials exclusions.

12. include performance/hot testing and start-up.

13. be maintained in effect, subject to the provisions herein regarding Substantial Completion and partial occupancy or use of the Work by Owner, until the Work is complete.

B. Notice of Cancellation or Change: All the policies of insurance (and the certificates or other evidence thereof) required to be purchased and maintained in accordance with this Paragraph 6.05 will contain a provision or endorsement that the coverage afforded will not be canceled or materially changed or renewal refused until at least 10 days prior written notice has been given to the purchasing policyholder. Within three days of receipt of any such written notice, the purchasing policyholder shall provide a copy of the notice to each other insured.

C. Deductibles: The purchaser of any required builder’s risk or property insurance shall pay for costs not covered because of the application of a policy deductible.

D. Partial Occupancy or Use by Owner: If Owner will occupy or use a portion or portions of the Work prior to Substantial Completion of all the Work as provided in Paragraph 15.04, then Owner (directly, if it is the purchaser of the builder’s risk policy, or through Contractor) will
provide notice of such occupancy or use to the builder’s risk insurer. The builder’s risk insurance shall not be canceled or permitted to lapse on account of any such partial use or occupancy; rather, those portions of the Work that are occupied or used by Owner may come off the builder’s risk policy, while those portions of the Work not yet occupied or used by Owner shall remain covered by the builder’s risk insurance.

E. **Additional Insurance**: If Contractor elects to obtain other special insurance to be included in or supplement the builder’s risk or property insurance policies provided under this Paragraph 6.05, it may do so at Contractor’s expense.

F. **Insurance of Other Property**: If the express insurance provisions of the Contract do not require or address the insurance of a property item or interest, such as tools, construction equipment, or other personal property owned by Contractor, a Subcontractor, or an employee of Contractor or a Subcontractor, then the entity or individual owning such property item will be responsible for deciding whether to insure it, and if so in what amount.

**6.06 Waiver of Rights**

A. All policies purchased in accordance with Paragraph 6.05, expressly including the builder’s risk policy, shall contain provisions to the effect that in the event of payment of any loss or damage the insurers will have no rights of recovery against any insureds thereunder, or against Engineer or its consultants, or their officers, directors, members, partners, employees, agents, consultants, or subcontractors. Owner and Contractor waive all rights against each other and the respective officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, for all losses and damages caused by, arising out of, or resulting from any of the perils or causes of loss covered by such policies and any other property insurance applicable to the Work; and, in addition, waive all such rights against Engineer, its consultants, all Subcontractors, all individuals or entities identified in the Supplementary Conditions as insureds, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, under such policies for losses and damages so caused. None of the above waivers shall extend to the rights that any party making such waiver may have to the proceeds of insurance held by Owner or Contractor as trustee or fiduciary, or otherwise payable under any policy so issued.

B. Owner waives all rights against Contractor, Subcontractors, and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them, for:

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

2. loss or damage to the completed Project or part thereof caused by, arising out of, or resulting from fire or other insured peril or cause of loss covered by any property insurance maintained on the completed Project or part thereof by Owner during partial occupancy or use pursuant to Paragraph 15.04, after Substantial Completion pursuant to Paragraph 15.03, or after final payment pursuant to Paragraph 15.06.

C. Any insurance policy maintained by Owner covering any loss, damage or consequential loss referred to in Paragraph 6.06.B shall contain provisions to the effect that in the event of payment of any such loss, damage, or consequential loss, the insurers will have no rights of
recovery against Contractor, Subcontractors, or Engineer, or the officers, directors, members, partners, employees, agents, consultants, or subcontractors of each and any of them.

D. Contractor shall be responsible for assuring that the agreement under which a Subcontractor performs a portion of the Work contains provisions whereby the Subcontractor waives all rights against Owner, Contractor, all individuals or entities identified in the Supplementary Conditions as insureds, the Engineer and its consultants, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, for all losses and damages caused by, arising out of, relating to, or resulting from any of the perils or causes of loss covered by builder’s risk insurance and any other property insurance applicable to the Work.

6.07 Receipt and Application of Property Insurance Proceeds

A. Any insured loss under the builder’s risk and other policies of insurance required by Paragraph 6.05 will be adjusted and settled with the named insured that purchased the policy. Such named insured shall act as fiduciary for the other insureds, and give notice to such other insureds that adjustment and settlement of a claim is in progress. Any other insured may state its position regarding a claim for insured loss in writing within 15 days after notice of such claim.

B. Proceeds for such insured losses may be made payable by the insurer either jointly to multiple insureds, or to the named insured that purchased the policy in its own right and as fiduciary for other insureds, subject to the requirements of any applicable mortgage clause. A named insured receiving insurance proceeds under the builder’s risk and other policies of insurance required by Paragraph 6.05 shall distribute such proceeds in accordance with such agreement as the parties in interest may reach, or as otherwise required under the dispute resolution provisions of this Contract or applicable Laws and Regulations.

C. If no other special agreement is reached, the damaged Work shall be repaired or replaced, the money so received applied on account thereof, and the Work and the cost thereof covered by Change Order, if needed.

ARTICLE 7 – CONTRACTOR’S RESPONSIBILITIES

7.01 Supervision and Superintendence

A. Contractor shall supervise, inspect, and direct the Work competently and efficiently, devoting such attention thereto and applying such skills and expertise as may be necessary to perform the Work in accordance with the Contract Documents. Contractor shall be solely responsible for the means, methods, techniques, sequences, and procedures of construction.

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

7.02 Labor; Working Hours

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

7.03 **Services, Materials, and Equipment**

A. Unless otherwise specified in the Contract Documents, Contractor shall provide and assume full responsibility for all services, materials, equipment, labor, transportation, construction equipment and machinery, tools, appliances, fuel, power, light, heat, telephone, water, sanitary facilities, temporary facilities, and all other facilities and incidentals necessary for the performance, testing, start up, and completion of the Work, whether or not such items are specifically called for in the Contract Documents.

B. All materials and equipment incorporated into the Work shall be of good quality and new, except as otherwise provided in the Contract Documents. All special warranties and guarantees required by the Specifications shall expressly run to the benefit of Owner. If required by Engineer, Contractor shall furnish satisfactory evidence (including reports of required tests) as to the source, kind, and quality of materials and equipment.

C. All materials and equipment shall be stored, applied, installed, connected, erected, protected, used, cleaned, and conditioned in accordance with instructions of the applicable Supplier, except as otherwise may be provided in the Contract Documents.

7.04 **“Or Equals”**

A. Whenever an item of material or equipment is specified or described in the Contract Documents by using the name of a proprietary item or the name of a particular Supplier, the Contract Price has been based upon Contractor furnishing such item as specified. The specification or description of such an item is intended to establish the type, function, appearance, and quality required. Unless the specification or description contains or is followed by words reading that no like, equivalent, or “or equal” item is permitted, Contractor may request that Engineer authorize the use of other items of material or equipment, or items from other proposed suppliers under the circumstances described below.

1. If Engineer in its sole discretion determines that an item of material or equipment proposed by Contractor is functionally equal to that named and sufficiently similar so that no change in related Work will be required, Engineer shall deem it an “or equal” item. For the purposes of this paragraph, a proposed item of material or equipment will be considered functionally equal to an item so named if:

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

      1) it is at least equal in materials of construction, quality, durability, appearance, strength, and design characteristics;

      2) it will reliably perform at least equally well the function and achieve the results imposed by the design concept of the completed Project as a functioning whole;
3) it has a proven record of performance and availability of responsive service; and

4) it is not objectionable to Owner.

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

1) there will be no increase in cost to the Owner or increase in Contract Times; and

2) it will conform substantially to the detailed requirements of the item named in the Contract Documents.

B. Contractor’s Expense: Contractor shall provide all data in support of any proposed “or equal” item at Contractor’s expense.

C. Engineer’s Evaluation and Determination: Engineer will be allowed a reasonable time to evaluate each “or-equal” request. Engineer may require Contractor to furnish additional data about the proposed “or-equal” item. Engineer will be the sole judge of acceptability. No “or-equal” item will be ordered, furnished, installed, or utilized until Engineer’s review is complete and Engineer determines that the proposed item is an “or-equal”, which will be evidenced by an approved Shop Drawing or other written communication. Engineer will advise Contractor in writing of any negative determination.

D. Effect of Engineer’s Determination: Neither approval nor denial of an “or-equal” request shall result in any change in Contract Price. The Engineer’s denial of an “or-equal” request shall be final and binding, and may not be reversed through an appeal under any provision of the Contract Documents.

E. Treatment as a Substitution Request: If Engineer determines that an item of material or equipment proposed by Contractor does not qualify as an “or-equal” item, Contractor may request that Engineer considered the proposed item as a substitute pursuant to Paragraph 7.05.

7.05 Substitutes

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

1. Contractor shall submit sufficient information as provided below to allow Engineer to determine if the item of material or equipment proposed is functionally equivalent to that named and an acceptable substitute therefor. Engineer will not accept requests for review of proposed substitute items of material or equipment from anyone other than Contractor.

2. The requirements for review by Engineer will be as set forth in Paragraph 7.05.B, as supplemented by the Specifications, and as Engineer may decide is appropriate under the circumstances.

3. Contractor shall make written application to Engineer for review of a proposed substitute item of material or equipment that Contractor seeks to furnish or use. The application: 
a. shall certify that the proposed substitute item will:
   1) perform adequately the functions and achieve the results called for by the
general design,
   2) be similar in substance to that specified, and
   3) be suited to the same use as that specified.

b. will state:
   1) the extent, if any, to which the use of the proposed substitute item will
necessitate a change in Contract Times,
   2) whether use of the proposed substitute item in the Work will require a
change in any of the Contract Documents (or in the provisions of any other
direct contract with Owner for other work on the Project) to adapt the
design to the proposed substitute item, and
   3) whether incorporation or use of the proposed substitute item in connection
with the Work is subject to payment of any license fee or royalty.

c. will identify:
   1) all variations of the proposed substitute item from that specified, and
   2) available engineering, sales, maintenance, repair, and replacement services.

d. shall contain an itemized estimate of all costs or credits that will result directly or
indirectly from use of such substitute item, including but not limited to changes in
Contract Price, shared savings, costs of redesign, and claims of other contractors
affected by any resulting change.

B. Enginee’s Evaluation and Determination: Engineer will be allowed a reasonable time to
evaluate each substitute request, and to obtain comments and direction from Owner.
Engineer may require Contractor to furnish additional data about the proposed substitute
item. Engineer will be the sole judge of acceptability. No substitute will be ordered,
furnished, installed, or utilized until Engineer’s review is complete and Engineer determines
that the proposed item is an acceptable substitute. Engineer’s determination will be
evidenced by a Field Order or a proposed Change Order accounting for the substitution
itself and all related impacts, including changes in Contract Price or Contract Times.
Engineer will advise Contractor in writing of any negative determination.

C. Special Guarantee: Owner may require Contractor to furnish at Contractor’s expense a
special performance guarantee or other surety with respect to any substitute.

D. Reimbursement of Engineer’s Cost: Engineer will record Engineer’s costs in evaluating a
substitute proposed or submitted by Contractor. Whether or not Engineer approves a
substitute so proposed or submitted by Contractor, Contractor shall reimburse Owner for
the reasonable charges of Engineer for evaluating each such proposed substitute.
Contractor shall also reimburse Owner for the reasonable charges of Engineer for making
changes in the Contract Documents (or in the provisions of any other direct contract with
Owner) resulting from the acceptance of each proposed substitute.

E. Contractor’s Expense: Contractor shall provide all data in support of any proposed
substitute at Contractor’s expense.
F. **Effect of Engineer’s Determination:** If Engineer approves the substitution request, Contractor shall execute the proposed Change Order and proceed with the substitution. The Engineer’s denial of a substitution request shall be final and binding, and may not be reversed through an appeal under any provision of the Contract Documents. Contractor may challenge the scope of reimbursement costs imposed under Paragraph 7.05.D, by timely submittal of a Change Proposal.

7.06 **Concerning Subcontractors, Suppliers, and Others**

A. Contractor may retain Subcontractors and Suppliers for the performance of parts of the Work. Such Subcontractors and Suppliers must be acceptable to Owner.

B. Contractor shall retain specific Subcontractors, Suppliers, or other individuals or entities for the performance of designated parts of the Work if required by the Contract to do so.

C. Subsequent to the submittal of Contractor’s Bid or final negotiation of the terms of the Contract, Owner may not require Contractor to retain any Subcontractor, Supplier, or other individual or entity to furnish or perform any of the Work against which Contractor has reasonable objection.

D. Prior to entry into any binding subcontract or purchase order, Contractor shall submit to Owner the identity of the proposed Subcontractor or Supplier (unless Owner has already deemed such proposed Subcontractor or Supplier acceptable, during the bidding process or otherwise). Such proposed Subcontractor or Supplier shall be deemed acceptable to Owner unless Owner raises a substantive, reasonable objection within five days.

E. Owner may require the replacement of any Subcontractor, Supplier, or other individual or entity retained by Contractor to perform any part of the Work. Owner also may require Contractor to retain specific replacements; provided, however, that Owner may not require a replacement to which Contractor has a reasonable objection. If Contractor has submitted the identity of certain Subcontractors, Suppliers, or other individuals or entities for acceptance by Owner, and Owner has accepted it (either in writing or by failing to make written objection thereto), then Owner may subsequently revoke the acceptance of any such Subcontractor, Supplier, or other individual or entity so identified solely on the basis of substantive, reasonable objection after due investigation. Contractor shall submit an acceptable replacement for the rejected Subcontractor, Supplier, or other individual or entity.

F. If Owner requires the replacement of any Subcontractor, Supplier, or other individual or entity retained by Contractor to perform any part of the Work, then Contractor shall be entitled to an adjustment in Contract Price or Contract Times, or both, with respect to the replacement; and Contractor shall initiate a Change Proposal for such adjustment within 30 days of Owner’s requirement of replacement.

G. No acceptance by Owner of any such Subcontractor, Supplier, or other individual or entity, whether initially or as a replacement, shall constitute a waiver of the right of Owner to the completion of the Work in accordance with the Contract Documents.

H. On a monthly basis Contractor shall submit to Engineer a complete list of all Subcontractors and Suppliers having a direct contract with Contractor, and of all other Subcontractors and Suppliers known to Contractor at the time of submittal.

I. Contractor shall be fully responsible to Owner and Engineer for all acts and omissions of the Subcontractors, Suppliers, and other individuals or entities performing or furnishing any of the Work just as Contractor is responsible for Contractor’s own acts and omissions.
J. Contractor shall be solely responsible for scheduling and coordinating the work of Subcontractors, Suppliers, and all other individuals or entities performing or furnishing any of the Work.

K. Contractor shall restrict all Subcontractors, Suppliers, and such other individuals or entities performing or furnishing any of the Work from communicating with Engineer or Owner, except through Contractor or in case of an emergency, or as otherwise expressly allowed herein.

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

M. All Work performed for Contractor by a Subcontractor or Supplier shall be pursuant to an appropriate contractual agreement that specifically binds the Subcontractor or Supplier to the applicable terms and conditions of the Contract Documents for the benefit of Owner and Engineer.

N. Owner may furnish to any Subcontractor or Supplier, to the extent practicable, information about amounts paid to Contractor on account of Work performed for Contractor by the particular Subcontractor or Supplier.

O. Nothing in the Contract Documents:
   1. shall create for the benefit of any such Subcontractor, Supplier, or other individual or entity any contractual relationship between Owner or Engineer and any such Subcontractor, Supplier, or other individual or entity; nor
   2. shall create any obligation on the part of Owner or Engineer to pay or to see to the payment of any money due any such Subcontractor, Supplier, or other individual or entity except as may otherwise be required by Laws and Regulations.

7.07 Patent Fees and Royalties

A. Contractor shall pay all license fees and royalties and assume all costs incident to the use in the performance of the Work or the incorporation in the Work of any invention, design, process, product, or device which is the subject of patent rights or copyrights held by others. If a particular invention, design, process, product, or device is specified in the Contract Documents for use in the performance of the Work and if, to the actual knowledge of Owner or Engineer, its use is subject to patent rights or copyrights calling for the payment of any license fee or royalty to others, the existence of such rights shall be disclosed by Owner in the Contract Documents.

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

7.08 Permits
A. Unless otherwise provided in the Contract Documents, Contractor shall obtain and pay for all construction permits and licenses. Owner shall assist Contractor, when necessary, in obtaining such permits and licenses. Contractor shall pay all governmental charges and inspection fees necessary for the prosecution of the Work which are applicable at the time of the submission of Contractor’s Bid (or when Contractor became bound under a negotiated contract). Owner shall pay all charges of utility owners for connections for providing permanent service to the Work.

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

7.10 Laws and Regulations
A. Contractor shall give all notices required by and shall comply with all Laws and Regulations applicable to the performance of the Work. Except where otherwise expressly required by applicable Laws and Regulations, neither Owner nor Engineer shall be responsible for monitoring Contractor’s compliance with any Laws or Regulations.

B. If Contractor performs any Work or takes any other action knowing or having reason to know that it is contrary to Laws or Regulations, Contractor shall bear all resulting costs and losses, and shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such Work or other action. It shall not be Contractor’s responsibility to make certain that the Work described in the Contract Documents is in accordance with Laws and Regulations, but this shall not relieve Contractor of Contractor’s obligations under Paragraph 3.03.

C. Owner or Contractor may give notice to the other party of any changes after the submission of Contractor’s Bid (or after the date when Contractor became bound under a negotiated contract) in Laws or Regulations having an effect on the cost or time of performance of the Work, including but not limited to changes in Laws or Regulations having an effect on procuring permits and on sales, use, value-added, consumption, and other similar taxes. If Owner and Contractor are unable to agree on entitlement to or on the amount or extent, if any, of any adjustment in Contract Price or Contract Times resulting from such changes, then within 30 days of such notice Contractor may submit a Change Proposal, or Owner may initiate a Claim.
7.11 **Record Documents**

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

7.12 **Safety and Protection**

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

1. all persons on the Site or who may be affected by the Work;
2. all the Work and materials and equipment to be incorporated therein, whether in storage on or off the Site; and
3. other property at the Site or adjacent thereto, including trees, shrubs, lawns, walks, pavements, roadways, structures, other work in progress, utilities, and Underground Facilities not designated for removal, relocation, or replacement in the course of construction.

B. Contractor shall comply with all applicable Laws and Regulations relating to the safety of persons or property, or to the protection of persons or property from damage, injury, or loss; and shall erect and maintain all necessary safeguards for such safety and protection. Contractor shall notify Owner; the owners of adjacent property, Underground Facilities, and other utilities; and other contractors and utility owners performing work at or adjacent to the Site, when prosecution of the Work may affect them, and shall cooperate with them in the protection, removal, relocation, and replacement of their property or work in progress.

C. Contractor shall comply with the applicable requirements of Owner’s safety programs, if any. The Supplementary Conditions identify any Owner’s safety programs that are applicable to the Work.

D. Contractor shall inform Owner and Engineer of the specific requirements of Contractor’s safety program with which Owner’s and Engineer’s employees and representatives must comply while at the Site.

E. All damage, injury, or loss to any property referred to in Paragraph 7.12.A.2 or 7.12.A.3 caused, directly or indirectly, in whole or in part, by Contractor, any Subcontractor, Supplier, or any other individual or entity directly or indirectly employed by any of them to perform any of the Work, or anyone for whose acts any of them may be liable, shall be remedied by Contractor at its expense (except damage or loss attributable to the fault of Drawings or Specifications or to the acts or omissions of Owner or Engineer or anyone employed by any of them, or anyone for whose acts any of them may be liable, and not attributable, directly or indirectly, in whole or in part, to the fault or negligence of
Contractor or any Subcontractor, Supplier, or other individual or entity directly or indirectly employed by any of them).

F. Contractor’s duties and responsibilities for safety and protection shall continue until such time as all the Work is completed and Engineer has issued a notice to Owner and Contractor in accordance with Paragraph 15.06.B that the Work is acceptable (except as otherwise expressly provided in connection with Substantial Completion).

G. Contractor’s duties and responsibilities for safety and protection shall resume whenever Contractor or any Subcontractor or Supplier returns to the Site to fulfill warranty or correction obligations, or to conduct other tasks arising from the Contract Documents.

7.13 Safety Representative

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

7.14 Hazard Communication Programs

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

7.15 Emergencies

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

7.16 Shop Drawings, Samples, and Other Submittals

A. Shop Drawing and Sample Submittal Requirements:

1. Before submitting a Shop Drawing or Sample, Contractor shall have:
   a. reviewed and coordinated the Shop Drawing or Sample with other Shop Drawings and Samples and with the requirements of the Work and the Contract Documents;
   b. determined and verified all field measurements, quantities, dimensions, specified performance and design criteria, installation requirements, materials, catalog numbers, and similar information with respect thereto;
   c. determined and verified the suitability of all materials and equipment offered with respect to the indicated application, fabrication, shipping, handling, storage, assembly, and installation pertaining to the performance of the Work; and
   d. determined and verified all information relative to Contractor’s responsibilities for means, methods, techniques, sequences, and procedures of construction, and safety precautions and programs incident thereto.
2. Each submittal shall bear a stamp or specific written certification that Contractor has satisfied Contractor’s obligations under the Contract Documents with respect to Contractor’s review of that submittal, and that Contractor approves the submittal.

3. With each submittal, Contractor shall give Engineer specific written notice of any variations that the Shop Drawing or Sample may have from the requirements of the Contract Documents. This notice shall be set forth in a written communication separate from the Shop Drawings or Sample submittal; and, in addition, in the case of Shop Drawings by a specific notation made on each Shop Drawing submitted to Engineer for review and approval of each such variation.

B. Submittal Procedures for Shop Drawings and Samples: Contractor shall submit Shop Drawings and Samples to Engineer for review and approval in accordance with the accepted Schedule of Submittals. Each submittal will be identified as Engineer may require.

1. Shop Drawings:
   a. Contractor shall submit the number of copies required in the Specifications.
   b. Data shown on the Shop Drawings will be complete with respect to quantities, dimensions, specified performance and design criteria, materials, and similar data to show Engineer the services, materials, and equipment Contractor proposes to provide and to enable Engineer to review the information for the limited purposes required by Paragraph 7.16.D.

2. Samples:
   a. Contractor shall submit the number of Samples required in the Specifications.
   b. Contractor shall clearly identify each Sample as to material, Supplier, pertinent data such as catalog numbers, the use for which intended and other data as Engineer may require to enable Engineer to review the submittal for the limited purposes required by Paragraph 7.16.D.

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

C. Other Submittals: Contractor shall submit other submittals to Engineer in accordance with the accepted Schedule of Submittals, and pursuant to the applicable terms of the Specifications.

D. Engineer’s Review:

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

2. Engineer’s review and approval will not extend to means, methods, techniques, sequences, or procedures of construction or to safety precautions or programs incident thereto.
3. Engineer’s review and approval of a separate item as such will not indicate approval of the assembly in which the item functions.

4. Engineer’s review and approval of a Shop Drawing or Sample shall not relieve Contractor from responsibility for any variation from the requirements of the Contract Documents unless Contractor has complied with the requirements of Paragraph 7.16.A.3 and Engineer has given written approval of each such variation by specific written notation thereof incorporated in or accompanying the Shop Drawing or Sample. Engineer will document any such approved variation from the requirements of the Contract Documents in a Field Order.

5. Engineer’s review and approval of a Shop Drawing or Sample shall not relieve Contractor from responsibility for complying with the requirements of Paragraph 7.16.A and B.

6. Engineer’s review and approval of a Shop Drawing or Sample, or of a variation from the requirements of the Contract Documents, shall not, under any circumstances, change the Contract Times or Contract Price, unless such changes are included in a Change Order.

7. Neither Engineer’s receipt, review, acceptance or approval of a Shop Drawing, Sample, or other submittal shall result in such item becoming a Contract Document.

8. Contractor shall perform the Work in compliance with the requirements and commitments set forth in approved Shop Drawings and Samples, subject to the provisions of Paragraph 7.16.D.4.

E. Resubmittal Procedures:

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

2. Contractor shall furnish required submittals with sufficient information and accuracy to obtain required approval of an item with no more than three submittals. Engineer will record Engineer’s time for reviewing a fourth or subsequent submittal of a Shop Drawings, sample, or other item requiring approval, and Contractor shall be responsible for Engineer’s charges to Owner for such time. Owner may impose a set-off against payments due to Contractor to secure reimbursement for such charges.

3. If Contractor requests a change of a previously approved submittal item, Contractor shall be responsible for Engineer’s charges to Owner for its review time, and Owner may impose a set-off against payments due to Contractor to secure reimbursement for such charges, unless the need for such change is beyond the control of Contractor.

7.17 Contractor’s General Warranty and Guarantee

A. Contractor warrants and guarantees to Owner that all Work will be in accordance with the Contract Documents and will not be defective. Engineer and its officers, directors, members, partners, employees, agents, consultants, and subcontractors shall be entitled to rely on Contractor’s warranty and guarantee.
B. Contractor’s warranty and guarantee hereunder excludes defects or damage caused by:
   1. abuse, modification, or improper maintenance or operation by persons other than Contractor, Subcontractors, Suppliers, or any other individual or entity for whom Contractor is responsible; or
   2. normal wear and tear under normal usage.

C. Contractor’s obligation to perform and complete the Work in accordance with the Contract Documents shall be absolute. None of the following will constitute an acceptance of Work that is not in accordance with the Contract Documents or a release of Contractor’s obligation to perform the Work in accordance with the Contract Documents:
   1. observations by Engineer;
   2. recommendation by Engineer or payment by Owner of any progress or final payment;
   3. the issuance of a certificate of Substantial Completion by Engineer or any payment related thereto by Owner;
   4. use or occupancy of the Work or any part thereof by Owner;
   5. any review and approval of a Shop Drawing or Sample submittal;
   6. the issuance of a notice of acceptability by Engineer;
   7. any inspection, test, or approval by others; or
   8. any correction of defective Work by Owner.

D. If the Contract requires the Contractor to accept the assignment of a contract entered into by Owner, then the specific warranties, guarantees, and correction obligations contained in the assigned contract shall govern with respect to Contractor’s performance obligations to Owner for the Work described in the assigned contract.

7.18 Indemnification

A. To the fullest extent permitted by Laws and Regulations, and in addition to any other obligations of Contractor under the Contract or otherwise, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to the performance of the Work, provided that any such claim, cost, loss, or damage is attributable to bodily injury, sickness, disease, or death, or to injury to or destruction of tangible property (other than the Work itself), including the loss of use resulting therefrom but only to the extent caused by any negligent act or omission of Contractor, any Subcontractor, any Supplier, or any individual or entity directly or indirectly employed by any of them to perform any of the Work or anyone for whose acts any of them may be liable.

B. In any and all claims against Owner or Engineer or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors by any employee (or the survivor or personal representative of such employee) of Contractor, any Subcontractor, any Supplier, or any individual or entity directly or indirectly employed by any of them to perform any of the Work, or anyone for whose acts any of them may be liable, the indemnification obligation under Paragraph 7.18.A shall not be limited in any way by any limitation on the amount or type of damages, compensation, or benefits payable by or for
Contractor or any such Subcontractor, Supplier, or other individual or entity under workers’ compensation acts, disability benefit acts, or other employee benefit acts.

C. The indemnification obligations of Contractor under Paragraph 7.18.A shall not extend to the liability of Engineer and Engineer’s officers, directors, members, partners, employees, agents, consultants and subcontractors arising out of:

1. the preparation or approval of, or the failure to prepare or approve maps, Drawings, opinions, reports, surveys, Change Orders, designs, or Specifications; or
2. giving directions or instructions, or failing to give them, if that is the primary cause of the injury or damage.

7.19 Delegation of Professional Design Services

A. Contractor will not be required to provide professional design services unless such services are specifically required by the Contract Documents for a portion of the Work or unless such services are required to carry out Contractor’s responsibilities for construction means, methods, techniques, sequences and procedures. Contractor shall not be required to provide professional services in violation of applicable Laws and Regulations.

B. If professional design services or certifications by a design professional related to systems, materials, or equipment are specifically required of Contractor by the Contract Documents, Owner and Engineer will specify all performance and design criteria that such services must satisfy. Contractor shall cause such services or certifications to be provided by a properly licensed professional, whose signature and seal shall appear on all drawings, calculations, specifications, certifications, and other submittals prepared by such professional. Shop Drawings and other submittals related to the Work designed or certified by such professional, if prepared by others, shall bear such professional’s written approval when submitted to Engineer.

C. Owner and Engineer shall be entitled to rely upon the adequacy, accuracy, and completeness of the services, certifications, or approvals performed by such design professionals, provided Owner and Engineer have specified to Contractor all performance and design criteria that such services must satisfy.

D. Pursuant to this paragraph, Engineer’s review and approval of design calculations and design drawings will be only for the limited purpose of checking for conformance with performance and design criteria given and the design concept expressed in the Contract Documents. Engineer’s review and approval of Shop Drawings and other submittals (except design calculations and design drawings) will be only for the purpose stated in Paragraph 7.16.D.1.

E. Contractor shall not be responsible for the adequacy of the performance or design criteria specified by Owner or Engineer.

ARTICLE 8 – OTHER WORK AT THE SITE

8.01 Other Work

A. In addition to and apart from the Work under the Contract Documents, the Owner may perform other work at or adjacent to the Site. Such other work may be performed by Owner’s employees, or through contracts between the Owner and third parties. Owner may also arrange to have third-party utility owners perform work on their utilities and facilities at or adjacent to the Site.
B. If Owner performs other work at or adjacent to the Site with Owner’s employees, or through contracts for such other work, then Owner shall give Contractor written notice thereof prior to starting any such other work. If Owner has advance information regarding the start of any utility work at or adjacent to the Site, Owner shall provide such information to Contractor.

C. Contractor shall afford each other contractor that performs such other work, each utility owner performing other work, and Owner, if Owner is performing other work with Owner’s employees, proper and safe access to the Site, and provide a reasonable opportunity for the introduction and storage of materials and equipment and the execution of such other work. Contractor shall do all cutting, fitting, and patching of the Work that may be required to properly connect or otherwise make its several parts come together and properly integrate with such other work. Contractor shall not endanger any work of others by cutting, excavating, or otherwise altering such work; provided, however, that Contractor may cut or alter others’ work with the written consent of Engineer and the others whose work will be affected.

D. If the proper execution or results of any part of Contractor’s Work depends upon work performed by others under this Article 8, Contractor shall inspect such other work and promptly report to Engineer in writing any delays, defects, or deficiencies in such other work that render it unavailable or unsuitable for the proper execution and results of Contractor’s Work. Contractor’s failure to so report will constitute an acceptance of such other work as fit and proper for integration with Contractor’s Work except for latent defects and deficiencies in such other work.

8.02 Coordination

A. If Owner intends to contract with others for the performance of other work at or adjacent to the Site, to perform other work at or adjacent to the Site with Owner’s employees, or to arrange to have utility owners perform work at or adjacent to the Site, the following will be set forth in the Supplementary Conditions or provided to Contractor prior to the start of any such other work:

1. the identity of the individual or entity that will have authority and responsibility for coordination of the activities among the various contractors;

2. an itemization of the specific matters to be covered by such authority and responsibility; and

3. the extent of such authority and responsibilities.

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

8.03 Legal Relationships

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

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

B. Contractor shall take reasonable and customary measures to avoid damaging, delaying, disrupting, or interfering with the work of Owner, any other contractor, or any utility owner performing other work at or adjacent to the Site. If Contractor fails to take such measures and as a result damages, delays, disrupts, or interferes with the work of any such other contractor or utility owner, then Owner may impose a set-off against payments due to Contractor, and assign to such other contractor or utility owner the Owner’s contractual rights against Contractor with respect to the breach of the obligations set forth in this paragraph.

C. When Owner is performing other work at or adjacent to the Site with Owner’s employees, Contractor shall be liable to Owner for damage to such other work, and for the reasonable direct delay, disruption, and interference costs incurred by Owner as a result of Contractor’s failure to take reasonable and customary measures with respect to Owner’s other work. In response to such damage, delay, disruption, or interference, Owner may impose a set-off against payments due to Contractor.

D. If Contractor damages, delays, disrupts, or interferes with the work of any other contractor, or any utility owner performing other work at or adjacent to the Site, through Contractor’s failure to take reasonable and customary measures to avoid such impacts, or if any claim arising out of Contractor’s actions, inactions, or negligence in performance of the Work at or adjacent to the Site is made by any such other contractor or utility owner against Contractor, Owner, or Engineer, then Contractor shall (1) promptly attempt to settle the claim as to all parties through negotiations with such other contractor or utility owner, or otherwise resolve the claim by arbitration or other dispute resolution proceeding or at law, and (2) indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them from and against any such claims, and against all costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such damage, delay, disruption, or interference.

ARTICLE 9 – OWNER’S RESPONSIBILITIES

9.01 Communications to Contractor

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

9.02 Replacement of Engineer

A. Owner may at its discretion appoint an engineer to replace Engineer, provided Contractor makes no reasonable objection to the replacement engineer. The replacement engineer’s status under the Contract Documents shall be that of the former Engineer.
9.03 **Furnish Data**
A. Owner shall promptly furnish the data required of Owner under the Contract Documents.

9.04 **Pay When Due**
A. Owner shall make payments to Contractor when they are due as provided in the Agreement.

9.05 **Lands and Easements; Reports, Tests, and Drawings**
A. Owner’s duties with respect to providing lands and easements are set forth in Paragraph 5.01.
B. Owner’s duties with respect to providing engineering surveys to establish reference points are set forth in Paragraph 4.03.
C. Article 5 refers to Owner’s identifying and making available to Contractor copies of reports of explorations and tests of conditions at the Site, and drawings of physical conditions relating to existing surface or subsurface structures at the Site.

9.06 **Insurance**
A. Owner’s responsibilities, if any, with respect to purchasing and maintaining liability and property insurance are set forth in Article 6.

9.07 **Change Orders**
A. Owner’s responsibilities with respect to Change Orders are set forth in Article 11.

9.08 **Inspections, Tests, and Approvals**
A. Owner’s responsibility with respect to certain inspections, tests, and approvals is set forth in Paragraph 14.02.B.

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

9.10 **Undisclosed Hazardous Environmental Condition**
A. Owner’s responsibility in respect to an undisclosed Hazardous Environmental Condition is set forth in Paragraph 5.06.

9.11 **Evidence of Financial Arrangements**
A. Upon request of Contractor, Owner shall furnish Contractor reasonable evidence that financial arrangements have been made to satisfy Owner’s obligations under the Contract Documents (including obligations under proposed changes in the Work).

9.12 **Safety Programs**
A. While at the Site, Owner’s employees and representatives shall comply with the specific applicable requirements of Contractor’s safety programs of which Owner has been informed.
B. Owner shall furnish copies of any applicable Owner safety programs to Contractor.

ARTICLE 10 – ENGINEER’S STATUS DURING CONSTRUCTION

10.01 Owner’s Representative

A. Engineer will be Owner’s representative during the construction period. The duties and responsibilities and the limitations of authority of Engineer as Owner’s representative during construction are set forth in the Contract.

10.02 Visits to Site

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

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

10.03 Project Representative

A. If Owner and Engineer have agreed that Engineer will furnish a Resident Project Representative to represent Engineer at the Site and assist Engineer in observing the progress and quality of the Work, then the authority and responsibilities of any such Resident Project Representative will be as provided in the Supplementary Conditions, and limitations on the responsibilities thereof will be as provided in Paragraph 10.08. If Owner designates another representative or agent to represent Owner at the Site who is not Engineer’s consultant, agent, or employee, the responsibilities and authority and limitations thereon of such other individual or entity will be as provided in the Supplementary Conditions.

10.04 Rejecting Defective Work

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

10.05 Shop Drawings, Change Orders and Payments

A. Engineer’s authority, and limitations thereof, as to Shop Drawings and Samples, are set forth in Paragraph 7.16.
B. Engineer’s authority, and limitations thereof, as to design calculations and design drawings submitted in response to a delegation of professional design services, if any, are set forth in Paragraph 7.19.

C. Engineer’s authority as to Change Orders is set forth in Article 11.

D. Engineer’s authority as to Applications for Payment is set forth in Article 15.

10.06 **Determinations for Unit Price Work**

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

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

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

10.08 **Limitations on Engineer’s Authority and Responsibilities**

A. Neither Engineer’s authority or responsibility under this Article 10 or under any other provision of the Contract, nor any decision made by Engineer in good faith either to exercise or not exercise such authority or responsibility or the undertaking, exercise, or performance of any authority or responsibility by Engineer, shall create, impose, or give rise to any duty in contract, tort, or otherwise owed by Engineer to Contractor, any Subcontractor, any Supplier, any other individual or entity, or to any surety for or employee or agent of any of them.

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

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

D. Engineer’s review of the final Application for Payment and accompanying documentation and all maintenance and operating instructions, schedules, guarantees, bonds, certificates of inspection, tests and approvals, and other documentation required to be delivered by Paragraph 15.06.A will only be to determine generally that their content complies with the requirements of, and in the case of certificates of inspections, tests, and approvals, that the results certified indicate compliance with the Contract Documents.

E. The limitations upon authority and responsibility set forth in this Paragraph 10.08 shall also apply to the Resident Project Representative, if any.
10.09 **Compliance with Safety Program**

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

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

11.01 **Amending and Supplementing Contract Documents**

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

1. **Change Orders:**
   a. If an amendment or supplement to the Contract Documents includes a change in the Contract Price or the Contract Times, such amendment or supplement must be set forth in a Change Order. A Change Order also may be used to establish amendments and supplements of the Contract Documents that do not affect the Contract Price or Contract Times.
   b. Owner and Contractor may amend those terms and conditions of the Contract Documents that do not involve (1) the performance or acceptability of the Work, (2) the design (as set forth in the Drawings, Specifications, or otherwise), or (3) other engineering or technical matters, without the recommendation of the Engineer. Such an amendment shall be set forth in a Change Order.

2. **Work Change Directives:** A Work Change Directive will not change the Contract Price or the Contract Times but is evidence that the parties expect that the modification ordered or documented by a Work Change Directive will be incorporated in a subsequently issued Change Order, following negotiations by the parties as to the Work Change Directive’s effect, if any, on the Contract Price and Contract Times; or, if negotiations are unsuccessful, by a determination under the terms of the Contract Documents governing adjustments, expressly including Paragraph 11.04 regarding change of Contract Price. Contractor must submit any Change Proposal seeking an adjustment of the Contract Price or Contract Times, or both, no later than 30 days after the completion of the Work set out in the Work Change Directive. Owner must submit any Claim seeking an adjustment of the Contract Price or the Contract Times, or both, no later than 60 days after issuance of the Work Change Directive.

3. **Field Orders:** Engineer may authorize minor changes in the Work if the changes do not involve an adjustment in the Contract Price or the Contract Times and are compatible with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents. Such changes will be accomplished by a Field Order and will be binding on Owner and also on Contractor, which shall perform the Work involved promptly. If Contractor believes that a Field Order justifies an adjustment in the Contract Price or Contract Times, or both, then before proceeding with the Work at issue, Contractor shall submit a Change Proposal as provided herein.

11.02 **Owner-Authorized Changes in the Work**

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

11.03 **Unauthorized Changes in the Work**

A. Contractor shall not be entitled to an increase in the Contract Price or an extension of the Contract Times with respect to any work performed that is not required by the Contract Documents, as amended, modified, or supplemented, except in the case of an emergency as provided in Paragraph 7.15 or in the case of uncovering Work as provided in Paragraph 14.05.

11.04 **Change of Contract Price**

A. The Contract Price may only be changed by a Change Order. Any Change Proposal for an adjustment in the Contract Price shall comply with the provisions of Paragraph 11.06. Any Claim for an adjustment of Contract Price shall comply with the provisions of Article 12.

B. An adjustment in the Contract Price will be determined as follows:

1. where the Work involved is covered by unit prices contained in the Contract Documents, then by application of such unit prices to the quantities of the items involved (subject to the provisions of Paragraph 13.03); or

2. where the Work involved is not covered by unit prices contained in the Contract Documents, then by a mutually agreed lump sum (which may include an allowance for overhead and profit not necessarily in accordance with Paragraph 11.04.C.2); or

3. where the Work involved is not covered by unit prices contained in the Contract Documents and the parties do not reach mutual agreement to a lump sum, then on the basis of the Cost of the Work (determined as provided in Paragraph 11.04.C) plus a Contractor’s fee for overhead and profit (determined as provided in Paragraph 11.04.C).

C. **Contractor’s Fee**: When applicable, the Contractor’s fee for overhead and profit shall be determined as follows:

1. a mutually acceptable fixed fee; or

2. if a fixed fee is not agreed upon, then a fee based on the following percentages of the various portions of the Cost of the Work:
   
   a. for costs incurred under Paragraphs 13.01.B.1 and 13.01.B.2, the Contractor’s fee shall be 15 percent;

   b. for costs incurred under Paragraph 13.01.B.3, the Contractor’s fee shall be five percent;

   c. where one or more tiers of subcontracts are on the basis of Cost of the Work plus a fee and no fixed fee is agreed upon, the intent of Paragraphs 11.04.C.2.a and
11.04.C.2.b is that the Contractor’s fee shall be based on: (1) a fee of 15 percent of the costs incurred under Paragraphs 13.01.A.1 and 13.01.A.2 by the Subcontractor that actually performs the Work, at whatever tier, and (2) with respect to Contractor itself and to any Subcontractors of a tier higher than that of the Subcontractor that actually performs the Work, a fee of five percent of the amount (fee plus underlying costs incurred) attributable to the next lower tier Subcontractor; provided, however, that for any such subcontracted work the maximum total fee to be paid by Owner shall be no greater than 27 percent of the costs incurred by the Subcontractor that actually performs the work;

d. no fee shall be payable on the basis of costs itemized under Paragraphs 13.01.B.4, 13.01.B.5, and 13.01.C;

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

f. when both additions and credits are involved in any one change, the adjustment in Contractor’s fee shall be computed on the basis of the net change in accordance with Paragraphs 11.04.C.2.a through 11.04.C.2.e, inclusive.

11.05 Change of Contract Times

A. The Contract Times may only be changed by a Change Order. Any Change Proposal for an adjustment in the Contract Times shall comply with the provisions of Paragraph 11.06. Any Claim for an adjustment in the Contract Times shall comply with the provisions of Article 12.

B. An adjustment of the Contract Times shall be subject to the limitations set forth in Paragraph 4.05, concerning delays in Contractor’s progress.

11.06 Change Proposals

A. Contractor shall submit a Change Proposal to Engineer to request an adjustment in the Contract Times or Contract Price; appeal an initial decision by Engineer concerning the requirements of the Contract Documents or relating to the acceptability of the Work under the Contract Documents; contest a set-off against payment due; or seek other relief under the Contract. The Change Proposal shall specify any proposed change in Contract Times or Contract Price, or both, or other proposed relief, and explain the reason for the proposed change, with citations to any governing or applicable provisions of the Contract Documents.

1. Procedures: Contractor shall submit each Change Proposal to Engineer promptly (but in no event later than 30 days) after the start of the event giving rise thereto, or after such initial decision. The Contractor shall submit supporting data, including the proposed change in Contract Price or Contract Time (if any), to the Engineer and Owner within 15 days after the submittal of the Change Proposal. The supporting data shall be accompanied by a written statement that the supporting data are accurate and complete, and that any requested time or price adjustment is the entire adjustment to which Contractor believes it is entitled as a result of said event. Engineer will advise Owner regarding the Change Proposal, and consider any comments or response from Owner regarding the Change Proposal.

2. Engineer’s Action: Engineer will review each Change Proposal and, within 30 days after receipt of the Contractor’s supporting data, either deny the Change Proposal in whole,
approve it in whole, or deny it in part and approve it in part. Such actions shall be in writing, with a copy provided to Owner and Contractor. If Engineer does not take action on the Change Proposal within 30 days, then either Owner or Contractor may at any time thereafter submit a letter to the other party indicating that as a result of Engineer’s inaction the Change Proposal is deemed denied, thereby commencing the time for appeal of the denial under Article 12.

3. **Binding Decision**: Engineer’s decision will be final and binding upon Owner and Contractor, unless Owner or Contractor appeals the decision by filing a Claim under Article 12.

B. **Resolution of Certain Change Proposals**: If the Change Proposal does not involve the design (as set forth in the Drawings, Specifications, or otherwise), the acceptability of the Work, or other engineering or technical matters, then Engineer will notify the parties that the Engineer is unable to resolve the Change Proposal. For purposes of further resolution of such a Change Proposal, such notice shall be deemed a denial, and Contractor may choose to seek resolution under the terms of Article 12.

### 11.07 Execution of Change Orders

A. Owner and Contractor shall execute appropriate Change Orders covering:

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

2. changes in Contract Price resulting from an Owner set-off, unless Contractor has duly contested such set-off;

3. changes in the Work which are: (a) ordered by Owner pursuant to Paragraph 11.02, (b) required because of Owner’s acceptance of defective Work under Paragraph 14.04 or Owner’s correction of defective Work under Paragraph 14.07, or (c) agreed to by the parties, subject to the need for Engineer’s recommendation if the change in the Work involves the design (as set forth in the Drawings, Specifications, or otherwise), or other engineering or technical matters; and

4. changes in the Contract Price or Contract Times, or other changes, which embody the substance of any final and binding results under Paragraph 11.06, or Article 12.

B. If Owner or Contractor refuses to execute a Change Order that is required to be executed under the terms of this Paragraph 11.07, it shall be deemed to be of full force and effect, as if fully executed.

### 11.08 Notification to Surety

A. If the provisions of any bond require notice to be given to a surety of any change affecting the general scope of the Work or the provisions of the Contract Documents (including, but not limited to, Contract Price or Contract Times), the giving of any such notice will be Contractor’s responsibility. The amount of each applicable bond will be adjusted to reflect the effect of any such change.
ARTICLE 12 – CLAIMS

12.01 Claims

A. Claims Process: The following disputes between Owner and Contractor shall be submitted to the Claims process set forth in this Article:

1. Appeals by Owner or Contractor of Engineer’s decisions regarding Change Proposals;
2. Owner demands for adjustments in the Contract Price or Contract Times, or other relief under the Contract Documents; and
3. Disputes that Engineer has been unable to address because they do not involve the design (as set forth in the Drawings, Specifications, or otherwise), the acceptability of the Work, or other engineering or technical matters.

B. Submittal of Claim: The party submitting a Claim shall deliver it directly to the other party to the Contract promptly (but in no event later than 30 days) after the start of the event giving rise thereto; in the case of appeals regarding Change Proposals within 30 days of the decision under appeal. The party submitting the Claim shall also furnish a copy to the Engineer, for its information only. The responsibility to substantiate a Claim shall rest with the party making the Claim. In the case of a Claim by Contractor seeking an increase in the Contract Times or Contract Price, or both, Contractor shall certify that the Claim is made in good faith, that the supporting data are accurate and complete, and that to the best of Contractor’s knowledge and belief the amount of time or money requested accurately reflects the full amount to which Contractor is entitled.

C. Review and Resolution: The party receiving a Claim shall review it thoroughly, giving full consideration to its merits. The two parties shall seek to resolve the Claim through the exchange of information and direct negotiations. The parties may extend the time for resolving the Claim by mutual agreement. All actions taken on a Claim shall be stated in writing and submitted to the other party, with a copy to Engineer.

D. Mediation:

1. At any time after initiation of a Claim, Owner and Contractor may mutually agree to mediation of the underlying dispute. The agreement to mediate shall stay the Claim submittal and response process.
2. If Owner and Contractor agree to mediation, then after 60 days from such agreement, either Owner or Contractor may unilaterally terminate the mediation process, and the Claim submittal and decision process shall resume as of the date of the termination. If the mediation proceeds but is unsuccessful in resolving the dispute, the Claim submittal and decision process shall resume as of the date of the conclusion of the mediation, as determined by the mediator.
3. Owner and Contractor shall each pay one-half of the mediator’s fees and costs.

E. Partial Approval: If the party receiving a Claim approves the Claim in part and denies it in part, such action shall be final and binding unless within 30 days of such action the other party invokes the procedure set forth in Article 17 for final resolution of disputes.

F. Denial of Claim: If efforts to resolve a Claim are not successful, the party receiving the Claim may deny it by giving written notice of denial to the other party. If the receiving party does not take action on the Claim within 90 days, then either Owner or Contractor may at any time thereafter submit a letter to the other party indicating that as a result of the inaction,
the Claim is deemed denied, thereby commencing the time for appeal of the denial. A denial of the Claim shall be final and binding unless within 30 days of the denial the other party invokes the procedure set forth in Article 17 for the final resolution of disputes.

G. Final and Binding Results: If the parties reach a mutual agreement regarding a Claim, whether through approval of the Claim, direct negotiations, mediation, or otherwise; or if a Claim is approved in part and denied in part, or denied in full, and such actions become final and binding; then the results of the agreement or action on the Claim shall be incorporated in a Change Order to the extent they affect the Contract, including the Work, the Contract Times, or the Contract Price.

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

13.01 Cost of the Work

A. Purposes for Determination of Cost of the Work: The term Cost of the Work means the sum of all costs necessary for the proper performance of the Work at issue, as further defined below. The provisions of this Paragraph 13.01 are used for two distinct purposes:

1. To determine Cost of the Work when Cost of the Work is a component of the Contract Price, under cost-plus-fee, time-and-materials, or other cost-based terms; or

2. To determine the value of a Change Order, Change Proposal, Claim, set-off, or other adjustment in Contract Price. When the value of any such adjustment is determined on the basis of Cost of the Work, Contractor is entitled only to those additional or incremental costs required because of the change in the Work or because of the event giving rise to the adjustment.

B. Costs Included: Except as otherwise may be agreed to in writing by Owner, costs included in the Cost of the Work shall be in amounts no higher than those prevailing in the locality of the Project, shall not include any of the costs itemized in Paragraph 13.01.C, and shall include only the following items:

1. Payroll costs for employees in the direct employ of Contractor in the performance of the Work under schedules of job classifications agreed upon by Owner and Contractor. Such employees shall include, without limitation, superintendents, foremen, and other personnel employed full time on the Work. Payroll costs for employees not employed full time on the Work shall be apportioned on the basis of their time spent on the Work. Payroll costs shall include, but not be limited to, salaries and wages plus the cost of fringe benefits, which shall include social security contributions, unemployment, excise, and payroll taxes, workers’ compensation, health and retirement benefits, bonuses, sick leave, and vacation and holiday pay applicable thereto. The expenses of performing Work outside of regular working hours, on Saturday, Sunday, or legal holidays, shall be included in the above to the extent authorized by Owner.

2. Cost of all materials and equipment furnished and incorporated in the Work, including costs of transportation and storage thereof, and Suppliers’ field services required in connection therewith. All cash discounts shall accrue to Contractor unless Owner deposits funds with Contractor with which to make payments, in which case the cash discounts shall accrue to Owner. All trade discounts, rebates, and refunds and returns from sale of surplus materials and equipment shall accrue to Owner, and Contractor shall make provisions so that they may be obtained.
3. Payments made by Contractor to Subcontractors for Work performed by Subcontractors. If required by Owner, Contractor shall obtain competitive bids from subcontractors acceptable to Owner and Contractor and shall deliver such bids to Owner, who will then determine, with the advice of Engineer, which bids, if any, will be acceptable. If any subcontract provides that the Subcontractor is to be paid on the basis of Cost of the Work plus a fee, the Subcontractor’s Cost of the Work and fee shall be determined in the same manner as Contractor’s Cost of the Work and fee as provided in this Paragraph 13.01.

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

5. Supplemental costs including the following:
   a. The proportion of necessary transportation, travel, and subsistence expenses of Contractor’s employees incurred in discharge of duties connected with the Work.
   b. Cost, including transportation and maintenance, of all materials, supplies, equipment, machinery, appliances, office, and temporary facilities at the Site, and hand tools not owned by the workers, which are consumed in the performance of the Work, and cost, less market value, of such items used but not consumed which remain the property of Contractor.
   c. Rentals of all construction equipment and machinery, and the parts thereof, whether rented from Contractor or others in accordance with rental agreements approved by Owner with the advice of Engineer, and the costs of transportation, loading, unloading, assembly, dismantling, and removal thereof. All such costs shall be in accordance with the terms of said rental agreements. The rental of any such equipment, machinery, or parts shall cease when the use thereof is no longer necessary for the Work.
   d. Sales, consumer, use, and other similar taxes related to the Work, and for which Contractor is liable, as imposed by Laws and Regulations.
   e. Deposits lost for causes other than negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, and royalty payments and fees for permits and licenses.
   f. Losses and damages (and related expenses) caused by damage to the Work, not compensated by insurance or otherwise, sustained by Contractor in connection with the performance of the Work (except losses and damages within the deductible amounts of property insurance established in accordance with Paragraph 6.05), provided such losses and damages have resulted from causes other than the negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable. Such losses shall include settlements made with the written consent and approval of Owner. No such losses, damages, and expenses shall be included in the Cost of the Work for the purpose of determining Contractor’s fee.
   g. The cost of utilities, fuel, and sanitary facilities at the Site.
   h. Minor expenses such as communication service at the Site, express and courier services, and similar petty cash items in connection with the Work.
i. The costs of premiums for all bonds and insurance that Contractor is required by
the Contract Documents to purchase and maintain.

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

1. Payroll costs and other compensation of Contractor’s officers, executives, principals
   (of partnerships and sole proprietorships), general managers, safety managers,
   engineers, architects, estimators, attorneys, auditors, accountants, purchasing and
   contracting agents, expediters, timekeepers, clerks, and other personnel employed by
   Contractor, whether at the Site or in Contractor’s principal or branch office for general
   administration of the Work and not specifically included in the agreed upon schedule
   of job classifications referred to in Paragraph 13.01.B.1 or specifically covered by
   Paragraph 13.01.B.4. The payroll costs and other compensation excluded here are to
   be considered administrative costs covered by the Contractor’s fee.

2. Expenses of Contractor’s principal and branch offices other than Contractor’s office at
   the Site.

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

4. Costs due to the negligence of Contractor, any Subcontractor, or anyone directly or
   indirectly employed by any of them or for whose acts any of them may be liable,
   including but not limited to, the correction of defective Work, disposal of materials or
   equipment wrongly supplied, and making good any damage to property.

5. Other overhead or general expense costs of any kind and the costs of any item not
   specifically and expressly included in Paragraph 13.01.B.

D. Contractor’s Fee: When the Work as a whole is performed on the basis of cost-plus,
   Contractor’s fee shall be determined as set forth in the Agreement. When the value of any
   Work covered by a Change Order, Change Proposal, Claim, set-off, or other adjustment in
   Contract Price is determined on the basis of Cost of the Work, Contractor’s fee shall be
   determined as set forth in Paragraph 11.04.C.

E. Documentation: Whenever the Cost of the Work for any purpose is to be determined
   pursuant to this Article 13, Contractor will establish and maintain records thereof in
   accordance with generally accepted accounting practices and submit in a form acceptable
   to Engineer an itemized cost breakdown together with supporting data.

13.02 Allowances

A. It is understood that Contractor has included in the Contract Price all allowances so named
   in the Contract Documents and shall cause the Work so covered to be performed for such
   sums and by such persons or entities as may be acceptable to Owner and Engineer.

B. Cash Allowances: Contractor agrees that:

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

2. Contractor’s costs for unloading and handling on the Site, labor, installation, overhead,
   profit, and other expenses contemplated for the cash allowances have been included
   in the Contract Price and not in the allowances, and no demand for additional
   payment on account of any of the foregoing will be valid.
C. *Contingency Allowance*: Contractor agrees that a contingency allowance, if any, is for the sole use of Owner to cover unanticipated costs.

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

13.03 *Unit Price Work*

A. Where the Contract Documents provide that all or part of the Work is to be Unit Price Work, initially the Contract Price will be deemed to include for all Unit Price Work an amount equal to the sum of the unit price for each separately identified item of Unit Price Work times the estimated quantity of each item as indicated in the Agreement.

B. The estimated quantities of items of Unit Price Work are not guaranteed and are solely for the purpose of comparison of Bids and determining an initial Contract Price. Payments to Contractor for Unit Price Work will be based on actual quantities.

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

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

E. Within 30 days of Engineer’s written decision under the preceding paragraph, Contractor may submit a Change Proposal, or Owner may file a Claim, seeking an adjustment in the Contract Price if:

1. the quantity of any item of Unit Price Work performed by Contractor differs materially and significantly from the estimated quantity of such item indicated in the Agreement;
2. there is no corresponding adjustment with respect to any other item of Work; and
3. Contractor believes that it is entitled to an increase in Contract Price as a result of having incurred additional expense or Owner believes that Owner is entitled to a decrease in Contract Price, and the parties are unable to agree as to the amount of any such increase or decrease.

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

14.01 *Access to Work*

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

A. Contractor shall give Engineer timely notice of readiness of the Work (or specific parts thereof) for all required inspections and tests, and shall cooperate with inspection and testing personnel to facilitate required inspections and tests.

B. Owner shall retain and pay for the services of an independent inspector, testing laboratory, or other qualified individual or entity to perform all inspections and tests expressly required by the Contract Documents to be furnished and paid for by Owner, except that costs incurred in connection with tests or inspections of covered Work shall be governed by the provisions of Paragraph 14.05.

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

D. Contractor shall be responsible for arranging, obtaining, and paying for all inspections and tests required:
   1. by the Contract Documents, unless the Contract Documents expressly allocate responsibility for a specific inspection or test to Owner;
   2. to attain Owner’s and Engineer’s acceptance of materials or equipment to be incorporated in the Work;
   3. by manufacturers of equipment furnished under the Contract Documents;
   4. for testing, adjusting, and balancing of mechanical, electrical, and other equipment to be incorporated into the Work; and
   5. for acceptance of materials, mix designs, or equipment submitted for approval prior to Contractor’s purchase thereof for incorporation in the Work.

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

E. If the Contract Documents require the Work (or part thereof) to be approved by Owner, Engineer, or another designated individual or entity, then Contractor shall assume full responsibility for arranging and obtaining such approvals.

F. If any Work (or the work of others) that is to be inspected, tested, or approved is covered by Contractor without written concurrence of Engineer, Contractor shall, if requested by Engineer, uncover such Work for observation. Such uncovering shall be at Contractor’s expense unless Contractor had given Engineer timely notice of Contractor’s intention to cover the same and Engineer had not acted with reasonable promptness in response to such notice.

14.03 Defective Work

A. Contractor’s Obligation: It is Contractor’s obligation to assure that the Work is not defective.

B. Engineer’s Authority: Engineer has the authority to determine whether Work is defective, and to reject defective Work.
C. **Notice of Defects:** Prompt notice of all defective Work of which Owner or Engineer has actual knowledge will be given to Contractor.

D. **Correction, or Removal and Replacement:** Promptly after receipt of written notice of defective Work, Contractor shall correct all such defective Work, whether or not fabricated, installed, or completed, or, if Engineer has rejected the defective Work, remove it from the Project and replace it with Work that is not defective.

E. **Preservation of Warranties:** When correcting defective Work, Contractor shall take no action that would void or otherwise impair Owner’s special warranty and guarantee, if any, on said Work.

F. **Costs and Damages:** In addition to its correction, removal, and replacement obligations with respect to defective Work, Contractor shall pay all claims, costs, losses, and damages arising out of or relating to defective Work, including but not limited to the cost of the inspection, testing, correction, removal, replacement, or reconstruction of such defective Work, fines levied against Owner by governmental authorities because the Work is defective, and the costs of repair or replacement of work of others resulting from defective Work. Prior to final payment, if Owner and Contractor are unable to agree as to the measure of such claims, costs, losses, and damages resulting from defective Work, then Owner may impose a reasonable set-off against payments due under Article 15.

14.04 **Acceptance of Defective Work**

A. If, instead of requiring correction or removal and replacement of defective Work, Owner prefers to accept it, Owner may do so (subject, if such acceptance occurs prior to final payment, to Engineer’s confirmation that such acceptance is in general accord with the design intent and applicable engineering principles, and will not endanger public safety). Contractor shall pay all claims, costs, losses, and damages attributable to Owner’s evaluation of and determination to accept such defective Work (such costs to be approved by Engineer as to reasonableness), and for the diminished value of the Work to the extent not otherwise paid by Contractor. If any such acceptance occurs prior to final payment, the necessary revisions in the Contract Documents with respect to the Work shall be incorporated in a Change Order. If the parties are unable to agree as to the decrease in the Contract Price, reflecting the diminished value of Work so accepted, then Owner may impose a reasonable set-off against payments due under Article 15. If the acceptance of defective Work occurs after final payment, Contractor shall pay an appropriate amount to Owner.

14.05 **Uncovering Work**

A. Engineer has the authority to require additional inspection or testing of the Work, whether or not the Work is fabricated, installed, or completed.

B. If any Work is covered contrary to the written request of Engineer, then Contractor shall, if requested by Engineer, uncover such Work for Engineer’s observation, and then replace the covering, all at Contractor’s expense.

C. If Engineer considers it necessary or advisable that covered Work be observed by Engineer or inspected or tested by others, then Contractor, at Engineer’s request, shall uncover, expose, or otherwise make available for observation, inspection, or testing as Engineer may require, that portion of the Work in question, and provide all necessary labor, material, and equipment.
1. If it is found that the uncovered Work is defective, Contractor shall be responsible for all claims, costs, losses, and damages arising out of or relating to such uncovering, exposure, observation, inspection, and testing, and of satisfactory replacement or reconstruction (including but not limited to all costs of repair or replacement of work of others); and pending Contractor’s full discharge of this responsibility the Owner shall be entitled to impose a reasonable set-off against payments due under Article 15.

2. If the uncovered Work is not found to be defective, Contractor shall be allowed an increase in the Contract Price or an extension of the Contract Times, or both, directly attributable to such uncovering, exposure, observation, inspection, testing, replacement, and reconstruction. If the parties are unable to agree as to the amount or extent thereof, then Contractor may submit a Change Proposal within 30 days of the determination that the Work is not defective.

14.06 Owner May Stop the Work

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

14.07 Owner May Correct Defective Work

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

B. In exercising the rights and remedies under this Paragraph 14.07, Owner shall proceed expeditiously. In connection with such corrective or remedial action, Owner may exclude Contractor from all or part of the Site, take possession of all or part of the Work and suspend Contractor’s services related thereto, and incorporate in the Work all materials and equipment stored at the Site or for which Owner has paid Contractor but which are stored elsewhere. Contractor shall allow Owner, Owner’s representatives, agents and employees, Owner’s other contractors, and Engineer and Engineer’s consultants access to the Site to enable Owner to exercise the rights and remedies under this paragraph.

C. All claims, costs, losses, and damages incurred or sustained by Owner in exercising the rights and remedies under this Paragraph 14.07 will be charged against Contractor as set-offs against payments due under Article 15. Such claims, costs, losses and damages will include but not be limited to all costs of repair, or replacement of work of others destroyed or damaged by correction, removal, or replacement of Contractor’s defective Work.

D. Contractor shall not be allowed an extension of the Contract Times because of any delay in the performance of the Work attributable to the exercise by Owner of Owner’s rights and remedies under this Paragraph 14.07.
ARTICLE 15 – PAYMENTS TO CONTRACTOR; SET-OFFS; COMPLETION; CORRECTION PERIOD

15.01 Progress Payments

A. Basis for Progress Payments: The Schedule of Values established as provided in Article 2 will serve as the basis for progress payments and will be incorporated into a form of Application for Payment acceptable to Engineer. Progress payments on account of Unit Price Work will be based on the number of units completed during the pay period, as determined under the provisions of Paragraph 13.03. Progress payments for cost-based Work will be based on Cost of the Work completed by Contractor during the pay period.

B. Applications for Payments:

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

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

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

C. Review of Applications:

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

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

   a. the Work has progressed to the point indicated;

   b. the quality of the Work is generally in accordance with the Contract Documents (subject to an evaluation of the Work as a functioning whole prior to or upon Substantial Completion, the results of any subsequent tests called for in the Contract Documents, a final determination of quantities and classifications for
Unit Price Work under Paragraph 13.03, and any other qualifications stated in the recommendation; and

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

3. By recommending any such payment Engineer will not thereby be deemed to have represented that:

   a. inspections made to check the quality or the quantity of the Work as it has been performed have been exhaustive, extended to every aspect of the Work in progress, or involved detailed inspections of the Work beyond the responsibilities specifically assigned to Engineer in the Contract; or

   b. there may not be other matters or issues between the parties that might entitle Contractor to be paid additionally by Owner or entitle Owner to withhold payment to Contractor.

4. Neither Engineer’s review of Contractor’s Work for the purposes of recommending payments nor Engineer’s recommendation of any payment, including final payment, will impose responsibility on Engineer:

   a. to supervise, direct, or control the Work, or

   b. for the means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or

   c. for Contractor’s failure to comply with Laws and Regulations applicable to Contractor’s performance of the Work, or

   d. to make any examination to ascertain how or for what purposes Contractor has used the money paid on account of the Contract Price, or

   e. to determine that title to any of the Work, materials, or equipment has passed to Owner free and clear of any Liens.

5. Engineer may refuse to recommend the whole or any part of any payment if, in Engineer’s opinion, it would be incorrect to make the representations to Owner stated in Paragraph 15.01.C.2.

6. Engineer will recommend reductions in payment (set-offs) necessary in Engineer’s opinion to protect Owner from loss because:

   a. the Work is defective, requiring correction or replacement;

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

   c. Owner has been required to correct defective Work in accordance with Paragraph 14.07, or has accepted defective Work pursuant to Paragraph 14.04;

   d. Owner has been required to remove or remediate a Hazardous Environmental Condition for which Contractor is responsible; or

   e. Engineer has actual knowledge of the occurrence of any of the events that would constitute a default by Contractor and therefore justify termination for cause under the Contract Documents.
D. **Payment Becomes Due:**
   1. Ten days after presentation of the Application for Payment to Owner with Engineer’s recommendation, the amount recommended (subject to any Owner set-offs) will become due, and when due will be paid by Owner to Contractor.

E. **Reductions in Payment by Owner:**
   1. In addition to any reductions in payment (set-offs) recommended by Engineer, Owner is entitled to impose a set-off against payment based on any of the following:
      a. claims have been made against Owner on account of Contractor’s conduct in the performance or furnishing of the Work, or Owner has incurred costs, losses, or damages on account of Contractor’s conduct in the performance or furnishing of the Work, including but not limited to claims, costs, losses, or damages from workplace injuries, adjacent property damage, non-compliance with Laws and Regulations, and patent infringement;
      b. Contractor has failed to take reasonable and customary measures to avoid damage, delay, disruption, and interference with other work at or adjacent to the Site;
      c. Contractor has failed to provide and maintain required bonds or insurance;
      d. Owner has been required to remove or remediate a Hazardous Environmental Condition for which Contractor is responsible;
      e. Owner has incurred extra charges or engineering costs related to submittal reviews, evaluations of proposed substitutes, tests and inspections, or return visits to manufacturing or assembly facilities;
      f. the Work is defective, requiring correction or replacement;
      g. Owner has been required to correct defective Work in accordance with Paragraph 14.07, or has accepted defective Work pursuant to Paragraph 14.04;
      h. the Contract Price has been reduced by Change Orders;
      i. an event that would constitute a default by Contractor and therefore justify a termination for cause has occurred;
      j. liquidated damages have accrued as a result of Contractor’s failure to achieve Milestones, Substantial Completion, or final completion of the Work;
      k. Liens have been filed in connection with the Work, except where Contractor has delivered a specific bond satisfactory to Owner to secure the satisfaction and discharge of such Liens;
      l. there are other items entitling Owner to a set off against the amount recommended.

2. If Owner imposes any set-off against payment, whether based on its own knowledge or on the written recommendations of Engineer, Owner will give Contractor immediate written notice (with a copy to Engineer) stating the reasons for such action and the specific amount of the reduction, and promptly pay Contractor any amount remaining after deduction of the amount so withheld. Owner shall promptly pay Contractor the amount so withheld, or any adjustment thereto agreed to by Owner and Contractor, if Contractor remedies the reasons for such action. The reduction
imposed shall be binding on Contractor unless it duly submits a Change Proposal contesting the reduction.

3. Upon a subsequent determination that Owner’s refusal of payment was not justified, the amount wrongfully withheld shall be treated as an amount due as determined by Paragraph 15.01.C.1 and subject to interest as provided in the Agreement.

15.02 Contractor’s Warranty of Title

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

15.03 Substantial Completion

A. When Contractor considers the entire Work ready for its intended use Contractor shall notify Owner and Engineer in writing that the entire Work is substantially complete and request that Engineer issue a certificate of Substantial Completion. Contractor shall at the same time submit to Owner and Engineer an initial draft of punch list items to be completed or corrected before final payment.

B. Promptly after Contractor’s notification, Owner, Contractor, and Engineer shall make an inspection of the Work to determine the status of completion. If Engineer does not consider the Work substantially complete, Engineer will notify Contractor in writing giving the reasons therefor.

C. If Engineer considers the Work substantially complete, Engineer will deliver to Owner a preliminary certificate of Substantial Completion which shall fix the date of Substantial Completion. Engineer shall attach to the certificate a punch list of items to be completed or corrected before final payment. Owner shall have seven days after receipt of the preliminary certificate during which to make written objection to Engineer as to any provisions of the certificate or attached punch list. If, after considering the objections to the provisions of the preliminary certificate, Engineer concludes that the Work is not substantially complete, Engineer will, within 14 days after submission of the preliminary certificate to Owner, notify Contractor in writing that the Work is not substantially complete, stating the reasons therefor. If Owner does not object to the provisions of the certificate, or if despite consideration of Owner’s objections Engineer concludes that the Work is substantially complete, then Engineer will, within said 14 days, execute and deliver to Owner and Contractor a final certificate of Substantial Completion (with a revised punch list of items to be completed or corrected) reflecting such changes from the preliminary certificate as Engineer believes justified after consideration of any objections from Owner.

D. At the time of receipt of the preliminary certificate of Substantial Completion, Owner and Contractor will confer regarding Owner’s use or occupancy of the Work following Substantial Completion, review the builder’s risk insurance policy with respect to the end of the builder’s risk coverage, and confirm the transition to coverage of the Work under a permanent property insurance policy held by Owner. Unless Owner and Contractor agree otherwise in writing, Owner shall bear responsibility for security, operation, protection of the Work, property insurance, maintenance, heat, and utilities upon Owner’s use or occupancy of the Work.

E. After Substantial Completion the Contractor shall promptly begin work on the punch list of items to be completed or corrected prior to final payment. In appropriate cases Contractor
may submit monthly Applications for Payment for completed punch list items, following the progress payment procedures set forth above.

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

15.04 Partial Use or Occupancy

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

1. At any time Owner may request in writing that Contractor permit Owner to use or occupy any such part of the Work that Owner believes to be substantially complete. If and when Contractor agrees that such part of the Work is substantially complete, Contractor, Owner, and Engineer will follow the procedures of Paragraph 15.03.A through E for that part of the Work.

2. At any time Contractor may notify Owner and Engineer in writing that Contractor considers any such part of the Work substantially complete and request Engineer to issue a certificate of Substantial Completion for that part of the Work.

3. Within a reasonable time after either such request, Owner, Contractor, and Engineer shall make an inspection of that part of the Work to determine its status of completion. If Engineer does not consider that part of the Work to be substantially complete, Engineer will notify Owner and Contractor in writing giving the reasons therefore. If Engineer considers that part of the Work to be substantially complete, the provisions of Paragraph 15.03 will apply with respect to certification of Substantial Completion of that part of the Work and the division of responsibility in respect thereof and access thereto.

4. No use or occupancy or separate operation of part of the Work may occur prior to compliance with the requirements of Paragraph 6.05 regarding builder’s risk or other property insurance.

15.05 Final Inspection

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

15.06 Final Payment

A. Application for Payment:

1. After Contractor has, in the opinion of Engineer, satisfactorily completed all corrections identified during the final inspection and has delivered, in accordance with the Contract Documents, all maintenance and operating instructions, schedules, guarantees, bonds, certificates or other evidence of insurance, certificates of
inspection, annotated record documents (as provided in Paragraph 7.11), and other
documents, Contractor may make application for final payment.

2. The final Application for Payment shall be accompanied (except as previously
delivered) by:
   a. all documentation called for in the Contract Documents;
   b. consent of the surety, if any, to final payment;
   c. satisfactory evidence that all title issues have been resolved such that title to all
      Work, materials, and equipment has passed to Owner free and clear of any Liens
      or other title defects, or will so pass upon final payment.
   d. a list of all disputes that Contractor believes are unsettled; and
   e. complete and legally effective releases or waivers (satisfactory to Owner) of all
      Lien rights arising out of the Work, and of Liens filed in connection with the Work.

3. In lieu of the releases or waivers of Liens specified in Paragraph 15.06.A.2 and as
   approved by Owner, Contractor may furnish receipts or releases in full and an affidavit
   of Contractor that: (a) the releases and receipts include all labor, services, material,
   and equipment for which a Lien could be filed; and (b) all payrolls, material and
   equipment bills, and other indebtedness connected with the Work for which Owner
   might in any way be responsible, or which might in any way result in liens or other
   burdens on Owner’s property, have been paid or otherwise satisfied. If any
   Subcontractor or Supplier fails to furnish such a release or receipt in full, Contractor
   may furnish a bond or other collateral satisfactory to Owner to indemnify Owner
   against any Lien, or Owner at its option may issue joint checks payable to Contractor
   and specified Subcontractors and Suppliers.

B. Engineer’s Review of Application and Acceptance:

1. If, on the basis of Engineer’s observation of the Work during construction and final
   inspection, and Engineer’s review of the final Application for Payment and
   accompanying documentation as required by the Contract Documents, Engineer is
   satisfied that the Work has been completed and Contractor’s other obligations under
   the Contract have been fulfilled, Engineer will, within ten days after receipt of the final
   Application for Payment, indicate in writing Engineer’s recommendation of final
   payment and present the Application for Payment to Owner for payment. Such
   recommendation shall account for any set-offs against payment that are necessary in
   Engineer’s opinion to protect Owner from loss for the reasons stated above with
   respect to progress payments. At the same time Engineer will also give written notice
   to Owner and Contractor that the Work is acceptable, subject to the provisions of
   Paragraph 15.07. Otherwise, Engineer will return the Application for Payment to
   Contractor, indicating in writing the reasons for refusing to recommend final payment,
   in which case Contractor shall make the necessary corrections and resubmit the
   Application for Payment.

C. Completion of Work: The Work is complete (subject to surviving obligations) when it is
   ready for final payment as established by the Engineer’s written recommendation of final
   payment.

D. Payment Becomes Due: Thirty days after the presentation to Owner of the final Application
   for Payment and accompanying documentation, the amount recommended by Engineer
(less any further sum Owner is entitled to set off against Engineer’s recommendation, including but not limited to set-offs for liquidated damages and set-offs allowed under the provisions above with respect to progress payments) will become due and shall be paid by Owner to Contractor.

15.07 Waiver of Claims

A. The making of final payment will not constitute a waiver by Owner of claims or rights against Contractor. Owner expressly reserves claims and rights arising from unsettled Liens, from defective Work appearing after final inspection pursuant to Paragraph 15.05, from Contractor’s failure to comply with the Contract Documents or the terms of any special guarantees specified therein, from outstanding Claims by Owner, or from Contractor’s continuing obligations under the Contract Documents.

B. The acceptance of final payment by Contractor will constitute a waiver by Contractor of all claims and rights against Owner other than those pending matters that have been duly submitted or appealed under the provisions of Article 17.

15.08 Correction Period

A. If within one year after the date of Substantial Completion (or such longer period of time as may be prescribed by the terms of any applicable special guarantee required by the Contract Documents, or by any specific provision of the Contract Documents), any Work is found to be defective, or if the repair of any damages to the Site, adjacent areas that Contractor has arranged to use through construction easements or otherwise, and other adjacent areas used by Contractor as permitted by Laws and Regulations, is found to be defective, then Contractor shall promptly, without cost to Owner and in accordance with Owner’s written instructions:

1. correct the defective repairs to the Site or such other adjacent areas;
2. correct such defective Work;
3. if the defective Work has been rejected by Owner, remove it from the Project and replace it with Work that is not defective, and
4. satisfactorily correct or repair or remove and replace any damage to other Work, to the work of others, or to other land or areas resulting therefrom.

B. If Contractor does not promptly comply with the terms of Owner’s written instructions, or in an emergency where delay would cause serious risk of loss or damage, Owner may have the defective Work corrected or repaired or may have the rejected Work removed and replaced. Contractor shall pay all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such correction or repair or such removal and replacement (including but not limited to all costs of repair or replacement of work of others).

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

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

E. Contractor’s obligations under this paragraph are in addition to all other obligations and
warranties. The provisions of this paragraph shall not be construed as a substitute for, or a
waiver of, the provisions of any applicable statute of limitation or repose.

ARTICLE 16 – SUSPENSION OF WORK AND TERMINATION

16.01 Owner May Suspend Work

A. At any time and without cause, Owner may suspend the Work or any portion thereof for a
period of not more than 90 consecutive days by written notice to Contractor and Engineer. Such
notice will fix the date on which Work will be resumed. Contractor shall resume the
Work on the date so fixed. Contractor shall be entitled to an adjustment in the Contract
Price or an extension of the Contract Times, or both, directly attributable to any such
suspension. Any Change Proposal seeking such adjustments shall be submitted no later
than 30 days after the date fixed for resumption of Work.

16.02 Owner May Terminate for Cause

A. The occurrence of any one or more of the following events will constitute a default by
Contractor and justify termination for cause:

1. Contractor’s persistent failure to perform the Work in accordance with the Contract
Documents (including, but not limited to, failure to supply sufficient skilled workers or
suitable materials or equipment or failure to adhere to the Progress Schedule);

2. Failure of Contractor to perform or otherwise to comply with a material term of the
Contract Documents;

3. Contractor’s disregard of Laws or Regulations of any public body having jurisdiction; or

4. Contractor’s repeated disregard of the authority of Owner or Engineer.

B. If one or more of the events identified in Paragraph 16.02.A occurs, then after giving
Contractor (and any surety) ten days written notice that Owner is considering a declaration
that Contractor is in default and termination of the contract, Owner may proceed to:

1. declare Contractor to be in default, and give Contractor (and any surety) notice that
the Contract is terminated; and

2. enforce the rights available to Owner under any applicable performance bond.

C. Subject to the terms and operation of any applicable performance bond, if Owner has
terminated the Contract for cause, Owner may exclude Contractor from the Site, take
possession of the Work, incorporate in the Work all materials and equipment stored at the
Site or for which Owner has paid Contractor but which are stored elsewhere, and complete
the Work as Owner may deem expedient.

D. Owner may not proceed with termination of the Contract under Paragraph 16.02.B if
Contractor within seven days of receipt of notice of intent to terminate begins to correct its
failure to perform and proceeds diligently to cure such failure.

E. If Owner proceeds as provided in Paragraph 16.02.B, Contractor shall not be entitled to
receive any further payment until the Work is completed. If the unpaid balance of the
Contract Price exceeds the cost to complete the Work, including all related claims, costs,
losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals) sustained by Owner, such excess will be paid to Contractor. If the cost to complete the Work including such related claims, costs, losses, and damages exceeds such unpaid balance, Contractor shall pay the difference to Owner. Such claims, costs, losses, and damages incurred by Owner will be reviewed by Engineer as to their reasonableness and, when so approved by Engineer, incorporated in a Change Order. When exercising any rights or remedies under this paragraph, Owner shall not be required to obtain the lowest price for the Work performed.

F. Where Contractor’s services have been so terminated by Owner, the termination will not affect any rights or remedies of Owner against Contractor then existing or which may thereafter accrue, or any rights or remedies of Owner against Contractor or any surety under any payment bond or performance bond. Any retention or payment of money due Contractor by Owner will not release Contractor from liability.

G. If and to the extent that Contractor has provided a performance bond under the provisions of Paragraph 6.01.A, the provisions of that bond shall govern over any inconsistent provisions of Paragraphs 16.02.B and 16.02.D.

16.03 Owner May Terminate For Convenience

A. Upon seven days written notice to Contractor and Engineer, Owner may, without cause and without prejudice to any other right or remedy of Owner, terminate the Contract. In such case, Contractor shall be paid for (without duplication of any items):

1. completed and acceptable Work executed in accordance with the Contract Documents prior to the effective date of termination, including fair and reasonable sums for overhead and profit on such Work;

2. expenses sustained prior to the effective date of termination in performing services and furnishing labor, materials, or equipment as required by the Contract Documents in connection with uncompleted Work, plus fair and reasonable sums for overhead and profit on such expenses; and

3. other reasonable expenses directly attributable to termination, including costs incurred to prepare a termination for convenience cost proposal.

B. Contractor shall not be paid on account of loss of anticipated overhead, profits, or revenue, or other economic loss arising out of or resulting from such termination.

16.04 Contractor May Stop Work or Terminate

A. If, through no act or fault of Contractor, (1) the Work is suspended for more than 90 consecutive days by Owner or under an order of court or other public authority, or (2) Engineer fails to act on any Application for Payment within 30 days after it is submitted, or (3) Owner fails for 30 days to pay Contractor any sum finally determined to be due, then Contractor may, upon seven days written notice to Owner and Engineer, and provided Owner or Engineer do not remedy such suspension or failure within that time, terminate the contract and recover from Owner payment on the same terms as provided in Paragraph 16.03.

B. In lieu of terminating the Contract and without prejudice to any other right or remedy, if Engineer has failed to act on an Application for Payment within 30 days after it is submitted, or Owner has failed for 30 days to pay Contractor any sum finally determined to be due, Contractor may, seven days after written notice to Owner and Engineer, stop the
Work until payment is made of all such amounts due Contractor, including interest thereon. The provisions of this paragraph are not intended to preclude Contractor from submitting a Change Proposal for an adjustment in Contract Price or Contract Times or otherwise for expenses or damage directly attributable to Contractor’s stopping the Work as permitted by this paragraph.

ARTICLE 17 – FINAL RESOLUTION OF DISPUTES

17.01 Methods and Procedures

A. Disputes Subject to Final Resolution: The following disputed matters are subject to final resolution under the provisions of this Article:

1. A timely appeal of an approval in part and denial in part of a Claim, or of a denial in full; and
2. Disputes between Owner and Contractor concerning the Work or obligations under the Contract Documents, and arising after final payment has been made.

B. Final Resolution of Disputes: For any dispute subject to resolution under this Article, Owner or Contractor may:

1. elect in writing to invoke the dispute resolution process provided for in the Supplementary Conditions; or
2. agree with the other party to submit the dispute to another dispute resolution process; or
3. if no dispute resolution process is provided for in the Supplementary Conditions or mutually agreed to, give written notice to the other party of the intent to submit the dispute to a court of competent jurisdiction.

ARTICLE 18 – MISCELLANEOUS

18.01 Giving Notice

A. Whenever any provision of the Contract Documents requires the giving of written notice, it will be deemed to have been validly given if:

1. delivered in person, by a commercial courier service or otherwise, to the individual or to a member of the firm or to an officer of the corporation for which it is intended; or
2. delivered at or sent by registered or certified mail, postage prepaid, to the last business address known to the sender of the notice.

18.02 Computation of Times

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

18.03 Cumulative Remedies

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

18.04 Limitation of Damages

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

18.05 No Waiver

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

18.06 Survival of Obligations

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

18.07 Controlling Law

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

18.08 Headings

A. Article and paragraph headings are inserted for convenience only and do not constitute parts of these General Conditions.
SUPPLEMENTARY CONDITIONS TO THE GENERAL 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.48 Add a new definition immediately following Paragraph 1.01.A.48 that is to read as follows:

SC-1.01.A.49 Consulting Engineer: The firm of Burk-Kleinpeter, Inc. and subsidiaries, affiliates, and its duly authorized agents, such agents acting within the scope of the particular duties entrusted to them.

SC-5.03 Add the following new paragraphs immediately after Paragraph 5.03.B:

C. The following drawings of physical conditions relating to existing surface or subsurface structures at or adjacent to the Site (except Underground Facilities) are known to Owner:


   a. None of the contents of such drawings is Technical Data on whose accuracy Contractor may rely.

D. Contractor may request electronic copies of drawings identified in SC-5.03.C from Engineer.

SC-5.06 Delete Paragraphs 5.06.A and 5.06.B in their entirety and insert the following:

A. No reports or drawings related to Hazardous Environmental Conditions at the Site are known to Owner.

B. Not Used.
SC-6.01 Add the following new paragraph immediately after Paragraph 6.01.F:

G. All projects costing in excess of $25,000.00 and for the construction, alteration, or repair of any public building or public work shall be required to have the following bonds:

1. **Performance Bond** payable to, in favor of, or for the protection of the City for the work to be done in an amount not less than the amount of the contract, conditioned for the full and faithful performance of the contract.

2. **Payment Bond** payable to the City conditioned for the prompt payment of all persons supplying labor or material used in the prosecution of the work under said contract, for the use of each such person in an amount not less than the amount of the contract.

SC-6.03 Add the following new paragraphs immediately after Paragraph 6.03.J:

K. The limits of liability for the insurance required by Paragraph 6.03 of the General Conditions shall provide coverage for not less than the following amounts or greater where required by Laws and Regulations:

1. Workers’ Compensation, and related coverage under Paragraphs 6.03.A.1 and A.2 of the General Conditions:
   a. Applicable Federal or State: Statutory
   b. Maritime: Not Required
   c. Railroad: Not Required
   d. Employer’s Liability
      - Each Accident: $1,000,000
      - Disease:
         - Each Employee: $1,000,000
         - Policy Limit: $2,000,000

2. Contractor’s Commercial General Liability under Paragraphs 6.03.B and 6.03.C of the General Conditions:
   a. Bodily Injury:
      - Each Occurrence: $1,000,000
      - Annual Aggregate: $5,000,000
   b. Property Damage:
      - Each Occurrence: $1,000,000
      - Annual Aggregate: $5,000,000
   c. Property Damage liability insurance shall provide Explosion, Collapse and Underground coverages.
3. Automobile Liability under Paragraph 6.03D of the General Conditions:

   a. Bodily Injury:
      Each Person ................................................................. $1,000,000
      Each Accident ............................................................ $2,000,000
   b. Property Damage:
      Each Occurrence ......................................................... $1,000,000
   c. Combined Single Limit ................................................ $2,000,000

L. The Successful Contractor shall have on file with the City of Meridian, prior to the issuance of the “Notice to Proceed”, a current “Certificate of Insurance”.

M. The Successful Contractor shall have his Insurance provider furnish an explanation of any endorsements, included on the Certificate of Insurance.

SC-7.02 Add the following new subparagraphs immediately after Paragraph 7.02.B:

1. Except where otherwise prohibited by Laws or Regulations, regular working hours at the Site are defined as up to eight hours per day, beginning no earlier than 8:00 a.m. and ending no later than 5:00 p.m.

2. Maintenance and cleanup activities may be performed during hours other than regular working hours provided that such activities do not require the startup of operation of construction equipment.

3. If it shall become absolutely necessary to perform Work at night or on Saturdays, Sundays, or legal holidays, written notice shall be submitted to Owner and Engineer at least seven (7) days in advance of the need for such Work. Owner will only consider the performance of such Work as can be performed satisfactorily under the conditions. Good lighting and all other necessary facilities for carrying out and observing the Work shall be provided and maintained where such Work is being performed at night.

SC-7.11 Add the following new paragraph immediately after Paragraph 7.11.A:

B. Contractor will be required to review with Engineer the status of record documents in connection with Engineer’s review of an Application for Payment. Failure to maintain record documents current may be just cause for Engineer to recommend withholding of payments for Work performed.

SC-7.14 Add the following new paragraph immediately after Paragraph 7.14.A:
B. Contractor shall provide a centralized location for the maintenance of the material safety data sheets or other hazardous communication information required to be made available to any employer on the Site. Location of the material safety data sheets or other hazardous communication information shall be readily accessible to the employees or employers on the Site.

SC-7.16 Add the following new paragraph immediately after Paragraph 7.16.E:

F. Contractor shall furnish required submittals with sufficient information and accuracy to obtain required approval or acceptance of submittal with no more than three submittals. Engineer will record Engineer’s time for reviewing subsequent submittals or Shop Drawings, Samples, or other submittals or items requiring approval or acceptance, and Contractor shall reimburse Owner for Engineer’s charges for such time.

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

SC-10.03 Add the following new paragraph immediately after Paragraph 10.03.A:

B. Resident Project Representative (RPR) will be Engineer’s employee or agent at the Site, will act as directed by and under the supervision of Engineer, and will confer with Engineer regarding RPR’s actions. RPR’s dealings in matters pertaining to the Work in general shall be with Engineer and Contractor keeping Owner advised as necessary. RPR’s dealings with Subcontractors shall only be through or with the full knowledge and approval of Contractor. RPR shall generally communicate with Owner with the knowledge of and under the direction of Engineer.

1. Duties and Responsibilities of RPR:
   a. Schedules: Review the Progress Schedule, Schedule of Submittals, and Schedule of Values prepared by Contractor and consult with Engineer concerning acceptability.
   b. Conferences and Meetings: Attend meetings with Contractor, such as preconstruction conferences, progress meetings, job conferences, and other Project-related meetings, and prepare and circulate copies of minutes thereof.
   c. Liaison:
      1) Serve as Engineer’s liaison with Contractor, working principally through Contractor’s superintendent, and assist in providing understanding of the intent of the Contract Documents; and assist Engineer in serving as Owner's
liaison with Contractor when Contractor’s operations affect Owner’s operations on the Site.
2) Assist in obtaining from Owner additional details or information when required for proper execution of the Work.
d. Shop Drawings and Samples:
1) Record the date of Shop Drawings and Samples that are received at the Site.
2) Receive Samples that are furnished at the Site by Contractor, and notify Engineer of availability of Samples for examination.
3) Advise Engineer and Contractor of the commencement of any Work requiring a Shop Drawing or Sample if the submittal has not been approved by Engineer.
e. Review of Work, Rejection of Defective Work, Inspections and Tests:
1) Conduct observations of the Work in progress on the Site to assist Engineer in determining if the Work is, in general, proceeding in accordance with the Contract Documents.
2) Report to Engineer when RPR believes that any Work is unsatisfactory, faulty, or defective or does not conform generally to the Contract Documents, or has been damaged, or does not meet the requirements of any inspection, test, or approval required to be made; and advise Engineer of Work that RPR believes should be corrected or rejected or should be uncovered for observation, or requires special testing, inspection, or approval.
3) Verify that tests, equipment, and systems startups, and operating and maintenance training are conducted in the presence of appropriate Owner’s personnel, and that Contractor maintains adequate records thereof; and observe, record, and report to Engineer appropriate details relative to the test procedures and startups.
4) Accompany visiting inspectors representing public or other agencies having jurisdiction over the Project, record the results of these inspections and report to Engineer.
f. Interpretations of Contract Documents: Report to Engineer when clarifications and interpretations of the Contract Documents are needed and transmit to Contractor clarifications and interpretations as issued by Engineer.
g. Modifications: Consider and evaluate Contractor’s suggestions for modifications to Drawings or Specifications and report with RPR’s recommendations to Engineer. Transmit to Contractor decisions issued by Engineer.
h. Records:
1) Maintain at the Site orderly files for correspondence, reports of job conferences, Shop Drawings and Samples, and
reproductions of original Contract Documents including all Addenda, Change Orders, Work Change Directives, Field Orders, additional Drawings issued subsequent to the execution of the Agreement, Engineer’s clarifications and interpretations of the Contract Documents, progress reports, and other Project-related documents.

2) Keep a record recording Contractor’s hours on Site, weather conditions, data relative to questions on Change Orders or changed conditions, list of visitors to the Site, daily activities, decisions, observations in general, and specific observations in more detail as in the case of observing test procedures; and send copies to Engineer.

3) Record names, addresses, and telephone numbers of all Contractors, Subcontractors, and major Suppliers of materials and equipment.

i. Reports:
   1) Furnish Engineer periodic reports as required of progress of the Work and of Contractor’s compliance with the Progress Schedule and Schedule of Submittals.
   2) Consult with Engineer is advance of schedule major tests, inspections, or start of important phases of the Work.
   3) Prepare draft of proposed Change Order, obtaining backup documents from Contractor, and provide recommendations to Engineer regarding Change Orders and Field Orders.
   4) Report immediately to Engineer and Owner upon the occurrence of any Site accident, and Hazardous Environmental Condition, emergencies or acts of God endangering the Work, or property damage by fire or other cause.

j. Payment Requests: Review Applications for Payment with Contractor for compliance with the established procedure for their submission, and submit recommendations to Engineer, noting particularly the relationship of the payment request to the Schedule of Values, Work completed, and materials and equipment delivered at the Site but not incorporated in the Work.

k. Certificates, Maintenance and Operation Manuals: During the course of the Work, verify that certificates, maintenance and operation manuals, and other data required by the Specifications to be assembled and furnished by Contractor are applicable to the items actually installed and in accordance with the Contract Documents, and have this material delivered to Engineer for review and forwarding to Owner prior to final payment for the Work.

l. Completion:
1) Before Engineer issues a certificate of Substantial Completion, submit to Contractor a list of observed items requiring completion or correction.

2) Observe whether Contractor has arranged for inspections required by Laws and Regulations, including but not limited to those to be performed by public authorities having jurisdiction over the Work.

3) Conduct final inspection in the company of Engineer, Owner, and Contractor, and prepare a final list of items to be completed or corrected.

4) Observe that all items on final list have been completed or corrected and make recommendations to Engineer concerning acceptance of the Work.

2. The RPR shall not:
   a. Authorize any deviation from the Contract Documents or substitution of materials or equipment, including “or equal” items.
   b. Exceed limitations of Engineer’s authority as set forth in the Contract Documents.
   c. Undertake any of the responsibilities of Contractor, Subcontractors, or Contractor’s superintendents.
   d. Advise on, issue directives relative to, or assume control over any aspect of the means, methods, techniques, sequences or procedures of construction, unless such advice or directions are specifically required by the Contract Documents.
   e. Advise on, issue directions regarding, or assume control over safety precautions and programs in connection with the Work.
   f. Accept Shop Drawings or Sample submittals from anyone other than Contractor.
   g. Authorize Owner to occupy the Project in whole or in part.
   h. Participate in specialized field or laboratory tests or inspections conducted by other except as specifically authorized by Engineer.

SC-15.01 Delete Paragraph 15.01.D in its entirety and insert the following:

D. Payment Becomes Due:

1. No later than forty-five (45) days after approval of the Application for Payment by Owner with Engineer’s recommendation, the amount recommended (subject to any Owner set-offs) will become due, and when due will be paid by Owner to Contractor.

SC-15.06 Delete Paragraph 15.06.D in its entirety and insert the following:

D. Payment Becomes Due: Sixty days after the presentation to Owner of the final Application for Payment and accompanying documentation,
the amount recommended by Engineer (less any further sum Owner is entitled to set-off against Engineer’s recommendation, including but not limited to set-offs for liquidated damages and set-offs allowed under the provisions above with respect to progress payments) will become due and shall be paid by Owner to Contractor.

- END OF SUPPLEMENTARY CONDITIONS -
U. S. CITIZENSHIP CERTIFICATION FOR DISADVANTAGED BUSINESS ENTERPRISES

I certify that ___________________________________________ is

____________________________________
MBE/WBE Company Name

a _____________________ owned business enterprise as defined in

Enter “Minority” or “Women”

Federal Regulations 40 CFR, Part 31. I further certify that I am a citizen of the United States of America (resident aliens are not eligible for minority or women owned business status under programs funded in part by DWSIRLF loans).

____________________________________
Signature of DBE Business Owner

____________________________________
Date

This form is required for a DBE firm that has not previously participated in a Drinking Water Systems Improvements Revolving Loan Fund funded project.
CERTIFICATION BY PROPOSED PRIME OR SUBCONTRACTOR REGARDING EQUAL EMPLOYMENT OPPORTUNITY

DWI-L-380005-01
(DWSIRLF Project Number)

INSTRUCTIONS

This certification is required pursuant to Executive Order 11246, Part II, Section 203(b), (30 F.R. 12319-25). Any bidder or prospective contractor, or any of their proposed subcontractors, shall state as an initial part of the bid or negotiations of the contract whether it has participated in any previous contract or subcontract subject to the equal opportunity clauses; and, if so, whether it has filed all compliance reports due under applicable instructions. Where this certification indicates that the prime or subcontractor has not filed a compliance report due under applicable instruction, such contractor shall be required to submit a compliance report.

THIS FORM ALONG WITH ITEMS LISTED IN SPECIAL NOTICE #1 IS TO BE SUBMITTED BY LOW BIDDER AND PROPOSED SUBCONTRACTORS WITH A PROCUREMENT VALUE OVER $10,000 TO THE OWNER TEN (10) DAYS AFTER BID OPENING.

(SEE SUPPLEMENTAL GENERAL CONDITIONS, ATTACHMENT #3)

Prime or Subcontractor’s Name: ____________________________________________________________

Address: ____________________________________________________________________________

____________________________________________________________________________________

1. Bidder has participated in a previous contract or subcontract subject to the Equal Opportunity Clause. YES _____ NO _____

2. Compliance Reports were required to be filed in connection with such contract or subcontract. YES _____ NO _____

If YES, state what reports were filed and with what agency.

3. Bidder has filed all compliance reports due under applicable instructions YES _____ NO _____

4. If answer to item 3 is NO, please explain in detail on reverse side of this certification. The information above is true and complete to the best of my knowledge and belief. (A willfully false statement is punishable by law - U.S. Code, Title 18, Section 1001.)

NAME AND TITLE OF SIGNER (PLEASE TYPE)

______________________________ __________________________
SIGNATURE DATE
CERTIFICATION REGARDING DEBARMENT, SUSPENSION
AND OTHER RESPONSIBILITY MATTERS

Under Executive Order 12549 individuals or organizations debarred from participation in Federal Assistance Programs may not receive an assistance award under a federal program or subagreement thereunder for $25,000 or more. Accordingly each recipient of a Drinking Water Systems Improvements Revolving Loan Fund loan or a contract (engineering or construction) awarded under a loan must complete the following certification (see 40 CFR 32.510).

The loan recipient must obtain this certification from all contractors (prime construction contractor and subcontractors/equipment/material suppliers). The Department will not approve the award of a contract for DWSIRLF participation until the loan recipient certifies that certification has been obtained from the successful bidder and his sub-contractors. Prime and subcontractor/equipment/material suppliers’ certifications must be included with the executed contract documents submittal to the Department.

The prospective participant certifies to the best of their 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 (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 U.S.C. Subsection 1001, a false statement may result in a fine of up to $10,000 or imprisonment for up to 5 years, or both.

Prime or Subcontractor’s Name       Signature/Date

(   ) I am unable to certify to the above statements. Attached is my explanation.
SUPPLEMENTAL GENERAL CONDITIONS 
FOR 
CONSTRUCTION OF DRINKING WATER SYSTEMS 
IMPROVEMENTS REVOLVING LOAN FUND PROJECTS
**TABLE OF CONTENTS**

The attached instructions and regulations as listed below shall be incorporated into the Contract Documents.

1. Special Provisions                      SGC-03
2. General Conditions                    SGC-04
   - Price Reduction For Defective Cost Or Pricing Data
   - Audit - Access To Records
   - Covenant Against Contingent Fees
   - Gratuities
3. EEO Documents                          SGC-07
   - Notice of Requirement for Affirmative Action
   - Equal Employment Opportunity Clause
   - Goals
   - 40CFR Part 8, Equal Opportunity Requirements
   - EEO Special Notice No. 1
4. Utilization of Disadvantaged Businesses SGC-21
   - Sample MBE/WBE Letter
5. Davis-Bacon and Related Acts          SGC-28
6. DWSIRLF Project Document Board        SGC-36

Attachments:

  
  DBE Directory                          Attachment 1

These Supplemental General conditions shall supersede any conflicting provisions of this contract.
SECTON 1 - SPECIAL PROVISIONS:

(a) Construction shall be carried out so as to prevent by-passing of wastewater during construction.

(b) Best Management Practices (BMP’s) shall be used for erosion and sediment control on the construction site.

(c) Disturbed areas shall be restored to the original or better condition.

(d) It is the duty of the Contractor, the owner and the engineer to insure the construction of the project, including the letting of contracts in connection therewith, complies with all applicable laws and regulations and requirements of the United States of America or any agency thereof, the State of Mississippi or any agency thereof, or any local government or political subdivision to the extent that such requirements do not conflict with Federal laws and regulations and any regulations or policies established by the Local Governments and Rural Water Systems Improvements Board (Board).

(e) The Contractor agrees to indemnify and save, release and hold harmless the State of Mississippi, the Board, the Mississippi State Department of Health (Department), and all of their employees and officers from and against any and all claim, demand, cause of action, liability, loss, damage, injury, suit, judgment, debt and cost, including attorney’s fees or expenses on the part of Contractor or Subcontractor or their agents or employees or any other parties arising out of or incident to, any and all work under the terms of this contract.

(f) Upon execution of this contract between the Owner and the Contractor, the State of Mississippi, the Board, the Department, and all their employees and officers do not assume any authorities, duties, responsibilities, or liabilities under such contract.

(g) The State of Mississippi, the Board, the Department and all their employees and officers, do not have any authority, duty, responsibility, or liability in contract claims identification, negotiation, resolution, or any other actions regarding contract claims under this contract.

(h) No actions taken by the State of Mississippi, the Board, the Department and all their employees and officers either directly or indirectly, in regard to this contract constitute or establish any determinations, authority, duty, responsibility, or liability under this contract.

(i) The Owner and the Contractor must resolve all claims and contract disputes, as provided in the contract documents, prior to the Owner’s submission of any documents regarding DWSIRLF loan participation to the Department.
SECTION 2 - GENERAL CONDITIONS:

PRICE REDUCTION FOR DEFECTIVE COST OR PRICING DATA

(NOTE - The following clause applies to (1) any sub-agreement negotiated between the Loan Recipient and its Contractor in excess of $100,000; (2) negotiated sub-agreement amendments or change orders in excess of $100,000 affecting the price of formally advertised, competitively awarded, fixed price sub-agreement, or (3) any lower tier sub-agreement or purchase order in excess of $100,000 under a sub-agreement other than a formally advertised, competitively awarded, fixed price sub-agreement. This clause does not apply to sub-agreements awarded on the basis of effective price competition.)

(a) The Contractor and Subcontractor, where appropriate, assure that the cost and pricing data submitted for evaluation with respect to negotiation of prices for negotiated sub-agreements, lower tier sub-agreements and change orders is based on current, accurate and complete data supported by their books and records. If the Loan Recipient or Department Staff determine that any price (including profit) negotiated in connection with this sub-agreement, lower tier sub-agreement or amendment thereunder was increased by any significant sums because the data provided was incomplete, inaccurate or not current at the time of submission, then such price or cost or profit shall be reduced accordingly and the recipient shall modify the sub-agreement in writing to reflect such action.

(b) Failure to agree on a reduction shall be subject to the remedies clause of this sub-agreement.

(Note - Since the agreement is subject to reduction under this clause by reason of defective cost or pricing data submitted in connection with lower tier sub-agreements, the Contractor may wish to include a clause in each lower tier sub-agreement requiring the lower tier subcontractor to appropriately indemnify the Contractor. It is also expected that any lower tier Subcontractor subject to such indemnification will generally require substantially similar indemnification for defective cost or pricing data submitted by lower tier contractors.)

AUDIT - ACCESS TO RECORDS

(a) The Contractor shall maintain books, records, documents and other evidence directly pertinent to performance on State funded work under this sub-agreement in accordance with generally accepted accounting principles and practices consistently applied, and 40 CFR Part 30 in effect on the date of execution of this sub-agreement. The Contractor shall also maintain the financial information and data used in the preparation or support of the cost submission required under 40 CFR 33.290 for any negotiated sub-agreement or change order and a copy of the cost summary submitted to the Loan Recipient. The United States Environmental Protection Agency, the Comptroller General of the United States, the United States Department of Labor, the Loan Recipient, and (the State of Mississippi) or
any of their authorized representatives shall have access to all such books, records, documents and either evidence for the purpose of inspection audit and copying during normal business hours. The Contractor shall provide proper facilities for such access and inspection.

(b) If this is a formally advertised, competitively awarded, fixed price sub-agreement, the Contractor agrees to make paragraphs (a) through (g) of this clause applicable to all negotiated change orders and sub-agreement amendments affecting the sub-agreement price. In the case of all other types of prime sub-agreements, the Contractor agrees to make paragraphs (a) through (g) applicable to all sub-agreements be awarded in excess of $10,000, at any tier, and to make paragraphs (a) through (g) of this clause applicable to all change orders directly related to project performance.

(c) Audits conducted under this provision shall be in accordance with generally accepted auditing standards and with established procedures and guidelines of the reviewing or audit agency(ies).

(d) The Contractor agrees to disclose all information and reports resulting from access to records under paragraphs (a) and (b) of this clause to any of the agencies referred to in paragraph (a).

(e) Records under paragraphs (a) and (b) above shall be maintained by the Contractor during performance on State assisted work under this sub-agreement and for the time periods specified in 40 CFR Part 30. In addition, those records which relate to any controversy arising under a State assistance agreement, litigation, the settlement of claims arising out of such performance or to costs or items to which an audit exception has been taken shall be maintained by the Contractor for the time periods specified in 40 CFR Part 30.

(f) Access to records is not limited to the required retention periods. The authorized representatives designated in paragraph (a) of this clause shall have access to records at any reasonable time for as long as the records are maintained.

(g) This right of access clause applies to financial records pertaining to all sub-agreements (except formally advertised competitively awarded, fixed price sub-agreements) and all sub-agreement change orders regardless of the type of sub-agreement, and all sub-agreement amendments regardless of the type of sub-agreement. In addition this right of access applies to all records pertaining to all sub-agreements, sub-agreement change orders and sub-agreement amendments:

(1) To the extent the records pertain directly to sub-agreement performance;
(2) If there is any indication that fraud, gross abuse or corrupt practices may be involved; or
(3) If the sub-agreement is terminated for default or for convenience.
COVENANT AGAINST CONTINGENT FEES

The Contractor assures that no person or selling agency has been employed or retained to solicit or secure this sub-agreement upon an agreement or understand for a commission, percentage, brokerage or contingent fee excepting bonafide employees or bonafide established commercial or selling agencies maintained by the Contractor for the purpose of securing business. For breach or violation of this assurance, the Loan Recipient shall have the right to annul this agreement without liability or, at its discretion, to deduct from the contract price or consideration, or otherwise recover the full amount of such commission, percentage brokerage or contingent fee.

GRATUITIES

(a) If the Loan Recipient finds after a notice and hearing that the Contractor or any of the Contractor's agents or representatives offered or gave gratuities (in the form of entertainment, gifts or otherwise) to any official, employee or agent of the Loan Recipient, the State in an attempt to secure a sub-agreement or favorable treatment in awarding, amending or making any determination related to the performance of this sub-agreement, the Loan Recipient may, by written notice to the Contractor, terminate this sub-agreement. The Loan Recipient may also pursue other rights and remedies that the law or this sub-agreement provides. However, the existence of the facts on which the Loan Recipient bases such findings shall be in issue and may be reviewed in proceedings under the Remedies clause of this sub-agreement.

(b) In the event this sub-agreement is terminated as provided in paragraph (a) the Loan Recipient may pursue the same remedies against the Contractor as it could pursue in the event of a breach of the sub-agreement by the Contractor, and as a penalty, in addition to any other damages to which it may be entitled by law, be entitled to exemplary damages in an amount (as determined by the recipient) which shall be not less than three nor more than ten times the costs the Contractor incurs in providing any such gratuities to any such officer or employee.
SECTION 3 - EEO DOCUMENTS:

EEO Notice
Following is the standard language which must be incorporated into all solicitations for offers and bids on all DWSIRLF Loan Program - assisted construction contracts or subcontracts in excess of $10,000 to be performed in designated geographical areas:

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

1. The Offeror’s or Bidder’s attention is called to the “Equal Opportunity Clause” which is included in the Nondiscrimination Provision, Labor Standards and the “Standard Federal Equal Employment Opportunity Construction Contract Specifications” set forth herein.

2. The goals for minority and female participation, expressed in percentage terms for the Contractor’s aggregate workforce in each trade on all construction work in the covered area, are as follows:

<table>
<thead>
<tr>
<th>Goals for minority participation in each trade:</th>
<th>Goals for female participation in each trade:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Insert goals for each year</td>
<td>6.9%</td>
</tr>
</tbody>
</table>

See Goals:

These goals are applicable to all the Contractor’s construction work (whether or not it is DWSIRLF Loan Program assisted) performed in the covered area. 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 minority 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 performance.
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, county and city, if any).
EQUAL EMPLOYMENT OPPORTUNITY CLAUSE

SEE LABOR STANDARDS PROVISIONS AND NONDISCRIMINATION PROVISIONS

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:

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

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;
   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 good faith efforts to achieve the Plan goals and timetables.

4. The Contractor shall implement the specific affirmative action standards provided in paragraphs 7a 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 actions to ensure equal employment opportunity. The evaluation of the Contractor’s compliance with these specifications shall be based upon its effort to achieve maximum results from its actions. The
Contractor shall document these efforts fully, and shall implement affirmative action steps at least as extensive 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 obligations.

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 7b 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 at least 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 the EEO policy and the Contractor's obligations under these specifications are being carried out.
n. Ensure that all facilities and company activities are non-segregated 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 associates.

p. Conduct a review, at least annually, of all supervisors’ adherence to and performance under the Contractor’s EEO policies and affirmative action obligation.

8. Contractors are encouraged to participate in voluntary associations which assist in fulfilling one or more of their affirmative action obligations (7a 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 7a 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 a 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 goals 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 or 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).
GOALS

The following goals for female and minority utilization shall be included in all federal and federally assisted construction contracts and subcontracts in excess of $10,000.00.

EEO Goals applicable for this project:

Women: 1.1%
Minorities: 3.1%

Appendix B-80

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 $10,000.00 to be performed in the respective geographical areas. 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 with the applicable SMSA or EA goal contained in this Appendix B-80.

ECONOMIC AREAS

<table>
<thead>
<tr>
<th>Area</th>
<th>Minority Goal (Percent)</th>
</tr>
</thead>
<tbody>
<tr>
<td>047 Mobile, AL</td>
<td></td>
</tr>
<tr>
<td>SMSA Counties</td>
<td></td>
</tr>
<tr>
<td>6025 Pascagoula - Moss Point, MS</td>
<td>16.9</td>
</tr>
<tr>
<td>MS – Jackson</td>
<td></td>
</tr>
<tr>
<td>055 Memphis, TN</td>
<td></td>
</tr>
<tr>
<td>SMSA Counties</td>
<td></td>
</tr>
<tr>
<td>4920 Memphis, TN-AR-MS</td>
<td>32.3</td>
</tr>
<tr>
<td>MS - Desoto, Non-SMSA Counties</td>
<td></td>
</tr>
<tr>
<td>MS - Alcorn, Benton, Bolivar, Calhoun, Carroll, Chickasaw, Clay, Coahoma, Grenada, Itawamba, Lafayette, Lee, Leflore, Marshall,</td>
<td>26.5</td>
</tr>
</tbody>
</table>
Monroe, Montgomery, Panola, Pontotoc, Prentiss, Quitman, Sunflower, Tallahatchie, Tate, Tippah, Tishomingo, Union, Washington, Webster, Yalobusha

3. MISSISSIPPI:
112 Jackson, MS
SMSA Counties: 30.3
3560 Jackson, MS
MS - Hinds, Rankin
Non-SMSA Counties 32.0
MS - Attala, Choctaw, Claiborne, Clarke, Copiah, Covington, Franklin, Holmes, Humphreys, Issaquena, Jasper, Jefferson, Jefferson Davis, Jones, Kemper, Lauderdale, Lawrence, Leake, Lincoln, Lowndes, Madison, Neshoba, Newton

4. MISSISSIPPI COUNTIES LOCATED IN NEW ORLEANS, LA AREA:
113 New Orleans, LA
SMSA Counties: 19.2
0920 Biloxi, Gulfport, MS
MS - Hancock, Harrison, Stone
Non-SMSA Counties 27.7
MS - Forrest, Lamar, Marion, Pearl River, Perry, Pike, Walthall

5. MISSISSIPPI COUNTIES LOCATED IN BATON ROUGE, LA AREA:
114 Baton Rouge, LA 26.1
Non-SMSA Counties
MS - Adams, Amite, Wilkinson
40 CFR PART 8, EQUAL OPPORTUNITY REQUIREMENTS

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

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

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

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

(4) The Contractor will comply with all provisions of Executive Order No. 11246 of September 24, 1965, and of the rules, regulations, and relevant orders of the Secretary of Labor.

(5) The Contractor will furnish all information and reports required by Executive Order No. 11246 of September 24, 1965, and by the rules, regulations, and orders of the Secretary of Labor, or pursuant thereto, and will permit access to his books, records, and accounts by the administering agency and the Secretary of Labor for purposes of investigation to ascertain compliance with such rules, regulations, and orders.

(6) In the event of the Contractor’s non-compliance with the equal opportunity (federally assisted construction) clause of this contract or with any of the said rules, regulations, or orders, this contract may be canceled, terminated, or suspended, in whole or in part, and the Contractor may be declared ineligible for further Government contracts or federally assisted construction contracts in accordance with procedures authorized in Executive Order No. 11246 of September 24, 1965, and such other sanctions may be imposed and remedies invoked as provided in Executive Order No. 11246 of September 24, 1965, or by rule, regulations, or order of the Secretary of Labor, or as provided by law.
The Contractor will include this equal opportunity (federally assisted construction) clause in every subcontract or purchase order unless exempted by the rules, regulations, or orders of the Secretary of Labor issued pursuant to Section 204 of Executive Order No. 11246 of September 24, 1965, so that such provisions will be binding upon each subcontractor or vendor. The Contractor will take such action with respect to any subcontract or purchase order as the administering agency may direct as a means of enforcing such provisions, including sanctions for noncompliance: Provided, however, That in the event a contractor becomes involved in, or is threatened with, litigation with a subcontractor or vendor, as a result of such direction by the administering agency the Contractor may request the United States to enter into such litigation to protect the interests of the United States.

The applicant further agrees that it will be bound by the above equal opportunity clause with respect to its own employment practices when it participates in federally assisted construction work: Provided, That if the applicant so participating is a state or local government, the above equal opportunity clause is not applicable to any agency, instrumentally or subdivision of such government which does not participate in work on or under the contract.

The applicant agrees that it will assist and cooperate actively with the Agency and the Secretary of Labor in obtaining the compliance of contractors and subcontractors with the equal opportunity clause and the rules, regulations, and relevant orders of the Secretary of Labor; that it will furnish the Agency and the Secretary of Labor such information as they may require for the supervision of such compliance; and that it will otherwise assist the Agency in the discharge of its primary responsibility for securing compliance.

The applicant further agrees that it will refrain from entering into any contract or contract modification subject to the Order with a contractor debarred from, or who has not demonstrated eligibility for, Government contracts and federally assisted construction contracts pursuant to the Order and will carry out such sanctions and penalties for violation of the equal opportunity clause, as may be imposed upon contractors and subcontractors by the Agency or the Secretary of Labor pursuant to Part II, Subpart D of the Order. In addition, the applicant agrees that if it fails or refuses to comply with these undertakings, the Agency may take any or all of the following actions: Cancel, terminate, or suspend in whole or in part this grant (contract, loan, insurance, guarantee); refrain from extending any further assistance to the applicant under the program with respect to which the failure or refusal occurred until satisfactory assurance of future compliance has been received from such applicant; and refer the case to the Department of Justice for appropriate legal proceedings.
Federal Executive Order 11246 requires an EEO commitment of the prime contractor and all subcontractors (in excess of $10,000). EEO Affirmative Action is mandated throughout the duration of the contract.

Failure to submit the required EEO documentation may subject the Contractor to sanctions under Executive Order 11246.

THE LOW, RESPONSIVE, RESPONSIBLE BIDDER MUST FORWARD THE FOLLOWING ITEMS, IN DUPLICATE TO THE OWNER NO LATER THAN 10 DAYS AFTER BID OPENING. THE OWNER SHALL TRANSMIT 1 COPY TO DEQ WITHIN 14 DAYS AFTER BID OPENING.

1. DWSIRLF Project Number. Project Location. Type of Construction.
2. Copy of EEO-1 Report (Employer Information Report, annually submitted to the Equal Employment Opportunity Commission). Required for Firms with 100 employees or more.
3. Copy of the Affirmative Action Plan of the 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 and trade.
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. Subcontractors’ contracts over $10,000 must submit items one (1) through eight (8).
9. List of any subcontract work yet to be committed with estimate of dollar amount and duration of contract.

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11. Each Contractor shall be required to maintain in their files a CC-257, monthly Employment Utilization Report, for each month of the construction period.
SECTION 4 - UTILIZATION OF DISADVANTAGED BUSINESS ENTERPRISES (DBEs):

It is the policy of the Drinking Water State Revolving Loan Fund and the Environmental Protection Agency (EPA) to promote a “fair share” of sub-agreement awards to small, minority and women’s businesses for equipment, supplies, construction, and services. Compliance with these contract provisions is required in order for project costs to be eligible for DWSRF Funding. Failure on the part of the apparent successful bidder to submit required information to the loan recipient (Owner) may be considered by the owner in evaluation whether the bidder is responsive to bid requirements. This requirement is contained in Appendix E of the DWSIRLF Program Regulations.

The following procedures are to be followed for procurement under DWSIRLF construction loans:

If the successful bidder plans to enter into sub-agreements for construction, equipment, materials and/or supplies the bidder must submit to the owner within 10 days after bid opening, evidence of the affirmative steps taken to utilize small, minority and women’s businesses, as described under the section entitled “Submittal of MBE/WBE Documentation”. The affirmative steps are:

1. Ensure DBEs are made aware of contracting opportunities to the extent practicable, including placing DBEs on solicitation lists and soliciting them whenever there are potential sources;

2. Make information on forthcoming opportunities available to DBEs and arrange time frames for contracts and establish delivery schedules, where the requirements permit, in a way that encourages and facilitates participation by DBEs in the competitive process. Assure that DBE businesses are solicited whenever they are potential sources;

3. Divide total requirements, when economically feasible, into small tasks or quantities to permit maximum participation of DBEs;

4. Encourage contracting with a consortium of DBEs when a contract is too large for one of these firms to handle individually;

5. Utilize the services and assistance of the Department of Economic and Community Development’s Rural Minority Business Development Center and the contract procurement centers (See The Department of Environmental Quality’s Minority and Women Business Enterprises Resource Directory for the locations of these centers);
(6) Require the subcontractor to take the steps listed above, if the subcontractor awards sub-agreements.

For purposes of clarification:

- The term sub-agreement as used in this section refers to a subcontract for construction work or a purchase order for equipment, supplies and/or materials.

- This requirement applies to any DWSIRLF financially assisted procurement agreement or sub-agreement in excess of $10,000.

- This requirement mandates two responsibilities; separate solicitations must be made of minority business enterprises and women’s business enterprises.

- A minority business is a business, at least 51 percent of which is owned and controlled by minority group members (Black; Hispanic; Asian American; American Indian; and any other designations approved by the Office of Management and Budget). Any specific clarification concerning the ownership and/or control issues will be provided by the Department.

- A women’s business is a business, at least 51 percent of which is owned and controlled by one or more women.

- The control determination will revolve around the minority or woman owner’s involvement in the day-to-day management of the business enterprise.

- Solicitation should allow adequate time for price analysis; the Department requires that contact be made no later than 10 days before bid opening.

- Prime Contractors must include the project’s MBE and WBE fair share objectives percentages in their requests for quotes (solicitations) to MBE and WBE firms.

- Efforts taken to comply with this requirement must be documented in detail; maintain records of firms contacted, including any negotiation efforts to reach competitive price levels, and awards to the designated firms.

- The prime contractor must utilize the services of “The Rural Minority Business Development Center” (RMBDC) and the “Contract Procurement Center” closest to the project. The RMBDC is operated by the Mississippi Department of Economic and Community Development, Minority Business Enterprise Division under a grant from the United States Department of Commerce - Minority Business Development Agency. The RMBDC provides technical, financial and contracting assistance to minority business enterprises. The U.S. Small Business Administration and the State of Mississippi jointly fund the Contract Procurement Centers. These centers, upon request, provide a listing of small, minority and
women’s businesses. They notify these businesses of contracting and subcontracting opportunities. Use of the services provided by centers does not absolve the prime contractors from pursuing additional efforts to comply with this requirement.

- Bidders may rely on written representation by a subcontractor regarding its status as a minority or women’s business. However, the Department will require any DBE that has not previously participated in an EPA or DWSIRLF funded project to submit a DBE certification from the Mississippi Department of Economic and Community Development; U.S. Small Business Administration’s 8A Program or Mississippi Department of Transportation. If the firm does not have such DBE certification, or if the Department has reasonable cause to believe that a firm doing business is not a legitimate DBE, the Department will require that firm to submit appropriate data to prove ownership and control.

- Challenges to DBE status will not be accepted under the bid protest procedures. Any individual or firm that files a false statement may be prosecuted under U.S.C. 1001. If allegations are made that a firm misrepresented its status as a MBE/WBE, the matter may be investigated by the Office of the Inspector General, and, if appropriate, turned over to the Department of Justice for criminal and/or civil prosecution.

- Credit for DBE participation shall be granted for DBE firms performing a useful business function according to custom and practice in the industry. A DBE firm may further subcontract a portion of the work provided that such further subcontracting is in accordance with these contract documents and that the majority of work is being performed by the MBE or WBE firm having the contract. MBE/WBE participation will not be counted when the MBE and/or the WBE subcontracts back to the prime contractor.

- DBE firms serving as material and equipment suppliers under DWSIRLF funded projects will be credited toward the projects' DBE fair share objectives in accordance with the following definition and conditions:

  A supplier is defined as a business which acts as a distributor of materials or equipment, and which provides a commercially useful function when such activity is traditional in the industry manufacturing the material or equipment supplied. Commercially useful function normally includes:

  (1) Providing technical assistance to the purchaser prior to the purchase, during installation and after the supplies or equipment are placed in service;

  (2) Manufacturing or being first tier below manufacturer of the supplies or equipment supplied;
(3) Providing functions other than just accepting and referring request for supplies or equipment to another party for direct shipment to a contractor.

DBE suppliers who provide a commercially useful service such as delivery to site, modification or assembly of purchased items at their place of operation or at the job site will have 100% of procurement value credited to the project's DBE fair share objectives;

DBE suppliers who serve as sales representatives of authorized dealers will have 25% of the procurement value credited to the project's DBE fair share objective. Haulers will receive 100% credit if they provide the material that is hauled. No credit will be granted for MBE/WBE suppliers who serve as passive conduits of funds for the purchase of supplies and/or equipment to some other, non-minority firm.

- Expenditures to DBE firms that act as a broker in a transaction will not be counted toward the DBE fair share objectives. A broker is a firm that does not, itself, perform, manage or supervise the work of its contract or subcontract in a manner consistent with the normal business practices for contractors or subcontractors in its line of business. A DBE firm will also be considered a broker if it subcontracts 50 percent or more of the work.

- Any proposed changes from the approved Small/Minority/Woman business participation after EEO/DBE approval shall be reported with the reason for the proposed deviation to and approved by the Department prior to initiation of the action.

- During construction of the project the Department may conduct a DBE Utilization Follow-up Review. Prime contractor(s) may be required to provide verification of reported DBE utilization. This verification may include invoices for supplies and/or equipment, pay requests from MBE and WBE subcontractors, etc.

- Each DWSIRLF loan recipient and its prime contractor shall be required to submit a DWSIRLF34 Form, Semi-annual DBE Utilization Report within seven (7) days after the end of each reporting period (April 7th and October 7th).

SUBMITTAL AND APPROVAL OF DBE DOCUMENTATION

The successful bidder shall submit the following documentation of good faith efforts to achieve the project’s DBE fair share objectives:

A. If the fair share objectives were met:

1. Total dollar amount of proposed contract;
2. Total dollar amount of proposed DBE participation;

3. Percentage of proposed DBE participation;

4. Name, address, telephone number, contact person of each proposed DBE subcontractor and/or supplier, type of proposed subcontract and dollar amount, and identification of each subcontract as a DBE contractor, and;

5. Certification from each DBE firm declaring its status as a DBE firm, if they have not previously participated on a DWSIRLF funded project.

B. If the fair share objectives were not met:

1. Copies of solicitation letters from the successful bidder (delivered by certified mail, return receipt requested) mailed to DBE firms requesting proposals for specific subcontracting opportunities, material or supply needs and encouraging inquiries for further details. Solicitation letters must include the project’s MBE and WBE percentages. Solicitation letters should have been sent in a timely manner (post marked no later than 10 days before bids were due). Letters that are general in nature and do not request quotes or proposals for specific subcontracting opportunities, equipment, material and supply needs will not be acceptable as good faith efforts to obtain MBE and WBE participation (See Sample letter from contractor to MBE/WBE firms on page SGC-28).

2. Copies of solicitation letters from the successful bidder to the Mississippi Rural Minority Business Development Center and the Contract Procurement Center closest to the project area requesting their assistance in identifying DBE firms.

3. If the successful bidder, in addition to solicitation letters, chose to use newspaper advertisements to solicit DBE firms (use of newspaper advertisements cannot be substituted for solicitation letters), documentation should include proof of publication of requests for proposals or bids in newspapers in the project’s general area.

4. The successful bidder must submit a listing of those DBE firms from whom quotes or proposals were received who were not awarded subcontracts, for construction, equipment, supplies and/or materials. If a DBE did not receive a subcontract, the successful bidder must document that the subcontractor or supplier selected was lower in price than the DBE firm’s proposal and that the scope of work or equipment/material purchase was the same as bid on by the DBE and not a reduced portion thereof.

5. If there are any DBE subcontracts (although the fair share objectives were not met) the information specified in Provisions 1-5 of Section A must be provided.
6. Once DBE documentation is submitted, the Department will determine if deficiencies exist in the DBE documentation. If the Department determines that such deficiencies are correctable, the successful bidder will be informed as to what actions must be taken to correct the deficiency. Award of the proposed construction contract will not be approved for loan participation until the corrective action has been taken.

Please be aware that DBE Documentation is a matter of bidder responsibility. Failure on the part of the low bidder to take the required corrective action will cause the loan recipient to determine whether the low bidder satisfied the required responsibility criteria and to reject any bidder that fails to meet the criteria.
SAMPLE
LETTER FROM CONTRACTOR TO MBE/WBE FIRMS
(CONTRACTOR’S LETTERHEAD)

Date

(MBE/WBE Name)
(Address)

RE: Project # DWI-L ________________

Dear _________________:

This company intends to submit a bid on the above referenced project.

We are soliciting a proposal from you for any item or items on this project for which you are qualified to subcontract. You may submit proposals to subcontract items of construction or for project materials and supplies if you are a distributor of materials or equipment. The project’s MBE/WBE fair share objectives are _____% MBE and _____%WBE.

A Bid Schedule is attached for your review. You are encouraged to submit proposals on any item(s) for which you are qualified to subcontract. Proposals must be submitted by ____ (date) to be considered.

For further details, you are encouraged to call this office at (telephone number) and ask for (person’s name) during normal business hours.

Sincerely,

(Name of Contractor)

Enclosure:
SECTION 5 - Davis Bacon and Related Acts Requirements:

Labor Standards Provisions for Federally Assisted Contracts

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

(1) Minimum wages.

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

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

Loan recipients may obtain wage determinations from the U.S. Department of Labor’s web site, www.wdol.gov.

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

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

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

(B) If the contractor and the laborers and mechanics to be employed in the classification (if known), or their representatives, and the loan recipient(s) agree on the classification and wage rate (including the amount designated for fringe benefits where appropriate), a report of the action taken shall be sent by the loan recipient(s) to the State award official. The State award official will transmit the report, to the Administrator of the Wage and Hour Division, Employment Standards Administration, U.S. Department of Labor, Washington, DC 20210. The Administrator, or an authorized representative, will approve, modify, or disapprove every additional classification action within 30 days of receipt and so advise the State award official or will notify the State award official within the 30-day period that additional time is necessary. (Approved by the Office of Management and Budget under OMB control number 1215-0140)

(C) In the event the contractor, the laborers or mechanics to be employed in the classification or their representatives, and the and the loan recipient(s) do not agree on the proposed classification and wage rate (including the amount designated for fringe benefits, where appropriate), the award official shall refer the questions, including the views of all interested parties and the recommendation of the State award official, to the Administrator for determination. The Administrator, or an authorized representative, will issue a determination within 30 days of receipt and so advise the contracting officer or will notify the contracting officer within the 30-day period that additional time is necessary. (Approved by the Office of Management and Budget under OMB control number 1215-0140)

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

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

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

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

(3) Payrolls and basic records.

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

(ii)(A) The contractor shall submit weekly, for each week in which any contract work is performed, a copy of all payrolls to the loan recipient, that is, the entity that receives the sub-grant or loan from the State capitalization grant recipient. Such documentation shall be available on request of the State recipient or EPA. As to each payroll copy received, the loan recipient shall provide written confirmation in a form satisfactory to the State indicating whether or not the project is in compliance with the requirements of 29 CFR 5.5(a)(1) based on the most recent payroll copies for the specified week. The payrolls shall set out accurately and completely all of the information required to be maintained under 29 CFR 5.5(a)(3)(i), except that full social security numbers and home addresses shall not be included on the weekly payrolls. Instead the payrolls shall only need to include an individually identifying number for each employee (e.g., the last four digits of the employee's social security number). The required weekly payroll information may be submitted in any form desired. Optional Form WH-347 is available for this purpose from the Wage and Hour Division Web site at http://www.dol.gov/esa/whd/forms/wh347instr.htm or its successor site. The prime contractor is responsible for the submission of copies of payrolls by all subcontractors. Contractors and subcontractors shall maintain the full social security number and current address of each covered worker, and shall provide them upon request to the loan recipient(s) for transmission to the State or EPA if requested by EPA, the State, the contractor, or the Wage and Hour Division of the Department of Labor for purposes of an investigation or audit of compliance with prevailing wage requirements. It is not a violation of this section for a prime contractor to require a subcontractor to provide addresses and social security numbers to the prime contractor for its own records, without weekly submission to the contracting officer or loan recipient.

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

1. That the payroll for the payroll period contains the information required to be provided under § 5.5 (a)(3)(ii) of Regulations, 29 CFR part 5, the appropriate information is being maintained under § 5.5

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(a)(3)(i) of Regulations, 29 CFR part 5, and that such information is correct and complete;

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

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

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

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

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

(4) Apprentices and trainees

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

(ii) Trainees. Except as provided in 29 CFR 5.16, trainees will not be permitted to work at less than the predetermined rate for the work performed unless they are employed pursuant to and individually registered in a program which has received prior approval, evidenced by formal certification by the U.S. Department of Labor, Employment and Training Administration. The ratio of trainees to journeymen on the job site shall not be greater than permitted under the plan approved by the Employment and Training Administration. Every trainee must be paid at not less than the rate specified in the approved program for the trainee's level of progress, expressed as a percentage of the journeyman hourly rate specified in the applicable wage determination. Trainees shall be paid fringe benefits in accordance with the provisions of the trainee program. If the trainee program does not mention fringe benefits, trainees shall be paid the full amount of fringe benefits listed on the wage determination unless the Administrator of the Wage and Hour Division determines that there is an apprenticeship program associated with the corresponding journeyman wage rate on the wage determination which provides for less than full fringe benefits for apprentices. Any employee listed on the payroll at a trainee rate who is not registered and participating in a training plan approved by the Employment and Training Administration shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any trainee performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. In the event the Employment and Training Administration withdraws approval of a training program, the contractor will no longer be permitted to utilize trainees at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

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

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

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

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

(8) Compliance with Davis-Bacon and Related Act requirements. All rulings and interpretations of the Davis-Bacon and Related Acts contained in 29 CFR parts 1, 3, and 5 are herein incorporated by reference in this contract.
(9) Disputes concerning labor standards. Disputes arising out of the labor standards provisions of this contract shall not be subject to the general disputes clause of this contract. Such disputes shall be resolved in accordance with the procedures of the Department of Labor set forth in 29 CFR parts 5, 6, and 7. Disputes within the meaning of this clause include disputes between the contractor (or any of its subcontractors) and loan recipient(s), State, EPA, the U.S. Department of Labor, or the employees or their representatives.

(10) Certification of eligibility.

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

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


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

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

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

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

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

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

5. Compliance Verification

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

(b) The subrecipient shall establish and follow an interview schedule based on its assessment of the risks of noncompliance with DB posed by contractors or subcontractors and the duration of the contract or subcontract. At a minimum, the subrecipient must conduct interviews with a representative group of covered employees within two weeks of each contractor or subcontractor’s submission of its initial weekly payroll data and two weeks prior to the estimated completion date for the contract or subcontract. Subrecipients must conduct more frequent interviews if the initial interviews or other information indicates that there is a risk that the contractor or subcontractor is not complying with DB. Subrecipients shall immediately conduct necessary interviews in response to an alleged violation of the prevailing wage requirements. All interviews shall be conducted in confidence.

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

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

(e) **Subrecipients** must immediately report potential violations of the DB prevailing wage requirements to the EPA DB contact listed above and to the appropriate DOL Wage and Hour District Office listed at [http://www.dol.gov/esa/contacts/whd/america2.htm](http://www.dol.gov/esa/contacts/whd/america2.htm).
SECTION 6 - DWSIRLF Project Document Board:

Due to various notice and posting requirements, a suitable document board must be provided on site for all the required posters and other information. Where necessary, document board must be weatherization to protect all the documents.

At a minimum, project document board must be large enough to accommodate the postings of a description of the project (8½ x 11 Sheet), the required wage determinations and Davis Bacon Posters of the Davis Bacon Act (a provision of the federal capitalization grant requirements) the required EEO posters.
American Iron and Steel Provisions

This contract is funded in whole or in part by funds from the Consolidated Appropriations Act of 2014 (H.R. 3547). Section 436 states:

(a)(1) None of the funds made available by a State drinking water treatment revolving loan fund as authorized by section 1452 of the Safe Drinking Water Act (42 U.S.C. 300j-12) shall be used for a project for the construction, alteration, maintenance, or repair of a public water system or treatment works unless all of the iron and steel products used in the project are produced in the United States. (2) In this section, the term “iron and steel products” means the following products made primarily of iron or steel: lined or unlined pipes and fittings, manhole covers and other municipal castings, hydrants, tanks, flanges, pipe clamps and restraints, valves, structural steel, reinforced precast concrete, and construction materials.

(b) Subsection (a) shall not apply in any case or category of cases in which the Administrator of the Environmental Protection Agency (in this section referred to as the “Administrator”) finds that:

1. Applying subsection (a) would be inconsistent with the public interest;

2. Iron and steel products are not produced in the United States in sufficient and reasonably available quantities and of satisfactory quality; or

3. Inclusion of iron and steel products in the United States will increase the cost of the overall project by more than 25 percent.
MINORITY BUSINESS ENTERPRISES

A & E UNDERGROUND LLC
2120 MOSES ROAD
RAYMOND MS 39154
EDDIE FREEMAN
Free5036@bellsouth.net
601-832-8008
UNDERGROUND DIRECTIONAL DRILLING, UTILITIES, SEWER, WATER

BARNES TRUCKING
2034 MILES STATION ROAD
HERMANVILLE MS 39086
ISAAC BARNES
601-885-6727  601-941-2043 (FAX)
HAULING, CLEARING, GRUBBING, EXCAVATION

ENVIRONMENTAL RESEARCH & DEVELOPMENT
1015 MEADOWS STREET
VICKSBURG MS 39180
MILTON BEVERLY
601-529-2317
ENVIR CONTROLS, RESEARCH, MGT CONSULTING SERVICES

FISH & FISHER TRUCKING INC
405 BRIARWOOD DRIVE SUITE 105B
P O BOX 347
JACKSON MS 39206
601-899-9492  601-899-9972 (FAX)
HAULING, TRANSPORTATION OF CONSTRUCTION ITEMS, “ICC DOT AUTHORITY 48 STATES”

FISHER CONSTRUCTION INC.
P.O. BOX 16592
JACKSON, MS 39211
RENNA FISHER
GENERAL FREIGHT TRUCKING (LOCAL)
SITE PREP CONTRACTORS (DEMO)

FORTSON GROUP INC/INDUST SUPPLY CO.
P O BOX 3256
JACKSON MS 39207
ROBERT L WILLIAMS
601-948-2053  1-800-948-2058
601-948-2065 (FAX)
SITE WORK LANDSCAPING, DIRT WORK, DEMOLITION, DEBRIS REMOVAL, ELECTRICAL UTILITIES, GENERAL CONSTRUCTION

TRACKLA SERVICES, INC.
P.O. BOX 821711
VICKSBURG, MS 39180
REXAL HEIDELBURG, PRESIDENT
(601) 619-9300  Fax (601) 619-9301
SITE PREPARATION (clearing and grubbing), CONCRETE CULVERTS & DRAINAGE STRUCTURES, LAYING PIPE AND HAULING

L SCOTT CONSTRUCTION COMPANY
84 EAST FRANKLIN STREET
NATCHEZ MS 39120
LEE EDWARD SCOTT
601-446-7535  601-442-3457
CONCRETE, CURB AND GUTTER, EROSION CONTROL, CONCRETE AND ASPHALT REMOVAL, EXCAVATION, GRANULAR MATERIALS, SPREADING AND COMPACTING

LARRY HARPER dba HARPERS CONSTRUCTION
1917 ROBINSON STREET
JACKSON MS 39209
LARRY D HARPER
lharp@jum.rr.com
601-352-4039  601-353-5963 (FAX)
CONSTRUCTION CLEANUP, SITE CLEANUP, HAULING, DIRT REMOVAL

MAC CONSTRUCTION COMPANY
2440 BAILEY AVENUE, SUITE D
JACKSON MS 39213
MARCUS WALLACE
Wallgroup2@yahoo.com
601-362-1852
DEMOLITION, HAULING, PAINTING, FOUNDATION, ETC., SITE PREPARATION

MULTI-CON INC
P O BOX 9325
JACKSON MS 39286
JOE COLLINS
Multiconelec@jum.rr.com
601-922-7777  601-982-1522 (FAX)
ELECTRICAL WORK

SOCRATES GARRETT ENTERPRISES INC
2659 LIVINGSTON ROAD
JACKSON MS 39213
601-896-0084
SITE PREPARATION & ASPHALT, WATER & SEWER LINES, CONSTRUCTION SAND AND GRAVEL MINING
CENTRAL MISSISSIPPI PROCUREMENT CENTER

3-J DIRTWORK COMPANY INC
708 MAIN STREET
UTICA MS 39175
HOMERO G JIMENEZ
jimenezh@bellsouth.net
601-885-8649
EXCAVATION WORK, SITE PREPARATION

U S COATING SPECIALTIES & SUPPLIES
125 WEST MAYES STREET
JACKSON MS 39213
EARL WASHINGTON
601-981-8986  601-981-9583 (FAX)
EPOXY APPLICATION, STRIPING,
WATERPROOFING, CHEMICAL & ALLIED
PRODUCTS, POLYURETHANE COATING

WALTON BULLDOZER SERVICE
295 WALTON LANE
VICKSBURG MS 39180
DONALD WALTON
601-636-0352
EXCAVATION, GRADING & DIRT WORK

WALTON CONSTRUCTION OF MS, LLC
295 WALTON LANE
VICKSBURG, MS 39183
DONALD WALTON, OWNER
601-856-2232 (601) 856-4840 (FAX)
SITE PREPARATION, DEMOLITION, CLEARING
& GRUBBING, MINOR STRUCTURE CONCRETE

WOMEN BUSINESS ENTERPRISES

AMERICAN FIELD SERVICE CORP
110 AMERICAN WAY
MADISON MS 39110
CYNTHIA B WARNER
601-853-1000
CONCRETE WORK

EZ ENTERPRISES INC
4030 COKER ROAD
MADISON MS 39110
KATHRYN R ZIGLAR
zigixmms@aol.com
601-856-2292  601-856-2238
WATER, SEWAGE, PIPELINE, UNDERGROUND
BORING

FORNEA ROAD BORING CO INC
P O BOX 16141
JACKSON MS 39236
TONIA FORNEA-BALLARD
601-362-0139 601-362-0139 (FAX)
ROAD BORING, UNDERGROUND UTILITIES,
POWER AND CONSTRUCTION LINES,
WATER/SEWER LINES AND RELATED
SERVICES

LAMMONS, INC.  0
BRIDGETT LAMMONS
P.O. BOX 126
CLINTON, MS 39060
lesiarouse@hotmail.com
601-925-1900  601-922-6083 (FAX)
WATER & WASTEWATER EQUIPMENT
SUPPLIER, PUMPS & VALVES

LEWIS ELECTRIC, INC.  0
SYLVIA RUSSELL
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FLOWOOD, MS 39232
sibby@lewiselectricinc.org
601-932-0101 601-709-0866 (FAX)
ELECTRICAL CONTRACTORS & OTHER
WIRING INSTALLATION CONTROATORS

RYAN HYDRICK CONSTRUCTION LLC
201 MAGNOLIA TRAIL
BRANDON MS 39047
NANCY HYDRICK
601-992-7169
CONSTRUCTION, SAND & GRAVEL, ASPHALT

SOUTHERN CONSULTANTS INC
5740 COUNTY CORK ROAD
JACKSON MS 39206
SUSAN H LUNARDINI
601-957-0999  957-9332 (FAX)
ENGINEERING SERVICES

SOUTHERN PINES ELECTRICAL
CONTRACTORS
100 ROCKHAVEN ROAD
BRANDON MS 39042
KATHY SMITH-KING
601-825-7867  601-825-1939 (FAX)
ELECTRICAL WORK

SUN-BELT HEAVY HAULERS INC
P O BOX 726
HAZLEHURST MS 39083
PATRICIA HUNT
601-892-5346  601-892-3998 (FAX)
HEAVY HAULING, TRUCKING

TREMAC RESTEEL INC
P O BOX 1422
MADISON MS 39130
PHYLISS TREVATHAN
601-853-3153 601-853-3559 (FAX)
INSTALLATION AND REINFORCING STEEL

WILLIAMS & SONS, INC.
1215 FAIRMONT AVENUE
JACKSON, MS 39204
SARAH WILLIAMS, PRESIDENT
601-948-2084
HAULING
CONTRACT PROCUREMENT CENTER
(GULF COAST)

MINORITY BUSINESS ENTERPRISES

ACE CONSTRUCTION COMPANY
P O BOX 6354
D'IBERVILLE MS 39540
KEVIN F DAVIS
228-396-1007
CURB AND GUTTER, CLEARING AND GRUBBING, ASPHALT & CONCRETE PAVING

APOLLO MAINTENANCE & CONSTRUCTION INC
102 NORTH 10TH AVENUE
HATTIESBURG MS 39401
Apollo39401@yahoo.com
601-582-9103
EXCAVATION WORK

G M & R CONSTRUCTION COMPANY
P O BOX 2579
BAY ST LOUIS MS 39521
HENRY MARTINEZ
henry@gmandr.com
228-467-0872 228-466-3945 (FAX)
MUNICIPAL & PUBLIC WORKS CONSTRUCTION

FELIX LEE ELECTRIC LLC
14005 DUNDEE COVE
GULFPORT MS 39503
FELIX L LEE
Snip1368@aol.com
228-832-6520 228-539-4147 (FAX)
ELECTRICAL WORK

J. T. & SON’S CONSTRUCTION INC
205 PINE STREET
MCCOMB MS 39648
JOHNNY TURNER
601-249-2808
GENERAL CONSTRUCTION

LANDSHAPERS INC
P O BOX 995
GULFPORT MS 39501
ROBERT PARKER
228-863-8996
ASPHALT PAVING, MINOR CONCRETE, DIRT WORK & LANDSCAPING

WOMEN BUSINESS ENTERPRISES

ABC UTILITY COMPANY INC
P O BOX 17799
HATTIESBURG MS 39401

BENVENUTTI ELECTRICAL APPARATUS
17865 16TH STREET SUITE C
GULFPORT MS 39503
MARY ANN BENVENUTTI
228-831-0445 832-8105 (FAX)
ELECTRICAL EQUIPMENT & SUPPLIES, NEC

BROOME LLC
P O BOX 16147
HATTIESBURG MS 39404
BETTIE JANE BROOME
601-583-6551 601-583-6552 (FAX)
DIRT WORK, WATER & SEWER LINE, CURB & GUTTER, EROSION CONTROL CONTRACTOR, CONCRETE FOUNDATIONS, STRUCTURE CONTRACTOR

C B DEVELOPERS INC
672 JERICHO LOOP
MCLAIN MS 39456
SHERRY BRELAND
csmhbreland@cs.com
601-753-9200 601-753-2622 (FAX)
WATER, SEWER, PIPELINE CONSTRUCTION

COASTAL HYDROGRASS INC
12400 LISA DRIVE
GULFPORT MS 39503
LISA MCINTOSH
228-831-0030 228-831-0412 (FAX)
EROSION CONTROL HYDROSEEDING, SEEDING AND MULCHING

GFH
P. O BOX 130
LONG BEACH MS 39560
DAWN PARKER LOCKHART
228-596-1008 228-868-1060 (FAX)
EROSION CONTROL, CLEARING & GRUBBING, SUPPLIER OF AGGERATES

J W LEE COMPANY INC
10131 SOUTHPARK DRIVE
GULFPORT MS 39503
JENNY M LEE
Jlee796869@aol.com
228-896-5330 228-896-5312 (FAX)
WATER, SEWER, PIPELINE CONSTRUCTION
LANDMARK CONTRACTING INC
P O BOX 2391
GULFPORT MS 39505
SUE B WALLER
228-831-4425  228-831-4467 (FAX)
CONCRETE PAVING, CONCRETE RAILING,
BARRIER WALLS, CURB AND GUTTER, MINOR
CONCRETE STRUCTURES, PIPE, DRAINAGE

MS CONCRETE CUTTING
P O BOX 6697
DIBERVILLE MS 39540
REGINA L MARCUM
Regimarc2@aol.com
228-872-5808
CONCRETE WORK

TITAN CONSTRUCTION
59 PARISH ROAD
PERKINSTON MS 39573
PAM WHITE
601-528-9848  228-860-3996  601-528-9848 (FAX)
CONSTRUCTION: RESIDENTIAL, CONCRETE:
SIDEWALKS, CURB AND GUTTERS, EROSION
CONTROL, SILT FENCING

T & S DEBRIS REMOVAL SERVICE
465 CHRISTIAN UNION ROAD
SUMRALL MS 39482
KEISHA NOBLES
tsdebrismoval@aol.com
601-736-9908 601-736-5919 (FAX)
SITE PREPARATION CONTRACTORS, DEBRI
REMOVAL
MINORITY BUSINESS ENTERPRISES

ACC Incorporated
10253 D’IBERVILLE BLVD
D’IBERVILLE, MS 39540
AARON DAVIS
662-834-1479   601-4458-2087   228-392-9192 (FAX)
LANDSCAPING, REMOVAL, SOD, GRASS,
CONCRETE, SITE PREPARATION,
CONSTRUCTION OF WALKWAYS, RETAINING
WALLS, DECKS, FENCES, AND PONDS

BLACKHAWK CONSTRUCTION & TRANSPORT
ROUTE 1 BOX 358A
COILA MS 38923
JOHN S JORDAN
Blackhawkconstruction@hotmail.com
662-237-4365
TRUCKING, HAULING, CONCRETE, DREDGING

DOUGLAS BROTHERS CONSTRUCTION
P O BOX 631
MOOREHEAD MS 38761
662-246-5341
PIPE, INLETS, SITE PREP. CONTRACTORS,
WATER/SEWER LINES, BOX CULVERTS,
MINOR CONCRETE WORK AND PLACING RIP-RAP

GREGORY BELL CONSTRUCTION COMPANY
P O BOX 148
ANGUILLA MS 38721
GREGORY BELL
GBCon01@bellsouth.net
662-873-6624
SITE PREPARATION CONTRACTORS

HOOVER’S ELECTRIC, PLUMBING, HEAT & A/C, INC.
623 MAIN STREET
GREENWOOD, MS 38930
JOHN HOOVER
662-453-0999   662-453-6237 (FAX)

J & L TRUCKING
1781 RANCH ROAD
HERNANDO MS 38632
JERRY L BELL
662-429-0904
HAULING ASPHALT, GRAVEL, SAND

JEHOVAH TRUCKING
20462 HWY 330 WEST
TILLATOBA MS 38961
KIP PROFIT
Kip94@bellsouth.net
662-675-2540
TRUCKING, HAULING ASPHALT, GRAVEL

NELSON PLUMBING INC
3889 ROBERTSON ROAD
NESSBIT MS 38651
HATTIE NELSON
wnelson@nelson-inc.net
901-332-5670   901-332-5680 (FAX)
WATER, SEWER, PIPELINE CONSTRUCTION

ROBY CONSTRUCTION COMPANY INC
703 TALLAHATCHIE STREET
GREENWOOD MS 38930
JIMMIE L ROBY
662-455-6655   662-453-5122 (FAX)
EXCAVATION AND EMBANKMENT,
SPREADING AND COMPACTING OF
GRANULAR MATERIAL, CLEARING AND
GRUBBING, LAYING OF PIPE

TARRASCO STEEL
1941 HIGHWAY 82 WEST
GREENVILLE MS 38701
JOSE GONZALEZ
662-344-1711   662-344-1742 (FAX)
INSTALLATION OF REINFORCING STEEL

TOWNES CONSTRUCTION COMPANY, INC.
16398 HWY 8 WEST
GRENADA, MS 38901
ARMSTEAD TOWNES, III, PRESIDENT
662-226-4816   662-417-0101
SITE PREPARATION, LOAD & HAULING
CONSTRUCTION MATERIALS, PIPE AND
CONCRETE FOOTING FOR SIGN POST
INCLUDING INSTALLATION OF STEEL
RELATED SUPPLIER, SUPPLIER OF SAND AND
GRAVEL

WOMEN BUSINESS ENTERPRISES

FLOYD CONSTRUCTION & DEVELOPMENT INC
1505 GENIE FAIRWAY
GREENVILLE MS 38701
ELIZABETH FLOYD
662-347-9417   662-332-6783 (FAX)
EQUIPMENT, CONSTRUCTION

MATT JOHNSON ELECTRIC LLC
4328 UNION ROAD
SARDIS MS 38666
MATT JOHNSON
662-487-3188
ELECTRICAL WORK

MEMPHIS ROAD BORING CO INC
P O BOX 1280
OLIVE BRANCH MS 38654
MARGO E DODSON
axidntiam@aol.com
662-895-7156 901-526-6582 (FAX)
ROAD BORING

QUINN CONTRACTING INC
24590 HIGHWAY 370 WEST
FAULKNER MS 38629
JANET QUINN
dfq@dixie-net.com
662-837-8778 662-837-8334 (FAX)
GRADING, CONCRETE WORK & DRAINAGE

ROBY CONSTRUCTION COMPANY INC
703 TALLAHATCHIE STREET SUITE 3
GREENWOOD MS 38930
JIMMIE L ROBY
662-455-6655 662-453-5122 (FAX)
EXCAVATION AND EMBANKMENT,
SPREADING AND COMPACTING OF
GRANULAR MATERIAL, CLEARING AND
GRUBBING, LAYING OF PIPE

SPECIALTY SUPPLY COMPANY INC
P O BOX 1121
GREENVILLE MS 38702
TRACY PROVENZA
662-378-2622 662-378-2625 (FAX)
ELECTRICAL APPARATUS

S-W ELECTRIC LLC
P O BOX 9087
GREENWOOD MS 38930
SHIRLEY OVERLEY
robertoverley@bellsouth.net
662-455-2060 662-299-8038 (FAX)
ELECTRICAL CONTRACTORS

VAIL CONSTRUCTION INC
ROUTHE 2 BOX 201B
WINONA MS 38967
KAY VAIL
kavhvail@hotmail.com
662-283-5579 662-417-1892 (FAX)
DIRTWORK, HAULING,
MINORITY BUSINESS ENTERPRISES

BURTON CONSTRUCTION INC
P O BOX 3241
MERIDIAN MS 39303
DERRICK BURTON
601-485-7860  601-485-7817 (FAX)
WATER, SEWER, PIPELINE, PLUMBING, AIR CONDITIONING

BUSCO CONSTRUCTION
609 12TH AVENUE
MERIDIAN MS 39301
ROY L BUSSEY II
buscoconstruction@hotmail.com
601-454-5580  601-622-4037  601-484-5580 (FAX)
GENERAL CONTRACTOR, BUILDING INTERIOR FINISHING WORK

CHEROKEE ELECTRIC COMPANY INC
1747 SKYLINE ROAD
MERIDIAN MS 39301
NORMA JEAN GIST
601-483-8431
ELECTRICAL WORK

CONSTRUCTION PLUS
P O BOX 4344
MERIDIAN MS 39304
EARL LOGAN SR
earllogan@bellsouth.net
601-938-5769  601-693-2000 (FAX)
SITE PREPARATION CONTRACTOR, EXCAVATION WORK & DRAINAGE

WOMEN BUSINESS ENTERPRISES

C & O DIRT SERVICE
P O BOX 191
RALEIGH MS 39153
CHRISTY ARENDER
601-782-9015  601-782-9011 (FAX)
HEAVY CONSTRUCTION, EXCAVATION WORK, HAULING

DAVIDSON HAULING & CONSTRUCTION INC
P O BOX 665
MERIDIAN MS 39342
601-482-1815
DIANE DAVIDSON
HAULING, PIPE, PLACING OF RIP-RAP, INSTALLATION, REMOVAL AND REPAIR OF UNDERGROUND STORAGE TANK, SITE PREPARATION

J & M INC
3219 MINNOW BUCKET ROAD
TOOMSUBA MS 39364
JUDY WARD
601-632-4534  601-632-1904 (FAX)
SMALL BRIDGES, CONCRETE STRUCTURES, DIRT EXCAVATION, PIPE, CLEARING AND GRUBBING, UNDER/SIDE DRAIN AND GEOTEXILE FABRIC FOR SUBSURFACE DRAINAGE

LANDRUM CONSTRUCTION INC
2001 HIGHWAY 37
RALEIGH MS 39153
JODY LANDRUM
601-782-4958
HEAVY CONSTRUCTION, NEC

RJM MCQUEEN CONTRACTING INC
12 MCQUEEN LANE
COLLINS MS 39428
601-765-6563  601-943-6420 (FAX)
EROSION CONTROL, CURB/GUTTER, MINOR CONCRETE STRUCTURES, HAULING, LIME, STABILIZATION, GRANULAR MATERIALS, SPREADING & COMPACTING, DBST PAVING, CONCRETE BRIDGE RAILING, ASPHALT REPAIR, LEAVING, OVERLAY, CONCRETE ISLAND, INSTALLATION OF REINFORCING STEEL FOR BRIDGE AND BOX CULVERT
MINORITY BUSINESS ENTERPRISES

AGNEW TRUCKING
201 CR 553
RIPLEY MS 38663
662-837-2721
JERRY AGNEW
HAULING, GENERAL FREIGHT TRUCKING

BUDDY AYERS CONSTRUCTION INC
202 AYERS ROAD
CORINTH MS 38834
BUDDY AYERS
662-287-2296  662-287-4668
SITE CLEARING, EXCAVATION, AND STORM DRAINAGE, HIGHWAYS, STREETS, & BRIDGES

CLOPTON CONTRACTORS INC
20366 EGYPT ROAD
ABERDEEN MS 39730
MICHAEL CLOPTON
Joyce_james_1999@yahoo.com
662-369-9538  662-369-9657 (FAX)
HEAVY CONSTRUCTION, SPECIAL TRADE CONTRACTORS

COLYER’S BACKHOE & TRUCKING
760 CR 503
RIPLEY MS 38663
JAMES W COLYER
Colyer55@hotmail.com
662-837-4072  662-223-5379 (FAX)
SITE PREPARATION, EXCAVATION, TRUCKING

4-D CONSTRUCTION COMPANY INC
P O BOX 127
LOUISVILLE MS 39339
K R DEMPSEY
662-773-4739  662-773-2095 (FAX)
WATER SUPPLY AND IRRIGATION SYSTEMS, SEWAGE TREATMENT FACILITIES, HIGHWAYS, STREET AND BRIDGE CONSTRUCTION

DAVCO LLC
819 CARVER STREET
WEST POINT MS 39773
JIMMY DAVIDSON
662-275-3834  662-494-2469 (FAX)
BUILDING ALTERATION AND RENOVATION, CLEARING, GRUBBING, HAULING

ELECTRICAL SERVICES PLUS LLC
871 PALMETTO ROAD
TUPELO MS 38801
ANTHONY SYKES
antdhandman@yahoo.com
662-566-4128
ELECTRICAL WORK

HERNANDEZ, INC.
P. O. BOX 66
AMORY, MS 38821
LARRY HERNANDEZ
662-256-7817  662-256-8361 (FAX)
PLACING OF GRANULAR MATERIALS, RIP-RAP, PIPE, DIRTWORK AND EXCAVATION, CLEARING & GRUBBING

MS PAVING & CONSTRUCTION
P O BOX 237
MATHISTON MS 39752
HAROLD GUYTON
662-323-7277  662-323-7145 (FAX)
PAVING, ASPHALT & CONCRETE, STREET & BRIDGE CONSTRUCTION, SITE PREP.

TUCKER TRUCKING
353 ALLEN CORNER ROAD
LAMAR MS 38642
MARK TUCKER
662-252-9916
TRUCKING HEAVY CONSTRUCTION

WOMEN BUSINESS ENTERPRISES

ATWOOD FENCE COMPANY INC
P O BOX 565
KOSCIUSKO MS 39090
KAY ATWOOD
atwoodfence@aol.com
662-289-6338  662-289-6371 (FAX)
FENCING, SIGNING AND GUARD RAIL, INSTALLATION OF SIGN STRUCTURE AND MASK POLE

GATTMAN CONSTRUCTION CO
P O BOX 95
GATTMAN MS 38844
SHEILA RASBURY
662-256-4088
RIP-RAP & CRUSHED STONE SUPPLIER

G & C CONSTRUCTION LLC
538 A ROCK SPRINGS DRIVE
OXFORD MS 38655
KAREN GRONER
gconstruction@dixie-net.com
662-234-8885
EXCAVATION WORK, DEBRI REMOVAL, DIRTWORK

GREERS ELECTRIC INC
1190 A CR 628
DUMAS MS 38625
NORTHEAST MISSISSIPPI PROCUREMENT CENTER

YVONNE GREER
bobbygreer@bellsouth.net
662-837-8510  662-837-0995 (FAX)
ELECTRICAL WORK

HALL’S CONSTRUCTION COMPANY
1354 HIGHWAY 30 EAST
NEW ALBANY MS 38652
PATRICIA HALL
662-534-7158
HIGHWAYS, STREETS, AND BRIDGES (NO BDE ALLOWED FOR CONTRACT HAULING)

HAWK SCADA
P.O. BOX 1865
STARKVILLE, MS  39760
MELANIE H. BOOTH
662-324-2721
WATER, WASTEWATER, SURFACE MINING
NATURAL-GAS, FM/AM BROADCASTING

HELLUMS TRUCKING COMPANY INC
P O BOX 308
DENNIS MS 38838
SHELLIE HELLUMS
662-454-3666
HAULING

INTERSTATE LANDSCAPING OF MS INC
20900 HWY 15 N
FAULKNER MS 38629
CATHY GRIFFIN
662-837-0079
SEEDING, SODDING, EROSION CONTROL,
PAVE DITCH, RIGHT OF WAY MARKERS,
UNDER/SIDE EDGE DRAIN, MINOR CONCRETE
STRUCTURE, BOX CULVERTS/BRIDGES AND
BRIDGE END PAVEMENT

NELL’S ELECTRICAL CONTRACTING
P O BOX 426
COLUMBUS MS 39703
IRNELL JONES
662-574-6320  601-327-6648 (FAX)
RESIDENTUAL, COMMERCIAL AND
INDUSTRIAL ELECTRICAL WORK

O W JACKSON SODDING
2096 CRAIG SPRINGS ROAD
STURGIS MS 39769
SYLVIA JACKSON
662-465-7530
SOIL EROSION CONTROL

PARKER SAND & GRAVEL
501 BARTON FERRY ROAD
COLUMBUS MS 39701
FLORENCE K PARKER
662-434-8555  662-434-8096 (FAX)
SAND & GRAVEL SUPPLIER

REA’S COUNTRY LANE CONSTRUCTION INC
102 RHODES STREET
HOUSTON MS 38851
662-456-9898  662-456-5815
DIRT EXCAVATION, GRADE AND DRAIN, PIPE
CLEARING AND GRUBBING, GRANULAR
MATERIALS, SPREADING, COMPACTING AND
RIP-RAP

TSL INC
210 CR 770
WALNUT MS 38683
LORaine NULL
662-223-5376  662-826-5913
EXCAVATION, GRANULAR MATERIALS,
SPREADING AND COMPACTING, PIPE,
CLEARING AND GRUBBING, EROSION
CONTROL

TULA TURF INC
14 COUNTY ROAD 466
OXFORD MS 38655
662-234-0376
LANDSCAPING, EROSION CONTROL

WALTER COMPANY INC
125 B MARTIN STREET
RIPLEY MS 38663
LESLIE WALKER
662-837-0040
TRANSPORATION/HAULING OF LIQUID
 ASPHALT, GENERAL FREIGHT TRUCKING
LOCAL

WMP CONSTRUCTION INC
420 TIBBEE DRIVE
COLUMBUS MS 39701
WENDY PETERSON
662-574-4052  662-327-3672 (FAX)
HEAVY CONSTRUCTION, WATER, SEWER,
PIPELINE CONSTRUCTION
MINORITY BUSINESS ENTERPRISES

CHARLES H HILL CONTRACTORS, INC
2183 FREEMONT STREET
MEMPHIS TN 38114
MARCEL HILL
901-744-3483  901-744-3485 (FAX)
HIGHWAY CONSTRUCTION, SITE PREPARATION CONTRACTORS (CLEARING, EXCAVATION), LANDSCAPING AND UNDERDRAINS, EROSION CONTROL

GULF STATES CONSTRUCTORS LLC
P.O. BOX 982
METAIRIE LA 70004
IGNACIO C VILLANUEVA
504-887-6500
PILE DRIVING, CONCRETE FOUNDATIONS, ROAD BORING, DIRECTIONAL DRILLING

MILLER BUILDING GROUP
2233 OLIVE STREET
ST. LOUIS, MO 63103
JIMMIE MILLER
314-588-9006  314-581-9195
POURED CONCRETE FOUNDATION AND STRUCTURE CONTRACTORS;
FINISH CARPENTRY CONTRACTORS

PICKWICK CONSTRUCTION COMPANY
P O BOX 253
COUNCE TN 38326
CHARLES IRONS
901-689-3353
 ASPHALT PAVING, DIRT EXCAVATION, RIP-RAP, HAULING

POTTS DISTRIBUTING COMPANY
P O BOX 179
COLUMBIA LA 71418
MABLE POTTS
318-649-6133
SUPPLIER OF MASONRY UNITS, CONCRETE AND PLASTIC PIPES, METAL PIPES, FENCE AND GUARDRAIL, TIMBER AND LUMBER, GEOTEXTILE, FABRICS AND GEOCOMPOSITE SYSTEMS, JOINT MATERIALS, REVETMENT, HAULING, LUMBER, PLYWOOD, MILLWORK, DOORS, WINDOWS AND WOOD PANEL

WBE BUSINESS ENTERPRISES

AIRFIELD ETC INC
3629 PRESCOTT ROAD
MEMPHIS, TN 38118
STEPHANIE POOLE
901-363-9210       901-795-5519 (FAX)
HIGHWAY, STREET & BRIDGE CONSTRUCTION, HIGH MAST AND TAXIWAY LIGHTING

L I SMITH & ASSOCIATES INC
302 NORTH CALDWELL STREET
PARIS TN 38242
LUCILE D SMITH
731-644-1014
SURVEY & STAKING

SGC-48
SECTION 01010

PROJECT DESCRIPTION AND SCOPE OF WORK

PART 1 - GENERAL

1.01 The City of Meridian owns the B Street WTP and the North WTP.

PART 2 - B STREET WTP

2.01 The B Street WTP (BWTP) is located at 1598 B Street, Meridian, MS 39302. Much of this plant was constructed in the 1950's and upgrades were periodically installed until the early 1980's. This plant consists of a rapid mixer, a flocculator, settling basins, rapid sand filters, a pump pit, and a clearwell. The BWTP requires repairs and upgrades to the rapid sand filters, filter pipe gallery, and various other areas with regard to filter upgrades. The filter media, underdrains and backwash troughs will be removed and replaced. Air scour piping and blowers will be added to allow for air scour in the filters as part of the backwash process. The filter valves and pneumatic valve actuators will be removed and replaced with electronically actuated valves and the associated controls will be upgraded. The existing control panels located on the filter operating floor will be removed and replaced with new control panels to allow the operators to initiate the backwash cycle by hand. In addition, additions will be made to the existing SCADA control system to allow for operator initiated automatic backwash at each of the four rapid sand filters. The filter backwash pump, valves, and a section of piping will be will be removed and replaced. A VFD will be added to the power/control system for the backwash supply pump to allow for regulation of flow. In addition, a magnetic flow meter will be added to the discharge of the backwash supply pump to indicate the flowrate from the backwash supply pump to the filters during backwash. Various electrical modifications will be made to support the changes being made as described above. The filter piping in the pipe gallery will be cleaned and recoated as an additive alternate.

PART 3 - NORTH WTP

3.01 The North WTP (NWTP) is located at 4609 48th Place, Meridian, MS 39305. This plant was constructed in the mid 1990's and much of the equipment and valves are original to the initial construction. This plant consists of aerators, rapid mixers, plate settlers, rapid sand filters, a clearwell and a sludge holding tank. The pneumatic valve actuators for the major filter valves will be removed and replaced with electronic actuators and integrated into the existing control system. A new modulating valve will be added to the clearwell piping station. The valves which are used to supply backwash water from the adjacent Cobb Hill reservoir will be removed and replaced with electronically actuated valves. Various electrical modifications will be made to support the changes being made as described above.
PART 4 - COORDINATION

4.01 Both BWTP and NWTP are operating treatment plants and the Contractor must coordinate their activities with the plant operators in order to maintain the plant functions while allowing for various parts of each of these plants to be shut down for short periods to make the necessary repairs.

END OF SECTION
SECTION 01015

MISCELLANEOUS REQUIREMENTS

PART 1 - GENERAL

1.01 DIVISIONS AND SECTIONS

A. Separation of these specifications into Divisions and Sections is done for convenience only and is not intended to establish responsibilities of work, nor shall it operate to make the Owner's Representative arbiter to establish limits to the Contracts between Contractor and Subcontractors.

B. Bidding and Contract Requirements

1. The Contractor, by execution of the subject documents agrees to comply with all applicable contract conditions.

1.02 NOT IN CONTRACT

A. Items indicated on drawings as "NIC", or noted "Not in Contract", are shown for convenience only and are not a part of this Contract.

1.03 ACCEPTANCE

A. Signing of the Contract will be deemed evidence that site and documents have been examined and that the Contractor is familiar with conditions under which the work will be done.

B. The Contractor shall verify measurements at site and accept responsibility for accuracy of same. The beginning of work indicates acceptance of conditions under which the work will be done.

C. Extra payments will not be authorized for work that could have been determined by a careful examination of site conditions and coordination with the Contract Documents.

1.04 FACILITATING OVERHEAD AND UNDERGROUND UTILITIES

A. The Contractor shall examine the site in detail in conformance with other requirements of these specifications. All overhead utilities are not shown on the drawings but are to be noted by the Contractor prior to submission of a bid. Contractor accepts responsibility for execution of the contract duties by submission of his bid.

B. The responsibility of the Contractor includes facilitating overhead lines throughout the completion of the project and assuming all costs for coordinating, de-energizing, re-energizing, temporarily relocating, permanently relocating, or using special construction methods to complete the work as indicated.
C. The Contractor shall also examine the site for all sign post indicating underground pipelines. Throughout the construction area are located high pressure gas pipe lines, hydrogen pipe lines, petroleum piping as well as other raw water, water, sludge and chemical pipelines. Contractor accepts responsibility for execution of the contract duties by submission of his bid.

1.05 INTERFERENCES

A. Drawings are generally diagrammatic. Contractor shall organize or coordinate his work with that of the different trades so that interferences of different equipment, piping, etc., shall be avoided and each piece of equipment, piping, etc., installed to function properly.

B. In the case where interferences develop, the Engineer is to be consulted to determine which equipment, piping, etc., is to be relocated regardless of which item was first installed.

1.06 NOTICE TO PROCEED

A. After notification from the Owner that the Contractor has signed the construction contract and submitted all necessary bonds, etc., the Owner's Representative shall send the Contractor a written "Notice to Proceed". The "Notice to Proceed" shall include the following information:

1. Number of calendar days in the construction contract.

2. Date of the beginning and end of the contract time.

3. Liquidated damages.

4. A statement indicating the Owner's intention to collect liquidated damages if the Contractor exceeds the contract time and any approved extensions.

1.07 JOBSITE MAINTENANCE

A. Keep areas within and about working and storing spaces free from trash, debris, garbage, etc.

B. Throughout the construction period, dirt and dust accumulated in the working, storing and access roadway areas shall be kept to a minimum.

1.08 PERSONNEL AND EQUIPMENT

A. Maintain a construction force at site, including competent, qualified superintendent, mechanics, craftsmen and laborers, sufficient to expedite work to completion on date indicated in Contract Documents.

B. Maintain construction equipment at site, in good condition, sufficient for efficient execution of work.
C. A responsible member of Contractor's organization shall be kept on site while work is in progress as herein specified. All communications given to the Superintendent, or his assistant in his absence, shall be as binding as if given to the Contractor.

1.09 LOCATION

A. The Contractor shall lay out all piping and appurtenances and other related work from the Contract Documents, and he shall furnish and put in all stakes and batter boards as may be deemed necessary. Contractor shall be solely responsible for all grades, lines and levels.

1.10 OBSTRUCTION TO CONSTRUCTION

A. The Contractor shall anticipate and remove all subsurface as well as above surface obstructions to construction of his work, unless information on subsurface obstructions is not available.

B. General Contractor shall not commence work in areas where existing underground utilities interfere with new construction, until the locations and extent of all existing underground utilities are established and removed, rerouted or abandoned.

1. Contractor shall notify the utility companies and/or the Using Agency to remove, re-route or abandon lines which are in or near the line of excavation.

2. Contractor shall notify the Respective Owner well in advance of any work in order to coordinate "tie-ins" and disruption of any services.

1.11 DEMANDS AND CAUSES OF ACTION

A. Contractor shall defend, indemnify, and hold harmless Owner and Engineer and their agents, employees, related and companion corporations (collectively referred to as Owner and Engineer) from and against any and all claims, demands, and personal injury, wrongful death, or property damage, in any way arising out of or resulting from, directly or indirectly, the work performed by or any of his subcontractors, suppliers or agents including all damages, losses, expenses, attorneys fees and costs.

1.12 EXISTING UNDERGROUND UTILITIES

A. The Contractor shall verify the location of all existing off site underground utilities which he is to relocate or to which he is to connect his work.

B. Protection of Existing Underground Utilities

1. The contractor is responsible for thorough protection of existing underground utilities within the limits of work. Where known utilities are to be encountered, only hand digging shall be allowed. Any damage must be immediately repaired to restore service to the Owner including work at night and weekends.
1.13 WATCHMAN
A. Services of a watchman are not required, but the Contractor shall be fully responsible for and shall provide reasonable protection to prevent damage to all the work and all materials and equipment to be incorporated therein.

1.14 SUPERINTENDENCE
A. The Contractor shall employ a competent Superintendent and necessary assistants who shall be in attendance at the project site during the progress of the Work. The Owner's Representative shall be advised of the Superintendent to be employed and he shall not be changed, except with the consent of the Engineer, unless Superintendent proves to be unsatisfactory to the Contractor and ceases to be in his employ. The Superintendent shall represent the Contractor and all communications given to the Superintendent shall be as binding as if given to the Contractor. Important communications will be confirmed in writing. Other communications will be so confirmed on written request in each case.

1.15 SERVICE CHARGES
A. Include all service charges that may be applicable for execution and completion of the Work.
B. Temporary service charges shall be determined by Contractor's arrangements with respective Utility Companies.

1.16 SALVAGE AND DISPOSITION OF MATERIAL AND EQUIPMENT
A. The Owner shall have priority for the selection of salvaged equipment and materials. Any equipment and materials selected to remain the property of the Owner shall be removed and delivered to a location as designated by the Owner. Material not retained by the Owner shall become the property of the Contractor and shall be removed from the site by him.

1.17 DEFINITIONS
A. Owners
1. The Owner of the subject project is the City of Meridian.

1.18 RESIDENT PROJECT REPRESENTATIVE
A. The Engineer may furnish a Resident Project Representative and assistants to aid Engineer in carrying out his responsibilities at the site. The duties, responsibilities, and limitations of authority of the Resident Project Representative are set forth in these documents.

1.19 OVERTIME WORK
A. Work hours are defined in the General Conditions and Supplementary Conditions.

B. The Contractor shall establish a normal work schedule which does not exceed 40 hours per week. Whenever Contractor's work requires scheduled overtime, Contractor shall reimburse Owner for extra costs incurred at a rate of $100.00 per hour for providing Resident Project Representative and overtime shall be scheduled only after Contractor obtains written permission from Owner. A Change Order shall be prepared to cover Owner's reimbursable costs.

1.20 CHANGE ORDER PROCEDURES

A. Without invalidating the Contract, the Owner may make reasonable changes by altering, adding to, or deducting from the Work, the Contract Price being adjusted accordingly. No claim for extra work or materials shall be allowed and no alteration of or deduction from the work shall be made, unless same is ordered in writing by the Owner.

B. Where changes ordered by the Owner involve a monetary consideration, the Contract shall be adjusted by negotiation with the terms of said negotiation being expressed in a supplemental agreement or Change Order signed by the Owner, the Contractor and the Engineers.

C. If the Owner and the Contractor are unable to reach an agreement as to the monetary consideration of a Contract addition, the Engineers acting as the Owner's representative may order the Contractor to do such work on a force account or time and materials basis.

D. The Contractor shall furnish labor, equipment and materials necessary to complete the work in a satisfactory manner and within a reasonable period of time.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION
SECTION 01025

MEASUREMENT AND PAYMENT

PART 1 - GENERAL

1.01 SUMMARY

A. The project shall be constructed complete as shown and indicated on the Contract Drawings and as described in the Contract Specifications.

B. Payment shall include all compensation to be received by the Contractor for furnishing all tools, equipment, supplies, and manufactured articles, and for all labors, operations, and incidentals as necessary to complete the various items of work all in accordance with the requirements of the Contract Documents, including all costs of compliance with the regulations of public agencies having jurisdiction. The Contractor is hereby on notice that no separate payment will be made for any item not specifically called out, but that is required to properly complete the project.

1.02 SECTION INCLUDES

A. Measurement and payment criteria applicable to portions of the Work performed under a unit price payment method.

B. Defect assessment and non-payment for rejected work.

1.03 AUTHORITY

A. Measurement methods delineated in the individual specifications sections complement the criteria of this section. In the event of conflict, the requirements of the individual specification section govern.

B. CONTRACTOR shall take all measurements and compute quantities. The Owner’s Representative will verify measurements and quantities.

C. CONTRACTOR shall provide necessary equipment, workers, and survey personnel as required by Owner’s Representative to verify quantities.

1.04 UNIT QUANTITIES SPECIFIED

A. Quantities indicated in the Bid Form are for bidding and contract purposes only. Quantities and measurements supplied or placed in the Work and verified by the Owner’s Representative determine payment.

B. If the actual work requires more or fewer quantities than those quantities indicated, provide the required quantities at the unit sum/prices contracted.
1.05 MEASUREMENT OF QUANTITIES

A. Measurement by Volume: Measured by cubic dimension using mean length, width and height or thickness.

B. Measurement by Area: Measured by square dimension using mean length and width or radius.

C. Linear Measurement: Measured by linear dimension, at the item centerline or mean chord.

D. Stipulated Sum/Price Measurement: Items measured by weight, volume, area or linear means or combination, as appropriate, as completed item or unit of the Work.

1.06 PAYMENT

A. Payment Includes: Full compensation for all required labor, products, tools, equipment, plant, transportation, services and incidentals; erection, application or installation of an item of the Work; overhead and profit.

B. Total compensation for required Unit Price Work shall be included in Unit Price bid in the Bid Schedule. Claims for payment as Unit Price Work, but not specifically covered in the list of unit prices contained in the Bid Schedule, will not be accepted.

C. Progress payments will be based on the Owner’s Representative’s observations and evaluations of quantities incorporated in the Work multiplied by the unit price.

D. Final payment for the Work governed by unit prices will be made on the basis of the actual measurements and quantities accepted by the Owner’s Representative multiplied by the unit sum/price for Work which is incorporated in or made necessary by the Work.

1.07 DEFECT ASSESSMENT

A. Replace the Work, or portions of the Work, not conforming to specified requirements.

B. If, in the opinion of the OWNER and Owner’s Representative, it is not practical to remove and replace the Work, the OWNER and Owner’s Representative will direct one of the following remedies:
   1. The defective Work may remain, but the unit sum/price will be adjusted to a new sum/price at the discretion of the OWNER and Owner’s Representative.
   2. The defective Work will be partially repaired to the instructions of the OWNER and Owner’s Representative, and the unit sum/price will be adjusted to a new sum/price at the discretion of the OWNER and Owner’s Representative.

C. The individual specification sections may modify these options or may identify a specific formula or percentage sum/price reduction.
D. The authority of the OWNER and Owner’s Representative to assess the defect and identify payment adjustment is final.

1.08 NON-PAYMENT FOR REJECTED PRODUCTS

A. Payment will not be made for any of the items listed below.

1. Products wasted or disposed of in a manner that is not acceptable.
2. Products determined as unacceptable before or after placement.
3. Products not completely unloaded from the transporting vehicle.
4. Products placed beyond the lines and levels of the required Work.
5. Products remaining on hand after completion of the Work.

B.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

PART 4 - MEASUREMENT AND PAYMENT

4.01 SCOPE

A. The Total Base Bid Price shall cover all work required by the Contract Documents. All costs in connection with the proper and successful completion of the work, including furnishing all materials, equipment, supplies, and appurtenances; providing all construction equipment, and tools; and performing all necessary labor and supervision to fully complete the work, shall be included in the unit and lump sum prices bid. All work not specifically set forth as a pay items in the Bid Form shall be considered a subsidiary obligation of the Contractor and all costs in connection therewith shall be included in the prices bid.

4.02 ESTIMATED QUANTITIES

A. All estimated quantities stipulated in the Bid Form or other Contract Documents are approximate and are to be used only (a) as a basis for estimating the probable cost of the work, and (b) for the purpose of comparing the bids submitted for the work. The actual amounts of work done and materials furnished under until price items may differ from the estimated quantities. The basis of payment for work and materials will be the actual amount of work done and materials furnished. No compensation will be given for any quantities not used.

4.03 BASE BID ITEMS

A. Item No. 1: MOBILIZATION AND DEMOBILIZATION

1. Measurement: Measurement for payment for “Mobilization and Demobilization” will be on a lump sum basis as specified herein.
2. **Payment:** Payment for mobilization and demobilization shall cover all preparatory work, obtaining all permits, insurance and bonds, movement of personnel, equipment, supplies and incidentals to the project site, the establishment of temporary offices, project signs and other construction facilities necessary for work on this project. It shall include removal of all personnel, equipment, supplies, and incidentals from the project site, removal of temporary offices and other construction facilities necessary for work on this project, all as required for the proper performance and completion of the work.

Payment will be made at the contract lump sum price, subject to the following provisions:

Partial payments for mobilization and demobilization will be made in accordance with the following schedule up to a maximum of 5 percent of the total contract amount (including this item), and payment of any remaining amount will be made upon completion of all work under the contract.

<table>
<thead>
<tr>
<th>Percent of Total Contract</th>
<th>Allowable Percent of the Lump Sum Price for the Item</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st Partial Estimate</td>
<td>25%</td>
</tr>
<tr>
<td>10%</td>
<td>50%</td>
</tr>
<tr>
<td>25%</td>
<td>75%</td>
</tr>
<tr>
<td>50%</td>
<td>100%</td>
</tr>
</tbody>
</table>

No price adjustments will be made for this item due to changes in the work.

B. **Item No. 2: REMOVAL AND DISPOSAL OF FILTER MEDIA**
1. **Measurement:** Measurement for payment for “Removal and Disposal of Filter Media” will be made on a lump sum basis.
2. **Payment:** Payment for this item will be made at the lump-sum bid and shall include all labor, materials, tools, equipment and incidentals necessary to complete removal and disposal of the existing filter media onsite, in the location designated by the owner. Payment for this bid item shall be made as percent complete of the total filter media removal and disposal.

C. **Item No. 3: REMOVAL OF EXISTING UNDERDRAIN SYSTEM**
1. **Measurement:** Measurement for payment for “Removal of Existing Underdrain System” will be made on a lump sum basis.
2. **Payment:** Removal of the existing underdrain system will be measured as provided above, will be paid at the unit price bid and shall include all labor, materials, tools, equipment and incidentals necessary to complete the work. Work shall include removal of the existing filter block, backwash troughs, and surface wash sprayers for the existing underdrain system, as shown on the construction plans.

D. **Item No. 4: DISPOSAL OF EXISTING UNDERDRAIN SYSTEM**
1. **Measurement:** Measurement for payment for “Disposal of Existing Underdrain System” will be made on a cubic yard basis.
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2. **Payment:** Disposal of the existing underdrain system will be measured as provided above, will be paid at the unit price bid and shall include all labor, materials, tools, equipment and incidentals necessary to complete the work. Work shall include disposal of the existing underdrains in an appropriate sanitary landfill, as required.

E. **Item No. 5: REMOVE EXISTING VALVE & ACTUATOR**
   1. **Measurement:** Measurement for payment for “Remove Existing Valve & Actuator” will be made on a per each basis.
   2. **Payment:** Removal of the existing valves and actuators as shown on the drawings will be measured as provided above, will be paid at the unit price bid and shall include all labor, materials, tools, equipment and incidentals necessary to complete the work. Work will include removal and disposal of all valves and actuators which are indicated to be removed on the drawings.

F. **Item No. 6: REMOVE EXISTING PIPING**
   1. **Measurement:** Measurement for payment for “Remove Existing Piping” will be made on a lump sum basis.
   2. **Payment:** Removal of existing piping as shown on the drawings will be measured as provided above, will be paid at the unit price bid and shall include all labor, materials, tools, equipment and incidentals necessary to complete the work. Work will include removal and disposal of existing piping as shown on the drawings.

G. **Item No. 7: NEW SUBFLOOR W/SAND FOUNDATION**
   1. **Measurement:** Measurement for payment for “New Subfloor w/Sand Foundation” will be made on a cubic yard basis.
   2. **Payment:** Installation of a new subfloor w/sand foundation will be measured as provided above, will be paid at the unit price bid and shall include all labor, materials, tools, equipment and incidentals necessary to complete the work. Work shall include installation of new subfloor with sand foundation as shown on the drawings. There will be no additional payment for backwashing, leveling, scraping, removal of fines, or supports for working in the basin after the sand foundation has been placed but costs for these items shall be included in the pay item for Install new subfloor with sand foundation.

H. **Item No. 8: NEW UNDERDRAIN EQUIPMENT**
   1. **Measurement:** Measurement for payment for “New Underdrain Equipment” will be made on a lump sum basis.
   2. **Payment:** New underdrain equipment will be measured as provided above, will be paid at the unit price bid and shall include all labor, materials, tools, equipment and incidentals necessary to complete the work. Work shall include all underdrain equipment as shown on the drawings.

I. **Item No. 9: FILTER SAND**
   1. **Measurement:** Measurement for payment for “Install Filter Sand” will be made on a cubic yard in place (CYIP) basis.
   2. **Payment:** Installation of filter sand as shown on the drawings will be measured as provided above, will be paid at the unit price bid and shall include all labor, materials, tools, equipment and incidentals necessary to complete the work. Work will include all backwashing, leveling, scraping, and removal of fines to provide a uniform thickness of sand as shown on the drawings. There will be no additional
payment for backwashing, leveling, scraping, removal of fines, or supports for working in the basin after the media has been placed but costs for these items shall be included in the pay item for Install Filter Sand.

J. Item No. 10: FILTER ANTHRACITE
   1. Measurement: Measurement for payment for “Install Filter Anthracite” will be made on a cubic yard in place (CYIP) basis.
   2. Payment: Installation of filter anthracite as shown on the drawings will be measured as provided above, will be paid at the unit price bid and shall include all labor, materials, tools, equipment and incidentals necessary to complete the work. Work will include all backwashing, leveling, scraping, and removal of fines to provide a uniform thickness of sand as shown on the drawings. There will be no additional payment for backwashing, leveling, scraping, removal of fines, or supports for working in the basin after the media has been placed but costs for these items shall be included in the pay item for Install Filter Sand.

K. Item No. 11: FILTER BASIN COATING
   1. Measurement: Measurement for payment for “Filter Basin Coating” will be made on a square foot basis.
   2. Payment: Filter basin coating as shown on the drawings will be measured as provided above will be paid at the unit price bid and shall include all labor, materials, tools, equipment and incidentals necessary to complete the work. Work will include installing a protective coating on the basin walls after the filter media has been removed. There will be no additional payment for cleaning, concrete patching, drying of surfaces to be coated, protection of surfaces not being coated or any other prep work required to install the coating but costs for these items shall be included in the pay item for Filter Basin Coating.

L. Item No. 12: BLOWERS
   1. Measurement: Measurement for payment for “Blowers” will be made on a per each basis.
   2. Payment: Blowers as shown on the drawings will be measured as provided above will be paid at the unit price bid and shall include all labor, materials, tools, equipment and incidentals necessary to complete the work. No measurement shall be made for materials, labor or equipment required to fully furnish, construct, install and test the Blower systems. All work shall be in accordance with the specifications and to the dimensions shown on the contract plans.

M. Item No. 13: BLOWER EQUIPMENT PADS
   1. Measurement: Measurement for payment for “Blower Equipment Pads” will be made on a lump sum basis.
   2. Payment: Blower Equipment Pads as shown on the drawings will be measured as provided above will be paid at the unit price bid and shall include all labor, materials, tools, equipment and incidentals necessary to complete the work. Work will include installing concrete pads for the two blowers and anchoring the blower to the pad in accordance with the manufacturer’s instructions.

N. Item No. 14: LOUVERS, WALL PENETRATION AND DUCT WORK
   1. Measurement: Measurement for payment for “Louvers, wall penetration and duct
work” will be made on a lump sum basis.

2. **Payment:** Louvers, wall penetration and duct work as shown on the drawings will be measured as provided above will be paid at the lump sum basis and shall include all labor, materials, tools, equipment and incidentals necessary to complete the work. Work will include modifying openings and brickwork to accept new louvers, attaching louvers in the wall, connecting ductwork from the louvers to the blower and testing louver for air leakages.

**O. Item No. 15 - 16: STAINLESS STEEL PIPING**

1. **Measurement:** Measurement for payment for “Stainless Steel Piping” will be made on a per linear foot basis of the diameter specifically listed on the bid schedule.

2. **Payment:** Stainless steel piping as shown on the drawings will be measured as provided above will be paid at the unit price bid and shall include all labor, materials, tools, equipment and incidentals necessary to complete the work. Work includes joining piping sections per the pipe schedule, pipe supports, connections to existing piping and equipment.

**P. Item No. 17: STAINLESS STEEL FITTINGS**

1. **Measurement:** Measurement for payment for “Stainless Steel Fittings” will be made on a lump sum basis.

2. **Payment:** Stainless steel fittings as shown on the drawings will be measured as provided above will be paid at the lump sum basis and shall include all labor, materials, tools, equipment and incidentals necessary to complete the work. Work will include furnishing and installing all tees, elbows, reducers and all other fittings required to complete the piping as shown on the drawings excluding the straight pipe measured and paid per other items.

**Q. Item No. 18 - 19: BUTTERFLY VALVE – AIR SERVICE**

1. **Measurement:** Measurement for payment for “Butterfly Valve – Air Service” will be made on a per each basis of the size specifically listed on the bid schedule.

2. **Payment:** Payment for this item will be made at the per each price bid for furnishing and installing butterfly valves as shown on the Drawings and described in the specifications. The Work will include all labor, material, tools, and equipment to install the valves and to connect to the air piping for the operation of the system as a whole.

**R. Item No. 20: WAFER CHECK VALVE**

1. **Measurement:** Measurement for payment for “Wafer Check Valve” will be made on a per each basis of the size specifically listed on the bid schedule.

2. **Payment:** Payment for this item will be made at the per each price bid for furnishing and installing check valves as shown on the Drawings and described in the specifications. The Work will include all labor, material, tools, and equipment to install the valves and to connect to the piping for the operation of the system as a whole.

**S. Item No. 21 – 23 & 32: BUTTERFLY VALVE WITH ELECTRONIC ACTUATOR**

1. **Measurement:** Measurement for payment for “Butterfly Valve with Electronic Actuator” will be made on a per each basis of the size specifically listed on the bid schedule.
2. **Payment**: Payment for this item will be made at the per each price bid for furnishing and installing butterfly valves and actuator as shown on the Drawings and described in the specifications. The Work will include all labor, material, tools, and equipment to remove the existing valves and install the valves, actuators, and to connect power and control wiring to control panels for operation of the system as a whole.

T. **Item No. 24: FILTERED WATER CONTROL VALVE**  
1. **Measurement**: Measurement for payment for “Filtered Water Control Valve” will be made on a per each basis of the size specifically listed on the bid schedule.  
2. **Payment**: Payment for this item will be made at the per each price bid for furnishing and installing filtered water control valves as shown on the Drawings, scheduled on sheet M.11 and described in the specifications. The Work will include all labor, material, tools, and equipment to install the valves and to connect to the piping for the operation of the system as a whole.

U. **Item No. 25: NEW BACKWASH PUMP W/VFD AND CONTROLS**  
1. **Measurement**: Measurement for payment for “New Backwash Pump w/VFD and Controls” will be made on a lump sum.  
2. **Payment**: Payment for this item will be made at the lump sum price bid for furnishing and installing a vertical pump system as shown on the Drawings and detailed in the specifications. The Work will include all labor, material, tools, and equipment to remove the existing pump & accessories and install the pump, pump bases, motors, guide rods, brackets, control panel, VFD, start up testing, anchor bolt and all other appurtenances necessary for a complete installation. The Work will also include a control panel that will operate the pumps on a level based system utilizing variable frequency drives to modulate the level of the wet well during pumping.

V. **Item No. 26: NEW BACKWASH PIPING AND VALVES**  
1. **Measurement**: Measurement for payment for “New Backwash Piping and Valves” will be made on a lump sum.  
2. **Payment**: Installation of the new piping, valves and specialties as shown on the drawings shall be paid as a lump sum and shall include all labor, materials, tools and equipment necessary to complete the furnishing and installing of the piping, fittings, valves, supports and tie-ins to existing as shown on the drawings and detailed in the specifications for a complete installation.

W. **Item No. 27: FLOW METERS**  
1. **Measurement**: Measurement for payment for “Flow Meters” will be made on a per each basis.  
2. **Payment**: Payment for this item will be made at the per each price bid for furnishing and installing magnetic flow meters as shown on the Drawings and specified in Section 13562. The Work will include all labor, material, tools, and equipment to install the flow meters, instrumentation and to connect the flow meters to the equipment control panel for operation of the system as a whole.

X. **Item No. 28: LEVEL SENSORS/INDICATORS**  
1. **Measurement**: Measurement for payment for “Level Sensors/Indicators” will be made on a per each basis.  
2. **Payment**: Payment for this item will be made at the per each price bid for furnishing...
and installing level sensors/indicators as shown on the Drawings and specified in Section 13563. The Work will include all labor, material, tools, and equipment to install the sensors, instrumentation and to connect to the equipment control panel for operation of the system as a whole.

Y. Item No. 29: CONTROL PANEL AND RIO FOR FILTER BACKWASH
1. Measurement: Measurement for payment for “Control Panel and RIO for Filter Backwash” will be made on a lump sum.
2. Payment: Control panel and PLC for filter backwash sequencing as shown on the drawings will be measured as provided above will be paid at the unit price bid and shall include all labor, materials, tools, equipment and incidentals necessary to complete the work. Work will include furnishing, installing, programming the control panel including connecting all control and power wiring.

Z. Item No. 30: BLOWER CONTROL PANELS
1. Measurement: Measurement for payment for “Blower Control Panels” will be made on a lump sum basis.
2. Payment: Blower Control Panels as shown on the drawings will be measured as provided above will be paid at the unit price bid and shall include all labor, materials, tools, equipment and incidentals necessary to complete the work. Work will include installing, connecting and testing the control panels provided for the blower including all control and power wiring.

AA. Item No. 31 & 36: ELECTRICAL
1. Measurement: Measurement for payment for “Electrical” will be made on a lump sum.
2. Payment: Electrical as shown on the drawings will be measured as provided above will be paid at the unit price bid and shall include all labor, materials, tools, equipment and incidentals necessary to complete all electrical work including but not limited to conduit, raceways, grounding, power and control wiring that is not specifically covered in other bid items. The price shall be full compensation for all labor, material, equipment, and all other miscellaneous and incidental work as specified and shown on drawings. Payment shall be paid based on percent of work completed/installed according to the schedule of values to be submitted by contractor with each pay application.

BB. Item No. 32 – 35: ELECTRONIC ACTUATOR FOR EXISTING BUTTERFLY VALVE
1. Measurement: Measurement for payment for “Electronic Actuator for Existing Butterfly Valve” will be made on a per each basis of the size specifically listed on the bid schedule.
2. Payment: Payment for this item will be made at the per each price bid for furnishing and installing electronic actuator as shown on the Drawings and described in the specifications. The Work will include all labor, material, tools, and equipment to remove and dispose the existing actuators, install the actuators on the existing valves and to connect power and control wiring to control panels for operation of the system as a whole.

CC. Item No. 36: DEMOLITION
1. Measurement: Measurement for payment for “Demolition” will be made on a lump sum...
2. Payment: Payment for this item will be made at the unit price and shall include all labor, materials, tools, equipment and incidentals necessary to complete demolition and disposal of the building elements specified in the plans. Payment for this bid item shall be made as percent complete of the total demolition.

DD. Item No. 37: CAST-IN-PLACE CONCRETE
1. Measurement: Measurement for payment for “Cast-in-Place Concrete” will be made on a lump sum basis. No separate measurement will be made for reinforcing steel.
2. Payment: Payment for this item will be made at the unit price and shall include all labor, materials, tools, equipment and incidentals necessary to complete the concrete work specified in the plans and specifications. Payment for this bid item shall be made as percent complete of the total work required. No separate payment will be made for reinforcing steel.

EE. Item No. 38: MASONRY WALL
1. Measurement: Measurement for payment for “Masonry Wall” will be made on a per square foot basis.
2. Payment: Payment for this item will be made at the unit price and shall include all labor, materials, tools, equipment and incidentals necessary to complete the masonry wall specified in the plans and specifications. Payment for this bid item shall be made as square footage complete.

FF. Item No. 39: STRUCTURAL METALWORK
1. Measurement: Measurement for payment for “Structural Metalwork” will be made on a lump sum basis.
2. Payment: Payment for this item will be made at the unit price and shall include all labor, materials, tools, equipment and incidentals necessary to complete the structural metalwork specified in the plans and specifications. Payment for this bid item shall be made as percent complete.

GG. Item No. 40: METAL MAN DOOR
1. Measurement: Measurement for payment for “Metal Man Door” will be made on a per each basis.
2. Payment: Payment for this item will be made at the unit price and shall include all labor, materials, tools, equipment and incidentals necessary to complete the installation of the metal man door specified in the plans and specifications. Payment for this bid item shall be made after the installation is completed and accepted.

HH. Item No. 41: OVERHEAD COILING DOOR
1. Measurement: Measurement for payment for “Overhead Coiling Door” will be made on a per each basis.
2. Payment: Payment for this item will be made at the unit price and shall include all labor, materials, tools, equipment and incidentals necessary to complete the installation of the overhead coiling door specified in the plans and specifications. Payment for this bid item shall be made after the installation is completed and accepted.

II. Item No. 42: FOLDING SECURITY GATE
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1. **Measurement:** Measurement for payment for “Folding Security Gate” will be made on a per each basis.
2. **Payment:** Payment for this item will be made at the unit price and shall include all labor, materials, tools, equipment and incidentals necessary to complete the installation of the folding security gate specified in the plans and specifications. Payment for this bid item shall be made after the installation is completed and accepted.

JJ. **Item No. 43: LOADING DOCK LIFT**
1. **Measurement:** Measurement for payment for “Loading Dock Lift” will be made on a per each basis.
2. **Payment:** Payment for this item will be made at the unit price and shall include all labor, materials, tools, equipment and incidentals necessary to complete the installation of the loading dock lift specified in the plans and specifications. Payment for this bid item shall be made after the installation is completed and accepted.

4.04  ALTERNATE BID ITEMS

A. **Item No. 101: B STREET PLANT PIPE AND WALL COATING**
1. **Measurement:** Measurement for payment for “B Street Plant Pipe and Wall Coating” will be made on a square foot basis.
2. **Payment:** B Street Plant pipe and wall coating as shown on the drawings will be measured as provided above will be paid at the unit price bid and shall include all labor, materials, tools, equipment and incidentals necessary to complete the work. Work will include installing a protective coating on the pipe and walls in the pipe gallery. There will be no additional payment for cleaning, concrete patching, drying of surfaces to be coated, protection of surfaces not being coated or any other prep work required to install the coating but costs for these items shall be included in the pay item for B Street Plant Pipe and Wall Coating.

B. **Item No. 201: SLIDE GATES**
1. **Measurement:** Measurement for payment for “Slide Gates” will be made on a per each basis.
2. **Payment:** Payment for this item will be made at the per each price bid for furnishing and installing slide gates as shown on the Drawings and described in the specifications. The Work will include all labor, material, tools, and equipment to remove the existing and dispose of the existing gates, install new frames, valves, bolts, seals, anchor bolts for the operation of the system as a whole.

- END OF SECTION -
MEASUREMENT AND PAYMENT   01025-12
DWSIRLF Project No. DWI-L380005-01
BKI Project No. TU.17.019

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B Street Water Treatment Plant &
North Water Treatment Plant Improvements
City of Meridian

SECTION 01040

COORDINATION

PART 1 - GENERAL

1.01 DESCRIPTION OF RESPONSIBILITIES

A. The Contractor shall coordinate scheduling, submittals and work of the various sections of the Specification to assure efficient and orderly sequence of installation of construction elements, with provisions for accommodating items to be installed later.

B. Each Contractor and subcontractor involved shall assume all liability, financial or otherwise, in connection with his work and shall protect and save harmless the Owner from any and all damages or claims that may arise because of inconvenience, delay or loss experienced by him because of the presence and operations of any other Contractors working within the limits of this project.

C. The Contractor shall arrange his work and shall place and dispose of the materials being used so as not to interfere with operations of others working in the surrounding area. He shall join his work with that of others in an acceptable manner and shall perform it in proper sequence to that of the others.

D. The contracting agency will not be responsible for any delays or inconvenience to the Contractor in carrying on his work while any public utility companies or agencies are making necessary adjustments of their fixtures or appurtenances, nor will the contracting agency be responsible for any cost incurred by the Contractor or utility owners for making said adjustments, by delays, etc.

1.02 EASEMENTS AND RIGHT-OF-WAY (SERVITUDE)

A. The easements and rights-of-way for the work will be provided by the Owner. Contractor shall confine his construction operations within the limits indicated on the drawings, and shall use due care in placing construction tools, equipment, excavated materials, and pipeline materials and supplies, so as to cause the least possible damage to property and interference with traffic.

B. All Work performed and all operations of Contractor, his employees or Subcontractors, within the limits of levee rights-of-way, shall be in conformity with the requirements and be under the control (through Owner) of the authority owning, or having jurisdiction over and control of, the right-of-way.

1.03 NOTICES TO OWNERS AND AUTHORITIES

A. Contractor shall, as provided in General Conditions, notify owners of adjacent property and utilities when prosecution of the Work may affect them.

B. When it is absolutely necessary to temporarily deny access by owners or tenants to their property, or when any utility service connection must be interrupted, Contractor
shall give notices sufficiently in advance to enable the affected persons to provide for their needs. Notices shall conform to any applicable local ordinance and, whether delivered orally or in writing, shall include appropriate information concerning the interruption and instruction on how to limit their inconvenience.

C. Utilities and other concerned agencies shall be contracted at least 24 hours prior to cutting or closing streets or other traffic areas or excavating near underground utilities or pole lines.

1.04 CONNECTIONS TO EXISTING FACILITIES

A. Unless otherwise specified or indicated, Contractor shall make all necessary connections to existing facilities including structures, drain lines, and utilities such as water, and electric. In each case, Contractor shall receive permission from Owner or the owning utility prior to undertaking connections. Contractor shall protect facilities against deleterious substances and damage.

B. Connections to existing facilities which are in service shall be thoroughly planned in advance, and all required equipment, materials and labor shall be on hand at the time of undertaking the connections. Work shall proceed continuously (around the clock) if necessary to complete connections in the minimum time. Operation of valves or other appurtenances on existing utilities, when required, shall be by or under the direct supervision of the owning utility.

C. Materials shall be cut and removed to the extent indicated on the Plans or as required to complete the Work. Materials shall be removed in a careful manner with no damage to adjacent facilities or materials. Materials which are not salvageable shall be removed from the site by Contractor.

D. All Work and existing facilities affected by cutting operations shall be restored with new materials, or with salvaged materials acceptable to Engineer, to obtain a finished installation with the strength, appearance, and functional capacity required. If necessary, entire surfaces shall be patched and refinished.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION
SECTION 01045

CUTTING AND PATCHING

PART 1 - GENERAL

1.01 DESCRIPTION

A. Contractor shall be responsible for all cutting, fitting and patching, including excavation and backfill, required to complete the Work or to:

1. Make its several parts fit together properly.
2. Uncover portions of the Work to provide for installation of ill-timed work.
3. Remove and replace defective work.
4. Remove and replace work not conforming to requirements of Contract Documents.
5. Remove samples of installed work as specified for testing.
6. Provide routine penetrations of non-structural surfaces for installation of piping and electrical conduit.

1.02 SUBMITTALS

A. The Contractor shall submit a written request to the Owner's Representative well in advance of executing any cutting or alteration which may affect:

1. The work of the Owner or any separate contractor.
2. The structural value or integrity of any element of the Project.
3. The integrity of effectiveness of weather-exposed or moisture-resistant elements or systems.
4. The efficiency, operational life, maintenance or safety of operational elements.
5. The visual qualities of sight-exposed elements.

B. The request shall include:

1. Identification of the Project.
2. Location and description of the affected work.
3. The necessity for cutting, alteration or excavation.
4. The effect on the work of the Owner or any separate contractor, or on the structural or weatherproof integrity of the Project.
5. Description of the proposed work:
a. The scope of cutting, patching, alteration, or excavation.

b. The trades who will execute the work.

c. Products proposed to be used.

d. The extent of refinishing to be done.

6. Alternatives to cutting and patching.

7. Cost proposal, when applicable.

8. Written permission of any separate contractor whose work will be affected.

9. Date and time work will be executed.

C. Should conditions of the work or the schedule indicate a change of products from the original installation, Contractor shall submit a request substitution.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Comply with specifications and standards for each specific product involved.

PART 3 - EXECUTION

3.01 INSPECTION

A. The Contractor shall inspect existing conditions of the Project, including elements subject to damage or to movement during cutting and patching.

B. After uncovering work, the Contractor shall inspect the conditions affecting the installation of products, or performance of the work. The commencement of any cutting or patching means acceptance of existing conditions.

C. Report unsatisfactory or questionable conditions to the Owner's Representative in writing; do not proceed with the work until the Owner's Representative has provided further instructions.

3.02 PREPARATION

A. The Contractor shall provide adequate temporary support as necessary to assure the structural value or integrity of the affected portion of the Work.

B. Provide devices and methods to protect other portions of the Project from damage.
C. Provide protection from the elements for that portion of the Project which may be exposed by cutting and patching work, and maintain excavations free from water.

3.03 PERFORMANCE

A. The Contractor shall execute cutting and demolition by methods which will prevent damage to other work, and will provide proper surfaces to receive installation of repairs.

B. Provide devices and methods to protect other portions of the Project from damage.

C. Provide protection from the elements for that portion of the Project which may be exposed by cutting and patching work, and maintain excavations free from water.

D. Execute excavating and backfilling by methods which will prevent settlement or damage to other work.

E. Execute fitting and adjustment of products to provide a finished installation to comply with specified products, functions, tolerances and finishes.

F. Restore work which has been cut or removed; install new products to provide completed Work in accordance with requirements of Contract Documents.

G. Fit work airtight to pipes, sleeves, ducts, conduit and other penetrations through surfaces.

H. Refinish entire surfaces as necessary to provide an even finish to match adjacent finishes:

1. For continuous surfaces, refinish to nearest intersection.

2. For an assembly, refinish the entire unit.

END OF SECTION
SECTION 01050

FIELD ENGINEERING AND SURVEYING

PART 1 - GENERAL

1.01 REQUIREMENTS INCLUDED

A. Contractor shall provide and pay for field engineering services and field surveying required for Project.

   1. Survey work required in execution of Project.
   2. Civil, structural or other professional engineering services specified, or required to execute Contractor's construction methods.

1.02 RELATED REQUIREMENTS

A. DIVISION 1

B. DIVISION 2

1.03 QUALIFICATIONS OF SURVEYOR OR ENGINEER

A. Registered professional engineer or registered land surveyor of the discipline required for the specific service of the Project, licensed in the State of Mississippi and acceptable to the Owner.

1.04 QUALITY CRITERIA

A. Contractor shall perform the following:

   1. Verify existing grades prior to beginning site preparation. If existing grades are at variance with drawings, notify Engineer and receive instructions prior to proceeding.
   2. Verify limits of the site preparation and earthwork operations. Locate adjacent buildings and appurtenances.
   3. Establish bench marks outside of working limits. Establish two benchmarks, located on the project site, as widely separated as possible.
   4. Verify utility locations, including new construction and existing active and inactive utilities encountered during construction activity.

B. Notify Engineer, in writing of on-site conditions which are at variance with the Contract Documents. Compare variations in locations, level, plumbness and deflection with allowable tolerances given in the Contract Documents.

1.05 SURVEY REFERENCE POINTS
A. The basic horizontal and vertical control points for the Project should be those designated on Drawings. Contractor shall verify all existing grades prior to beginning work on the site.

B. Contractor shall locate verify and protect control points prior to starting work, and preserve all permanent reference points during construction.
   1. Make no changes or relocations without prior written notice to Engineer.
   2. Report to Engineer when any reference point is lost or destroyed, or required relocation because of necessary changes in grades or locations.
   3. Require surveyor to replace Project control points which may be lost or destroyed.
      a. Establish replacements based on original survey control.

1.06 PROJECT SURVEY REQUIREMENTS

A. Establish temporary bench marks as needed referenced to data established by survey control points. Record all locations, with horizontal and vertical data, on Project Record Documents.

B. Establish lines and levels, locate and lay out, by instrumentation and similar appropriate means.

C. From time to time, as directed by the Engineer, verify layouts by same methods.

1.07 RECORDS

A. Maintain a complete, accurate log of all control and survey work as it progresses.

1.08 SUBMITTALS

A. Submit name and address of Surveyor and Professional Engineer to Engineer.

B. On request of Engineer, submit documentation to verify accuracy of field engineering work.

C. Submit certificate signed by Registered Engineer or Surveyor certifying that elevations and locations of improvements are in conformance, or non-conformance, with Contract Documents.

D. All field books, notes, and other data developed by Contractor in performing surveys required as part of the Work shall be available to Engineer for examination throughout the construction period.

E. All such data shall be submitted to Engineer with the other documentation required for final acceptance of the Work.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION
SECTION 01070

ABBREVIATIONS AND SYMBOLS

PART 1 - GENERAL

1.01 RELATED REQUIREMENTS: None

1.02 DESCRIPTION

A. Abbreviations used in the Contract Documents are defined as follows:

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>AA</td>
<td>Aluminum Association</td>
</tr>
<tr>
<td>AABC</td>
<td>Associated Air Balance Council</td>
</tr>
<tr>
<td>AAMA</td>
<td>American Architectural Manufacturers Association</td>
</tr>
<tr>
<td>AAN</td>
<td>American Association of Nurserymen</td>
</tr>
<tr>
<td>AASHTO</td>
<td>American Association of State Highway and Transportation Officials</td>
</tr>
<tr>
<td>ACEC</td>
<td>American Consulting Engineers Council</td>
</tr>
<tr>
<td>ACI</td>
<td>American Concrete Institute</td>
</tr>
<tr>
<td>ACPA</td>
<td>American Concrete Pipe Association</td>
</tr>
<tr>
<td>AFBMA</td>
<td>Antifriction Bearing Manufacturers Association</td>
</tr>
<tr>
<td>AGA</td>
<td>American Gas Association</td>
</tr>
<tr>
<td>AGC</td>
<td>Associated General Contractors of America</td>
</tr>
<tr>
<td>AGMA</td>
<td>American Gear Manufacturers Association</td>
</tr>
<tr>
<td>AHA</td>
<td>American Hardboard Association</td>
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<tr>
<td>AI</td>
<td>Asphalt Institute</td>
</tr>
<tr>
<td>AIA</td>
<td>American Institute of Architects</td>
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<tr>
<td>AISC</td>
<td>American Institute of Steel Construction</td>
</tr>
<tr>
<td>AISI</td>
<td>American Iron and Steel Institute</td>
</tr>
<tr>
<td>AITC</td>
<td>American Institute of Timber Construction</td>
</tr>
<tr>
<td>AMCA</td>
<td>Air Movement and Control Association</td>
</tr>
<tr>
<td>ANSI</td>
<td>American National Standards Institute</td>
</tr>
<tr>
<td>APA</td>
<td>American Plywood Association</td>
</tr>
<tr>
<td>API</td>
<td>American Petroleum Institute</td>
</tr>
<tr>
<td>APWA</td>
<td>American Public Works Association</td>
</tr>
<tr>
<td>ARI</td>
<td>Air Conditioning and Refrigeration Institute</td>
</tr>
<tr>
<td>ARIB</td>
<td>Asphalt Roofing Industry Bureau</td>
</tr>
<tr>
<td>ASA</td>
<td>American Standards Association</td>
</tr>
<tr>
<td>ASCE</td>
<td>American Society of Civil Engineers</td>
</tr>
<tr>
<td>ASHRAE</td>
<td>American Society of Heating, Refrigerating and Air Conditioning Engineers</td>
</tr>
<tr>
<td>ASLA</td>
<td>American Society of Landscape Architects</td>
</tr>
<tr>
<td>ASME</td>
<td>American Society of Mechanical Engineers</td>
</tr>
<tr>
<td>ASSE</td>
<td>American Society of Sanitary Engineering</td>
</tr>
<tr>
<td>ASTM</td>
<td>American Society for Testing and Materials</td>
</tr>
<tr>
<td>AWG</td>
<td>American Wire Gauge</td>
</tr>
<tr>
<td>AWI</td>
<td>American Woodworking Institute</td>
</tr>
<tr>
<td>AWPA</td>
<td>American Wood Preservers Association</td>
</tr>
<tr>
<td>AWPA</td>
<td>American Wood Products Association</td>
</tr>
</tbody>
</table>
B Street Water Treatment Plant &
North Water Treatment Plant Improvements
City of Meridian

AWPB American Wood Preservers Bureau
AWPI American Wood Preservers Institute
AWS American Welding Society
AWWA American Water Works Association
BIA Brick Institute of America
BHMA Builders Hardware Manufacturers Association
BOCA Building Officials Council of America
CE Corps of Engineers, U.S. Army
CISPI Cast Iron Soil Pipe Institute
CMA Crane Manufacturing Association
CPSC U. S. Consumer Products Safety Commission
CRSI Concrete Reinforcing Steel Institute
CS Commercial Standard
CSI Construction Specifications Institute
DHI Door and Hardware Institute
EJCDC Engineers Joint Contract Documents Committee
EPA Environmental Protection Agency
Fed Spec Federal Specifications
FDA Food & Drug Administration
FGMA Flat Glass Marketing Association
FM Factory Mutual Engineering Corporation
FMA Flat Glass Marketing Association
FS Federal Specifications
FSS Federal Specifications and Standards, General Services Administration
GA Gypsum Association
HMI Hoist Manufacturers Institute
IBBM Iron Body, Bronze Mounted
ICBO International Conference of Building Officials
IEEE Institute Electrical and Electronics Engineers
IES Illuminating Engineering Society
IFI Industrial Fasteners Institute
IPCEA Insulated Power Cable Engineers Association
IPS Iron Pipe Size
ISA Instrument Society of America
LSGA Laminators Safety Glass Association
MBMA Metal Building Manufacturers Association
MDOT Mississippi Department of Transportation
MIL Military Specification
ML/SFA Metal Lath/Steel Framing Association
MSS Manufacturers Standardization Society
MSSRBC Mississippi Standard Specifications for Road and Bridge Construction
NAAMM National Association of Architectural Metal Manufacturers
NACE National Association of Corrosion Engineers
NBC National Building Code
NBHA National Builders Hardware Association
NBS National Bureau of Standards
NCMA National Concrete Masonry Association
ABBREVIATIONS AND SYMBOLS

B Street Water Treatment Plant & North Water Treatment Plant Improvements
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NEC National Electrical Code
NEMA National Electrical Manufacturers Association
NFPA National Fire Protection Association
NFPA National Forest Products Association
NPA National Particleboard Association
NPCA National Pest Control Association
NPT National Pipe Thread
NRCA National Roofing Contractors Association
NSF National Sanitation Foundation
NSPE National Society for Professional Engineers
NWMA National Woodwork Manufacturers Association
NWWDA National Wood Window and Door Association
OSHA Occupational Safety and Health Administration
PCA Portland Cement Association
PCI Prestressed Concrete Institute
PDI Plumbing & Drainage Institute
PFI Pipe Fabrication Institute
PPI Plastic Pipe Institute
PS Product Standards
RCSC Research Council on Structural Connections
RMA Rubber Manufacturers Association
SAE Society of Automotive Engineers
SBCCI Southern Building Code Congress International
SCPRF Structural Clay Products Research Foundation
SCS Soil Conservation Service, U.S. Department of Agriculture
SDI Steel Deck Institute
SDI Steel Door Institute
SFPA Southern Forest Products Association
SJI Steel Joist Institute
SMACNA Sheet Metal and Air Conditioning Contractors National Association
SPI Society of the Plastics Industry
SPIB Southern Pine Inspection Bureau
SSPC Steel Structures Painting Council
STI Steel Tank Institute
SWI Sealant and Waterproofer Institute
SWI Steel Window Institute
TCA Tile Council of America
TPI Truss Plate Institute
UL Underwriters' Laboratories
US U. S. Bureau of Standards
WPRS Water and Power Resources Service
WRI Wire Reinforcement Institute
WWPA Western Wood Products Association

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION
B Street Water Treatment Plant &
North Water Treatment Plant Improvements
City of Meridian

SECTION 01200

PROJECT MEETINGS

PART 1 - GENERAL

1.01 WORK INCLUDED

A. The Owner's Representative may schedule and administer pre-bid and pre-construction meetings, periodic progress meetings, and specially called meetings throughout the progress of the work.

   1. Specially called meetings may be held at the job site during normal working hours, as necessary to expedite the progress of the job.

B. The Owner's Representative shall direct individuals attending the meeting to:

   1. Prepare agenda for meetings.
   2. Distribute written notice of each meeting.
   3. Preside at meetings.
   4. Record the minutes; include all significant proceedings and decisions.
   5. Reproduce and distribute copies of minutes.

C. Representatives of Contractors, subcontractors and suppliers attending the meetings shall be qualified and authorized to act on behalf of the entity each represents.

D. Related Requirements in Other Parts of the Contract Documents:

   1. Pre-Construction Conferences: Section 01210, 01220, 01700.

1.02 PRE-CONSTRUCTION MEETING

A. After notification that the contract has been executed and prior to the commencement of the Work at the site, the Owner's Representative shall arrange with the Owner, Using Agency and the Contractor to conduct a Pre-Construction Conference.

B. Location: Project site or where directed by the Owner's Representative.

C. Attendance:

   1. Owner's Representative.
   2. Using Agency's Representative.
   3. Engineer, his Professional Consultants, and his Project Representative.
4. Contractor.
5. Contractor's Superintendent.
6. Principal Subcontractors.
7. Principal Suppliers and manufacturer's representatives as appropriate.
8. Others as Appropriate.

D. The Contractor shall coordinate and be responsible for the attendance of his principal Subcontractors.

E. The Contractor shall furnish at the time of the pre-construction meeting to the Owner's Representative, the Engineer and Using Agency six (6) copies of the following documents:

1. Schedule of Values.
2. List of Subcontractors.
3. List of major material suppliers.
5. Procurement Schedule.
6. Shop Drawings and Submittal Schedule
7. Excavation Plan
8. Canal Crossing Plan

F. The purpose of the conference is to designate responsible personnel and establish a working relationship. Matters requiring coordination will be discussed and procedures for handling such matters established. The agenda will include:

1. Contractor's tentative schedules.
2. Transmittal, review, and distribution of Contractor's submittals.
3. Processing applications for payment. Application format.
6. Field decisions and Change Orders.
7. Use of premised, office and storage areas, security, housekeeping, and Owner’s needs.

8. Major equipment deliveries and priorities.

9. Contractor's assignments for safety and first aid.

10. Submitted of executed bonds and insurance certificates if not previously submitted.

1.03 PROGRESS MEETINGS

A. Progress meetings will be scheduled by the Owner’s Representative or the Engineer after consulting with the Owner and the Using Agency. These meetings shall be no more often than one per week as required by progress of the work, exclusive of any other meetings scheduled by the Owner's Representative, Owner or Using Agency.

1. It shall be the responsibility of the Owner's Representative to notify the Owner, Using Agency, and the Contractor of the time, place and date of the "Progress Meeting".

2. It shall be the responsibility of the Contractor to notify all suppliers and subcontractors.

B. The purpose of these regular meetings is to assess, realistically, the current status and progress of the work, to effect coordination, cooperation and assistance in every practical way and to discuss changes in scheduling, and to resolve other problems that may develop. This should maintain the progress of the project on schedule and complete the project within the contract time.

C. These meetings will be called as required during progress of the work.

D. Location of the meetings: The project field office or other location where directed by the Owner's Representative.

E. Attendance:

1. Owner's representative.

2. Using Agency’s representative.

3. Engineer, his professional consultants, and his Project Representative.

4. Contractor.

5. Contractor’s Superintendent.

6. Principal Subcontractors, and all subcontractors active on the site.
7. Principal Suppliers and Manufacturer's Representatives.

8. Others as appropriate.

F. Suggested Agendum:

1. Review and approve minutes of previous meeting.

2. Review of work progress since previous meeting.

3. Note field observations, problems, or conflicts.

4. Identify problems that impede Construction Schedule.

5. Develop corrective measures and procedures to regain projected schedule.

6. Revise Construction Schedule as required.

7. Plan progress, schedule, during succeeding work period.

8. Coordination of schedules.

9. Review submittal schedules; expedite as required to maintain schedule.

10. Review maintenance of quality and work standards.

11. Review proposed changes for the effect on Construction Schedule, completion date, and coordination.

12. Complete other current business.

END OF SECTION
SECTION 01210

PRECONSTRUCTION CONFERENCE

PART 1 - GENERAL

1.01 RELATED WORK

A. None

1.02 DESCRIPTION

A. In accordance with the General Conditions, prior to the commencement of Work at the site, a pre-construction conference may be held at a mutually agreed time and place. The conference shall be attended by:

1. Contractor
2. Principal Subcontractors.
3. Representatives of principal suppliers and manufacturers as appropriate.
4. Engineer and his Resident Project Representative.
5. Representatives of Owner.
6. Governmental representatives as appropriate.
7. Others as requested by Contractor, Owner, or Engineer.

B. Unless previously submitted to Engineer, Contractor shall bring to the conference a tentative schedule for each of the following:

1. Progress.
2. Procurement.
3. Values of progress payment purposes.
4. Shop Drawings and other submittals.

C. The purpose of the conference is to designate responsible personnel and establish a working relationship. Matters requiring coordination will be discussed and procedures for handling such matters established. The agenda will include:

1. Contractor's tentative schedules.
2. Transmittal, review, and distribution of Contractor's submittals.
3. Processing applications for payment.


6. Field decisions and Change Orders.

7. Use of premised, office and storage areas, security, housekeeping, and Owner's needs.

8. Major equipment deliveries and priorities.

9. Contractor's assignments for safety and first aid.

D. The Owner's Representative will preside at the conference and will arrange for keeping the minutes and distributing the minutes to all persons in attendance.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION
SECTION 01220

PROGRESS MEETINGS

PART 1 - GENERAL

1.01 RELATED WORK
   A. None

1.02 DESCRIPTION
   A. Engineer may schedule and hold regular progress meetings monthly and at other times as requested by the Owner or required by progress of the Work. Contractor, Engineer, and all Subcontractors active on the site shall be represented at each meeting. Contractor may at his discretion request attendance by representatives of his suppliers, manufacturers, and other Subcontractors.

   B. Engineer shall preside at the meetings and provide for keeping and distribution of the minutes. The purpose of the meetings will be to review the progress of the Work, maintaining coordination of efforts, discuss changes in scheduling, and resolve other problems that may develop.

   C. Progress meetings will be held at the office of the City of Meridian Public Works Department.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION
SECTION 01300

CONTRACTOR SUBMITTALS

PART 1 - GENERAL

1.01 GENERAL

A. Submittal, samples and any other information necessary for evaluation of shall be provided by the Contractor as stated in various sections of the General Conditions and any additional requirements stated in this Section 01300 – Contractor Submittals.

B. If there is any conflict with this Section 01300 and the General Conditions, the General Conditions shall govern.

1.02 PRECONSTRUCTION CONFERENCE SUBMITTALS

A. The Contractor shall prepare all preliminary schedules as listed in Section 2.05.A of the General Conditions and shall present same to the Engineer at the preconstruction conference. The CONTRACTOR shall submit the following items to the ENGINEER for review:

1. A preliminary Progress Schedule as described in Section 2.05.A.1 of the General Conditions.

2. A preliminary Schedule of Submittals as described in Section 2.05.A.2 of the General Conditions.

3. A preliminary Schedule of Values as described in Section 2.05.A.3 of the General Conditions.

1.03 SHOP DRAWINGS

A. Shop Drawings and Samples will be submitted as described in Section 6.17 of the General Conditions.

B. If specific sections call for more information to be shown on the Shop than sated in Section 6.17.A.b of the General Conditions, then that information in addition shall be provided for that specific specification section.

C. Shop Drawings may include detail design calculations, shop-prepared drawings, fabrication and installation drawings, erection drawings, lists, graphs, catalog sheets, data sheets, and similar items. Whenever the CONTRACTOR is required to submit design calculations as part of a submittal, such calculations shall bear the signature and seal of an engineer registered in the appropriate branch and in the state wherein the project is located, unless otherwise indicated.
D. Shop Drawing submittals shall be accompanied by the CONTRACTOR's standard submittal transmittal form. Submittals shall be signed by the CONTRACTOR as an indication that they have been reviewed for completeness and organization.

E. Organization

1. A single submittal transmittal form shall be used for each technical specification section or item or class of material or equipment for which a submittal is required. A single submittal covering multiple sections will not be acceptable, unless the primary specification references other sections for components. Example: if a pump section references other sections for the motor, shop-applied protective coating, anchor bolts, local control panel, and variable frequency drive, a single submittal would be acceptable. A single submittal covering vertical turbine pumps and horizontal split case pumps would not be acceptable.

2. On the transmittal form, index the components of the submittal and insert tabs or other physical divider in the submittal to match the components. Relate the submittal components to specification paragraph and subparagraph, Drawing number, detail number, schedule title, room number, or building name, as applicable.

3. Unless indicated otherwise, terminology and equipment names and numbers used in submittals shall match those used in the Contract Documents.

F. Format

1. Minimum sheet size shall be 8.5-inches by 11-inches. Maximum sheet size shall be 24-inches by 36-inches. Every page in a submittal shall be numbered in sequence. Each copy of a submittal shall be collated a stapled or bound, as appropriate. The ENGINEER will not collate sheets or copies.

2. Where product data from a manufacturer is submitted, clearly mark which model is proposed, with complete pertinent data capacities, dimensions, clearances, diagrams, controls, connections, anchorage, and supports. Sufficient level of detail shall be presented for assessment of compliance with the Contract Documents.

3. Each submittal shall be assigned a unique number. Submittals shall be numbered sequentially, and the submittal numbers shall be clearly noted on the transmittal. Original submittals shall be assigned a numeric submittal number followed by a letter of the alphabet to distinguish between the original submittal and each resubmittal. For example, if submittal 25-A requires a resubmittal, the first resubmittal will bear the designation "25-B" and the second resubmittal will bear the designation "25-C" and so on.

G. Disorganized submittals that do not meet the requirements of the Contract Documents will be returned without review.
H. Except as may otherwise be indicated, the ENGINEER will return a copy of each submittal to the CONTRACTOR with comments noted thereon, within 30 Days following receipt by the ENGINEER. It is considered reasonable that the CONTRACTOR will make a complete and acceptable submittal to the ENGINEER by the first resubmittal on an item. Contractor shall be held to Section 7.16E.2 of the General Conditions with regard to resubmittals. The ENGINEER'S maximum review period for each submittal or resubmittal will be 30 Days. Thus, for a submittal that requires 2 resubmittals before it is complete, the maximum review period could be 90 Days.

I. If a submittal is returned to the CONTRACTOR marked "REVIEWED", formal revision and resubmission will not be required.

J. If a submittal is returned marked "REVIEWED AS NOTED," CONTRACTOR shall make the corrections on the submittal, but formal revision and resubmission will not be required.

K. If a submittal is returned marked "REVISE & RESUBMIT," the CONTRACTOR shall revise it and shall resubmit the required number of copies to the ENGINEER for review. Resubmittal of portions of multi-page or multi-drawing submittals will not be allowed. For example, if a Shop Drawing submittal consisting of 10 drawings contains one drawing noted as "REVISE & RESUBMIT," the submittal as a whole is deemed "REVISE & RESUBMIT," and 10 drawings are required to be resubmitted.

L. If a submittal is returned marked "REJECTED", it shall mean either that the proposed material or product does not satisfy the specification, the submittal is so incomplete that it cannot be reviewed, or is a substitution request not submitted in accordance with the requirements of Section 01630 – Product Options and Substitutions.

M. Resubmittal of rejected portions of a previous submittal will not be allowed. Every change from a submittal to a resubmittal or from a resubmittal to a subsequent resubmittal shall be identified and flagged on the resubmittal.

N. Fabrication of an item may commence only after the ENGINEER has reviewed the pertinent submittals and returned copies to the CONTRACTOR marked either "REVIEWED" or "REVIEWED AS NOTED." Corrections indicated on submittals shall be considered as changes necessary to meet the requirements of the Contract Documents and shall not be taken as changes to the contract requirements.

O. Submittals shall be carefully reviewed by an authorized representative of the CONTRACTOR prior to submission to the ENGINEER. Each submittal shall be dated and signed by the CONTRACTOR as being correct and in strict conformance with the Contract Documents. In the case of Shop Drawings, each sheet shall be so dated and signed. Any deviations from the Contract Documents shall be noted on the transmittal sheet. The ENGINEER will only review submittals that have been so verified by the CONTRACTOR. Non-verified submittals will be returned to the CONTRACTOR without action taken by the ENGINEER, and any delays caused thereby shall be the total responsibility of the CONTRACTOR.
P. Corrections or comments made on the CONTRACTOR's Shop Drawings during review do not relieve the CONTRACTOR from compliance with Contract Drawings and Specifications. Review is for conformance to the design concept and general compliance with the Contract Documents only. The CONTRACTOR is responsible for confirming and correlating quantities and dimensions, fabrication processes and techniques, coordinating WORK with the trades, and satisfactory and safe performance of the WORK.

Q. A minimum of six (6) copies shall be provided by the Contractor to the Engineer for every submittal. The Engineer will return four (4) copies to the Contractor. Each subsequent resubmittal shall also be provided with six (6) copies for review with four (4) copies to the Contractor.

1.04 SAMPLES

A. The CONTRACTOR shall submit the number of samples indicated by the Specifications. If the number is not indicated, submit not less than 3 samples. Where the amount of each sample is not indicated, submit such amount as necessary for proper examination and testing by the methods indicated.

B. Samples shall be individually and indelibly labeled or tagged, indicating the salient physical characteristics and manufacturer's name. Upon acceptance by the ENGINEER, one set of the samples will be stamped and dated by the ENGINEER and returned to the CONTRACTOR, one set of samples will be retained by the ENGINEER, and one set shall remain at the Site in the ENGINEER's field office until completion of the WORK.

C. Unless indicated otherwise, the ENGINEER will select colors and textures from the manufacturer's standard colors and standard materials, products, or equipment lines. If certain samples represent non-standard colors, materials, products, or equipment lines that will require an increase in Contract Times or Price, the CONTRACTOR shall clearly state so on the transmittal page of the submittal.

D. The CONTRACTOR shall schedule sample submittals such that:

1. Sample submittals for color selection are complete so the ENGINEER has 45 Days to assemble color panels and select color dependent products and materials without delay to the construction schedule, and

2. After the ENGINEER selects colors, the CONTRACTOR has sufficient time to provide the products or materials without delay to the construction schedule. The Contract Times will not be extended for the CONTRACTOR's failure to allow enough review and approval or selection time, failure to submit complete samples requiring color selection, or failure to submit complete or approvable samples.

1.05 TECHNICAL MANUAL

A. The CONTRACTOR shall submit technical operation and maintenance information for each item of mechanical, electrical, and instrumentation equipment in an organized
manner in the Technical Manual. It shall be written so that it can be used and understood by the OWNER's operations and maintenance staff.

B. The Technical Manual shall be subdivided first by specification section number; second, by equipment item; and last, by "Category." The following "Categories" shall be addressed (as applicable):

1. Category 1 - Equipment Summary
   a. Summary: A table shall indicate the equipment name, equipment number, and process area in which the equipment is installed.
   b. Form: The ENGINEER will supply an Equipment Summary Form for each item of mechanical, electrical, and instrumentation equipment in the WORK. The CONTRACTOR shall fill in the relevant information on the form and include it in Part 1.

2. Category 2 - Operational Procedures
   a. Procedures: Manufacturer-recommended procedures on the following shall be included in Part 2:
      Installation
      Adjustment
      Startup
      Location of controls, special tools, equipment required, or related instrumentation needed for operation
      Operation procedures
      Load changes
      Calibration
      Shutdown
      Troubleshooting
      Disassembly
      Reassembly
      Realignment
      Testing to determine performance efficiency
Tabulation of proper settings for pressure relief valves, low and high pressure switches, and other protection devices

List of all electrical relay settings including alarm and contact settings

3. Category 3 - Preventive Maintenance Procedures
   a. Procedures: Preventive maintenance procedures shall include manufacturer-
      recommended procedures to be performed on a periodic basis, both by
      removing and replacing the equipment or component, and by maintaining the
      equipment in place.
   b. Schedules: Recommended frequency of preventive maintenance procedures
      shall be included. Lubrication schedules, including lubricant SAE grade, type,
      and temperature ranges, shall be covered.

4. Category 4 - Parts List
   a. Parts List: A complete parts list shall be furnished, including a generic
      description and manufacturer's identification number for each part. Addresses
      and telephone numbers of the nearest supplier and parts warehouse shall be
      included.
   b. Drawings: Cross-sectional or exploded view drawings shall accompany the
      parts list. Part numbers shall appear on the drawings with arrows to the
      corresponding part.

5. Category 5 - Wiring Diagrams
   a. Diagrams: Category 5 shall include complete internal and connection wiring
      diagrams for electrical equipment items.

6. Category 6 - Shop Drawings
   a. Drawings: This category includes approved shop or fabrication drawings with
      ENGINEER comments and corrections incorporated, complete with
      dimensions.

7. Category 7 - Safety
   a. Procedures: This category describes the safety precautions to be taken when
      operating and maintaining the equipment or working near it.

8. Category 8 - Documentation:
   a. Equipment warranties, affidavits, certifications, calibrations, laboratory test
      results, etc. required by the Technical Specifications shall be placed in this
      category.
C. Format

1. Each Technical Manual shall be bound in standard size 3-ring hardcover binders labeled on the spine and cover with project name, OWNER’s project number, specification section number, equipment name, and equipment identification number.

2. Each Binder shall contain its own detailed table of contents at the front, plus a summary level table of contents information for the other binders in a multi-binder set.

3. Documents in binders shall be 3-hole punched, no text shall be punched out, and pages larger than 8-1/2 by 11 shall be folded to 8-1/2 by 11.

4. Each final set of Technical Manuals shall include a CD with electronic files:
   a. Project specific files created in Adobe Acrobat portable document format, or other software required by the specifications.
   b. Manufacturer literature in Adobe Acrobat portable document format (PDF).

D. Review Process

1. The CONTRACTOR shall furnish 3 draft Technical Manuals for each Specification Section that requires a Manual. The ENGINEER will retain one copy, will forward one copy to the OWNER, and will return one copy to the CONTRACTOR with review comments.

2. The CONTRACTOR shall incorporate comments into the draft and submit 5 identical copies of the final Manual for acceptance.

E. Schedule

1. Except where indicated otherwise, manuals shall be submitted in final form to the ENGINEER not later than the 75 percent of construction completion date. Discrepancies found by the ENGINEER shall be corrected within 30 Days from the date of written notification by the ENGINEER.

2. Manuals that are incomplete or unacceptable at the schedule criterion above will constitute sufficient justification for the OWNER to withhold retainage from any monies due the CONTRACTOR.

1.06 SPARE PARTS LIST

A. The CONTRACTOR shall furnish to the ENGINEER 5 identical sets of spare parts information for mechanical, electrical, and instrumentation equipment. The spare parts list shall include those spare parts that each manufacturer recommends be maintained by the OWNER in inventory.
1. Sources and Pricing: The spare parts list shall include a current list price of each spare part. Each manufacturer or supplier shall indicate the name, address, and telephone number of its nearest outlet of spare parts to assist the OWNER in ordering.

2. Format: The CONTRACTOR shall cross-reference spare parts lists to the equipment numbers designated in the Contract Documents. The spare parts lists shall be bound in standard size, 3-ring, loose-leaf, vinyl plastic hard cover binders suitable for bookshelf storage. Binder ring size shall not exceed 2.5 inches. Each copy of the spare parts lists shall be accompanied by a CD containing the lists in electronic format.

1.07 RECORD DRAWINGS

A. The CONTRACTOR shall maintain one set of Drawings at the Site for the preparation of record drawings. On these, the Contractor shall mark every project condition, location, configuration, and any other change or deviation which may differ from the Contract Drawings at the time of award, including buried or concealed construction and utility features that are revealed during the course of construction. Special attention shall be given to recording the horizontal and vertical location of buried utilities that differ from the locations indicated, or that were not indicated on the Contract Drawings. Said record drawings shall be supplemented by any detailed sketches as necessary or as CONTRACTOR is directed, to fully indicate the WORK as actually constructed. These record drawings are the CONTRACTOR’s representation of as-built conditions, shall include revisions made by addenda and change orders, and shall be maintained up-to-date during the progress of the WORK. Red ink shall be used for alterations and notes. Notes shall identify relevant Change Orders by number and date.

B. In the case of those drawings that depict the detail requirement for equipment to be assembled and wired in the factory, such as motor control centers and the like, the record drawings shall be updated by indicating those portions which are superseded by change order drawings or final Shop Drawings, and by including appropriate reference information describing the change orders by number and the Shop Drawings by manufacturer, drawing, and revision numbers.

C. Disorganized or incomplete record drawings will not be accepted. The CONTRACTOR shall revise them and resubmit within 10 Days.

D. Record drawings shall be accessible to the ENGINEER at any time during the construction period.

E. Final payment will not be acted upon until the record drawings have been completed and delivered to the ENGINEER. Said up-to-date record drawings shall be in the form of a set of prints with carefully plotted information showing clearly each change or deviation from the original drawings that has occurred over the time of the contract.

F. Information submitted by the CONTRACTOR will be assumed to be correct, and the CONTRACTOR shall be responsible for the accuracy of such information.
1.08 QUALITY CONTROL (QC) SUBMITTALS

A. Quality control submittals are defined as those required by the Specifications to present documentary evidence to the ENGINEER that the CONTRACTOR has satisfied certain requirements of the Contract Documents.

B. Unless otherwise indicated, QC submittals shall be submitted:

1. Before delivery and unloading, for the following types of submittals:

   a. Manufacturers' installation instructions
   b. Manufacturers' and Installers' experience qualifications
   c. Ready mix concrete delivery tickets
   d. Design calculations
   e. Affidavits and manufacturers' certification of compliance with indicated product requirements
   f. Laboratory analysis results
   g. Factory test reports

2. Within 30 Days of the event documented for the following types of submittals.

   a. Manufacturers' field representative certification of proper installation
   b. Field measurement
   c. Field test reports
   d. Receipt of permit
   e. Receipt of regulatory approval

C. The ENGINEER will record the date that a QC submittal was received and review it for compliance with submittal requirements, but the review procedures above for Shop Drawings and samples will not apply.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION
SECTION 01320

PROGRESS REPORTS

PART 1 - GENERAL

1.01 RELATED REQUIREMENTS

A. None

1.02 DESCRIPTION

A. A written progress report shall be furnished to Engineer with each application for progress payment. If the Work falls behind schedule, Contractor shall submit additional progress reports at such intervals as Engineer may request.

B. Each progress report shall include sufficient narrative to describe current and anticipated delaying factors, their effect on the construction schedule, and proposed corrective actions. Any Work reported complete, but which is not readily apparent to Engineer, must be substantiated with satisfactory evidence. Each progress report shall be on Contractor's letterhead and signed by the Contractor's representative.

C. Each progress report shall also include three prints of the accepted graphic schedule marked to indicate actual progress.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION
SECTION 01360

SITE CONDITIONS SURVEY

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK INCLUDED

A. The Contractor, prior to mobilizing onto the jobsite, shall conduct a detailed survey of the jobsite, surrounding area and access routes.

B. This survey is intended to document existing conditions with respect to any conditions that may be noticed after construction begins. Post construction conditions shall also be compared to this data.

C. This documentation shall be provided by the Contractor and submitted to the Engineer as preparation to resolve any damage claims that may arise due to the construction of this project. All costs associated with this survey shall be included in other bid items.

D. These records shall become property of the Owner upon delivery to the Engineer or Owner's Representative.

1.02 OWNER'S QUALITY AUTHORITY

A. The Owner shall have the authority to reject all or any portion of the photographic documentation not conforming to the Specifications. Those rejected portions shall be re-photographed at no additional cost to the Owner.

PART 2 - PRODUCTS

2.01 COVERAGE OF THE SURVEY

A. Photographs shall be taken of the exterior of all public and private buildings and structures along any pipeline work and within 500’ of any excavation or pile driving.

B. The Contractor shall make every attempt to gain permission from property owners for access to private property for documenting pre-construction conditions. If a property owner refuses access after multiple attempts, the Contractor will notify the Engineer and log all contacts with the property owner. The attempts shall include a formal letter and upon refusal, a registered or certified letter to supplement the log of verbal and/or telephone contacts.

C. Elevations shall be taken on house slabs, driveway pavement, walkway paving, sidewalks, and paving elements in street sections adjacent to the project site. These elevations shall be recorded and produced under the supervision of a registered licensed surveyor in the State of the project site. Elevations on abutting drives and walks shall be taken at approximately 20-foot intervals and at the point of juncture with any structure to which they are attached. In addition, elevations shall be taken of all corners of house slabs along the job route.
D. Video tapes of the access routes shall be made to show existing street and right-of-way conditions. The camera shall be mounted on a tripod or platform upon a vehicle which places the camera approximately 10’ above the path being travelled upon. The travel speed of the vehicle shall be no greater than 48 feet per minute. Photographs shall be taken to supplement the video tapes to give more detailed documentation of pre-existing conditions.

E. A carefully prepared log shall be maintained to show the name of the individual taking the photographs, the stationing as shown on the Plans, or as directed by the Engineer, the name of the street, easement or building being documented, the project name, and the direction of travel and the viewing side.

2.02 PHOTOGRAPHS

A. All still photographs shall be taken on digital format.

B. Photographs shall be sharp clear, bright, well focused with accurate colors free from distortion or any other form of picture imperfection.

C. The date and time of each photograph shall be displayed on the photograph.

D. The Engineer and Owner shall be furnished a report containing the digital photographs with full descriptions of each photograph (origin, location, etc.) included. Digital copies of individual photographs shall also be submitted. The report and digital photographs shall be delivered no later than on the date of mobilization upon the site or staging areas.

E. No photography shall be done during periods of significant precipitation, mist or fog.

F. The photography shall only be done when sufficient sunlight is present to properly illuminate the subjects of recording. Proper flash lighting shall be used inside the buildings and less lighted areas.

END OF SECTION
SECTION 01380

CONSTRUCTION PHOTOGRAPHS

PART 1 - GENERAL

1.01 RELATED WORK

A. None

1.02 DESCRIPTION

A. The Contractor shall be responsible for the production of construction photographs showing the regular progress of the Work at all locations.

B. Before commencement of the Work and continuing through the duration of the contract at intervals, the Contractor shall take not less than ten (10) exposures consisting of different subjects or angles of view for each exposure at each site of work. The exposures shall be taken from all locations on the construction site, and at all sites within the limits of the project where work is currently being performed, for adequate documentation of the Work. The photographer shall attempt to use the same locations for four (4) exposures at each interval. The exposures shall be taken at intervals not exceeding two (2) weeks in duration. The Contractor shall take ten (10) additional exposures specific to each work site at the completion of the Work as directed by the Engineer. All photographs shall be furnished to the Engineer within two (2) weeks after each exposure.

C. All photographs shall be produced by a competent photographer and shall be color photographs of commercial quality. All digital image files and a report with descriptions of each view shall be submitted. Reports shall include the name and number of the contract, name of Contractor, description and location of view, and date photographed. Photographs shall be taken with an 8.0 megapixel or greater digital formatted camera. All photography shall be at the Contractor’s expense. Engineer shall transmit each photograph to Owner.

D. CONTRACTOR shall submit construction photographs with applications for payment.

E. Upon completion of the WORK but before final payment, an additional twenty (20) photographs for each distinct work site shall be made as directed by the ENGINEER. For the purposes of documenting the completed work, digital photographs and logs shall be delivered to the ENGINEER for transmittal to the OWNER.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION
SECTION 01400
QUALITY CONTROL

PART 1 - GENERAL

1.01 QUALITY CONTROL, GENERAL

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

B. Perform work only by persons qualified by equivalent applicable union standards to produce workmanship of the specified quality.

C. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, and racking.

D. Comply with manufacturer's instructions in full detail, including each step in sequence. Should instructions conflict with Contract Documents, notify and request clarification from Engineer before proceeding.

1.02 SITE INVESTIGATION AND CONTROL

A. The Contractor shall verify all dimensions in the field and shall check field conditions continuously during construction. The Contractor shall be solely responsible for any inaccuracies built into the Work due to his failure to comply with this requirement.

B. The Contractor shall inspect related, adjacent, and appurtenant Work and shall report in writing to the Engineer any conditions that will prevent proper completion of the Work. Failure to report any such conditions shall constitute acceptance of all site conditions, and any required removal, repair or replacement caused by unsuitable conditions shall be performed by the Contractor at their sole cost and expense.

1.03 INSPECTION OF THE WORK

A. The Work shall be conducted under the general observation of the Engineer and shall be subject to inspection by representatives of the Engineer acting on behalf of the Owner to insure strict compliance with the requirements of the Contract Documents. Such inspection may include mill, plant, shop or field inspection, as required. The Engineer shall be permitted access to all parts of the Work, including plants where materials or equipment are manufactured or fabricated.

B. The presence of the Engineer or any inspector(s), however, shall not relieve the Contractor of the responsibility for the proper execution of the work in accordance with all requirements of the Contract Documents. Compliance is a duty of the Contractor, and said duty shall not be avoided by any act or omission on the part of the Engineer or any inspector(s).
C. All materials and articles furnished by the Contractor shall be subject to rigid inspection, and no materials or articles shall be used in the Work until they have been inspected and accepted by the Owner or his representative. No Work shall be backfilled, buried, cast in concrete, hidden or otherwise covered until it has been inspected. Any Work so covered in the absence of inspector shall be subject to uncovering. Where uninspected work cannot be uncovered, such as in concrete cast over reinforcing steel, all such Work shall be subject to demolition, removal and reconstruction under proper inspection, and no additional payment will be allowed therefor.

1.04 TIME OF INSPECTIONS AND TESTS

A. Samples and test specimens required under these Specifications shall be furnished and prepared for testing in ample time for the completion of the necessary tests, analyses and reporting of results before said articles or materials are to be used. The Contractor shall furnish and prepare all required test specimens at its own expense. Except as otherwise provided in the Contract Documents, performance of the required tests will be by the Owner, and all costs thereof will be borne by the Owner at no extra cost to the Contractor; except, that the costs of any tests which show unsatisfactory results shall be borne by the Contractor.

B. Whenever the Contractor is ready to backfill, bury, cast in concrete, hide or otherwise cover any Work under the Contract, the Engineer shall be notified not less than 24 hours in advance to request inspection before beginning any such Work of covering. Failure of the Contractor to notify the Engineer at least 24 hours in advance of any such inspections shall be reasonable cause for the Engineer to order a sufficient delay in the Contractor's schedule to allow time for such inspections and any remedial or corrective Work required, and all costs of such delays, including its effect upon other portions of the Work, shall be borne by the Contractor. Payment for items that are built, uninspected, or unverified may be delayed by the Engineer until satisfactory evidence of compliance is attained.

1.05 SAMPLING AND TESTING

A. When not otherwise specified, all sampling and testing shall be in accordance with methods prescribed in the current standards of the ASTM or related standard entity, as applicable to the class and nature of the article or materials considered; however, the Owner reserves the right to use any generally-accepted system of inspection which, in the opinion of the Engineer, will insure the Owner that the quality of the workmanship is in full accordance with the Contract Documents.

B. Any waiver of any specific testing or other quality assurance measures, whether or not such waiver is accompanied by a guarantee of substantial performance as a relief from the specified testing or other quality assurance requirements as originally specified, and whether or not such guarantee is accompanied by a performance bond to assure execution of any necessary corrective or remedial Work, shall not be construed as a waiver of any technical or qualitative requirements of the Contract Documents.
C. Notwithstanding the existence of such waiver, the Engineer shall reserve the right to make independent investigations and tests as specified in the following paragraph and, upon failure of any portion of the Work to meet any of the quantitative requirements of the Contract Documents, shall be reasonable cause for the Engineer to require the removal or correction and reconstruction of any such Work.

D. In addition to any other inspection or quality assurance provisions that may be specified, the Engineer shall have the right to independently select, test and analyze, at the expense of the Owner, additional test specimens of any or all of the materials to be used. Results of such tests and analyses shall be considered along with the tests and analyses made by the Contractor to determine compliance with the applicable specifications for materials so tested or analyzed; provided that wherever any portion of the Work is discovered, as a result of such independent inspection and investigation, and all costs of removal, correction and reconstruction, or repair of any such Work shall be borne by the Contractor.

1.06 RIGHT OF REJECTION

A. The Engineer, acting for the Owner, shall have the right, at all times and places, to reject any articles or materials to be furnished herein which, in any respect, fail to meet the requirements of the Contract Documents, regardless of whether the defects in such articles or materials are detected at the point of manufacture or after completion of the Work at the site. If the Engineer or inspector, through an oversight or otherwise, has accepted materials or Work which is defective or which is contrary to the Contract Documents, such material, no matter in what stage or condition of manufacture, delivery or erection, may be rejected by the Engineer or the Owner.

B. The Contractor shall promptly remove rejected articles or material from the site of the Work after notification of rejection.

C. All costs of removal and replacement of rejected articles or materials from the site of the Work after notification of rejection shall be borne by the Contractor.

1.07 TESTING LABORATORY SERVICES

A. The Contractor will select and pay for the services of an independent testing laboratory to perform specified testing quality control and services.

1. Contractor shall cooperate with the laboratory to facilitate the execution of its required services.

2. Employment of the laboratory shall in no way relieve Contractor's obligations to perform the Work of the Contract.

B. Related Requirements

1. Inspections and testing required by laws, ordinances, rules, regulations, orders or approvals of public authorities as mentioned in the Conditions of the Contract.
2. Certification of Products indicated in respective Specification Sections.

C. Testing laboratory inspecting, sampling, and testing is required for, but not limited to:
   1. Soils Compaction and Control.
   2. Cast-in-Place Concrete.

D. Qualification of Laboratory
   2. Meet basic requirements of ASTM E 329, "Standard Recommended Practice for inspection and Testing Agencies for Concrete, Steel and Bituminous Materials as Used in Construction".
   3. Authorized to operate in the State in which the Project is located.

E. Laboratory Duties
   1. Cooperate with Engineer and Contractor; provide qualified personnel after due notice.
   2. Perform specified inspections, sampling and testing and reporting of results of materials and methods of construction:
      a. Comply with specified standards.
      b. Ascertain compliance of materials with requirements of Contract Documents.
      c. Tests and inspections shall be conducted in accordance with specified requirements and if not specified, in accordance with applicable standards of American Society of Testing and Materials and other recognized authorities as applicable.
   3. Promptly notify Engineer and Contractor of observed irregularities or deficiencies of work or products.
   4. Promptly submit written reports of each test and inspection; at least one copy each to Engineer, Owner, and Contractor.
   5. Perform any additional tests as required by the Engineer or Owner.

F. Limitations of Authority of Testing Laboratory.
   1. Laboratory is not authorized to:
a. Release, revoke, alter or enlarge any requirements of Contract Documents.

b. Approve or accept any portion of the Work.

c. Perform any duties of the Contractor.

G. Contractor's Responsibilities

1. Cooperate with laboratory personnel, provide access to Work and to Manufacturer's operations.

2. Provide to the laboratory and to the Engineer the preliminary design mix proposed to be used for concrete and other materials and mixes which require control by the testing laboratory.

3. Furnish copies of Products test reports as requested.

4. Furnish incidental labor and facilities:
   a. To provide access to Work to be tested.
   b. To obtain and handle samples at the Project Site or at the source of the product to be tested.
   c. To facilitate inspections and tests.
   d. For protection, storage and curing of test samples.

5. Costs of tests, samples and specified material, where the substitution is requested by the Contractor and the tests are necessary in the opinion of the Engineer to establish equality qualified with specified items, shall be borne by the Contractor.

6. Notify laboratory and Owner's Representative sufficiently in advance of operations to allow for laboratory assignment of personnel and scheduling of tests.

7. Employ and pay for the services of a separate, equally qualified independent testing laboratory to perform additional inspections, sampling and testing required:
   a. For the Contractor's convenience.
   b. When initial tests indicate Work does not comply with Contract Documents.
   c. When required by laws, ordinances, rules, regulations, orders or approvals of public authorities.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION
SECTION 01510

TEMPORARY UTILITIES

PART 1 - GENERAL

1.01 RELATED WORK

A. None

1.02 TEMPORARY UTILITIES

A. Comply with National Electric Code

B. Contractor shall provide and maintain all temporary utilities such as heating, lighting and electricity for the operation of Contractor's plant or equipment or for any other use by Contractor. Heating, air conditioning and lighting shall be maintained at the project office and project site if applicable until the Work is granted final acceptance. General construction and safety lighting: five footcandles minimum; and finishing work and testing: 25 footcandles minimum.

C. Contractor shall discover characteristics of available sources of electrical power (voltage, phases, amps, etc.) and shall coordinate with his needs as required.

1.03 TEMPORARY TELEPHONE SERVICE

A. Contractor shall make all necessary arrangements with the telephone utility for telephones in the temporary field office(s) for the duration of Project. All telephone numbers shall be in the name of the Contractor, and all charges after installation shall be billed to and paid by the Contractor.

B. All Contractors and others performing work or furnishing services at the site shall be permitted to use Contractor's telephone without charge for toll-free calls pertaining to the Work.

1.04 TEMPORARY WATER

A. All water (including extensions of lines and connections) required for and in connection with the Work to be performed and for any specified tests of piping or for any other use as may be required for proper completion of the Work shall be provided by and maintained at the expense of the Contractor. No separate payment for water used or required will be made and all costs in connection therewith shall be included in the contract bid price.

B. Size piping to supply construction needs.

C. All drinking water on the site during construction shall be furnished by the Contractor and shall be bottled water.
1.05 TEMPORARY SANITARY FACILITIES

A. Contractor shall furnish temporary sanitary facilities at the site, as provided herein, for the needs of all construction workers and other performing work or furnishing services on the Project.

B. Sanitary facilities shall be of reasonable capacity, properly maintained throughout the construction period and obscured from public view to the greatest practical extent. If toilets of the chemically treated type are used, at least one toilet will be furnished for each 20 men. Contractor shall enforce the use of such sanitary facilities by all personnel at the site.

1.06 TEMPORARY VENTILATION

A. Provide ventilation to prevent accumulation of dust, fumes or gases and to properly cure materials and disperse humidity.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.01 REMOVAL

A. Completely remove all temporary utilities when their use is no longer required. Clean and repair damage caused by temporary installation.

B. Relocate temporary facilities during construction as required by progress of the Work at no additional cost to the Owner.

END OF SECTION
SECTION 01530

BARRIERS AND ENCLOSURES

PART 1 - GENERAL

1.01 RELATED WORK

A. Furnish, install and maintain suitable barriers as required to maintain security to prevent public entry and to protect the Work and existing facilities from construction operations. Remove the barriers when no longer needed, or at completion of Work.

1.02 REQUIREMENTS OF REGULATORY AGENCIES

A. Comply with federal, state and local codes and regulations.

1.03 BARRICADES AND LIGHTS

A. All streets, roads, driveways and other thoroughfares which are closed to traffic shall be protected by effective barricades on which shall be placed acceptable warning signs. Barricades shall be located at the nearest intersection on each side of the blocked section.

B. All open trenches and other excavations shall have suitable barricades, signs and lights to provide adequate protection to the public. Obstructions such as material piles and equipment shall be provided with similar warning signs and lights.

C. All barricades and obstructions shall be illuminated with warning lights from sunset to sunrise. Material storage and conduct of the Work on or alongside streets and driveways shall cause the minimum obstruction and inconvenience to the traveling public as possible.

D. All barricades, lights and other protective devices shall be installed and maintained in conformity with the "Manual on Uniform Traffic Control Devices", latest edition.

1.04 FENCES

A. All existing fences affected by the Work shall be maintained by Contractor until completion of the Work. Fences which interfere with construction operations shall not be relocated or dismantled until written permission is obtained from the owner of the fence, and the period the fence may be left relocated and dismantled has been agreed upon. Where fences must be maintained across the construction easement, adequate gates shall be installed. Gates shall be kept closed and locked at all times when not in use. Fences or gates which have been disturbed or which have been opened must be closed when directed by the Owner or Engineer within 12 hours of any such direction. If the Contractor fails to comply with any of this type of direction the Owner shall retain the right to remedy any fence removal with other forces and deduct monies spent from monies due the Contractor.
B. Upon completion of the Work, Contractor shall restore all fences to their original or to a better condition and to their original location as needed.

PART 2 - PRODUCTS

2.01 GENERAL

A. Materials may be new or used suitable for the intended purpose, but must not violate requirements of applicable codes and standards.

PART 3 - EXECUTION (Not Used)

END OF SECTION
SECTION 01540
SECURITY

PART 1 - GENERAL

1.01 RELATED WORK

A. None

1.02 PROTECTION OF WORK

A. Contractor shall be responsible for protection of the site, and all work, materials, equipment and existing facilities thereon, against theft, vandals, and other unauthorized persons.

B. No claim shall be made against Owner by reason of any act of an employee or trespasser, and Contractor shall make good all damage to Owner's property resulting from his failure to provide security measures as specified.

C. Security measures shall be at least equal to those usually provided to protect the existing facilities during normal operation, but shall also include such additional security fencing, barricades, lighting, watchman services and other measures as required to protect the site.

D. Maintain security of the limited access areas as required by the Owner.

E. The work shall be under the charge and care of the Contractor until final acceptance. The Contractor shall take precautions against damages to the work by action of the elements or from other cause, and shall satisfactorily repair any damaged work at his expense. In case of suspension of work, the Contractor shall be responsible for all materials and shall properly store them if necessary, and shall erect temporary structures where necessary.

1.03 PROTECTION OF PUBLIC AND PRIVATE PROPERTY

A. Contractor shall protect, shore, brace, support and maintain all above ground and underground pipes, conduits, drains and infrastructure items uncovered or otherwise affected by his construction operations. All pavement,surfacing, driveways, curbs, walks, buildings, utility poles, guy wires, fences and other surface structures affected by construction operations, together with all sod and shrubs in yards and parking areas, shall be restored to their original conditions, whether within or outside the easement.

B. All replacements shall be made with new materials. No trees shall be removed outside of the permanent easement, except where authorized by Engineer. Whenever practicable, Contractor shall tunnel beneath trees in yards and parking areas when on or near the line of trench. Hand excavation shall be employed as necessary to prevent injury to trees. Trees standing shall be adequately protected against damage by construction operations.
C. Contractor shall be responsible for all damage to streets, roads, highways, shoulders, ditches, embankments, culverts, bridges and any other public or private property, regardless of location or character, which may be caused by transporting equipment, materials or men to or from the Work or any part of site thereof, whether by him or his Subcontractors. Contractor shall make satisfactory and acceptable arrangements with the owner of, or the agency or authority having jurisdiction over, the damaged property concerning its repair or replacement or payment of costs incurred in connection with the damage.

D. All fire hydrants, water control valves, and other facilities of public use shall be kept free from obstruction and available for use at all times. Fire hydrants to be removed and relocated shall be done as quickly as possible.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.01 PERFORMANCE OF SECURITY MEASURES

A. If the Contractor fails to comply with the provisions of this section, the Engineer will immediately notify the Contractor, in writing, of such noncompliance. If the Contractor fails to remedy unsatisfactory maintenance within 48 hours after receipt of such notices, the Engineer may immediately proceed to maintain the project, and the cost of this maintenance will be deducted from payments for the work.

B. If the unsatisfactory maintenance results in a condition that is hazardous to life, health or property, the Engineer will immediately affect necessary repairs and deduct the cost of such repairs from payments for the work.

END OF SECTION
SECTION 01560

TEMPORARY CONTROLS

PART 1 - GENERAL

1.01 RELATED WORK

A. None

1.02 DUST CONTROL

A. Contractor shall take reasonable measures to prevent or minimize unnecessary airborne dust. Earth surfaces subject to dusting shall be kept moist with water or by application of a chemical dust suppressant. Dusty materials in piles or in transit shall be covered to prevent blowing.

B. Buildings or operating facilities which may be affected adversely by dust shall be adequately protected from dust.

1.03 EROSION CONTROL

A. Contractor shall prevent erosion of soil on the site and adjacent property resulting from his construction activities. Effective measures shall be initiated prior to the commencement of clearing, grading, excavation or other operations that will disturb the natural protection.

B. Work shall be scheduled to expose areas subject to erosion for the shortest possible time, and natural vegetation preserved to the greatest extent practicable to minimize amount of bare soil exposed at one time. Temporary storage and construction buildings shall be located, and construction traffic routed, to minimize erosion. Temporary fast-growing vegetation or other suitable ground cover shall be provided as necessary to control runoff.

1.04 NOISE CONTROL

A. Contractor shall take reasonable measures to avoid unnecessary noise. Such measures shall be appropriate for the normal ambient sound levels in the area during working hours. All construction machinery and vehicles shall be equipped with practical sound muffling devices, and operated in a manner to cause the least noise consistent with efficient performance of the Work.

B. During construction activities on or adjacent to occupied buildings, and when appropriate, Contractor shall erect screens or barriers effective in reducing noise in the building; and shall conduct his operations to avoid unnecessary noise which might interfere with the activities of building occupants.

1.05 POLLUTION CONTROL
A. Contractor shall prevent the pollution of drains and watercourses by sanitary wastes, sediment, debris and other substances resulting from construction activities. No sanitary wastes will be permitted to enter any drain of watercourse other than sanitary sewers.

B. No sediment, debris or other substance will be permitted to enter sanitary sewers and reasonable measures will be taken to prevent such materials from entering any drain or watercourse.

C. Contractor shall comply with all state and local stormwater pollution prevention requirements.

1.06 SURFACE WATER CONTROL

A. The facilities to be constructed are located in an area that may be subject to heavy rainfall and flooding. During the construction period, Contractor shall provide temporary protection as necessary to prevent flood damage to new and existing facilities and shall be responsible for any damage that may result from flooding. Additionally, the Contractor shall provide adequate flow area to the existing stations as to not impede its pumping capacity.

B. Contractor shall provide for the drainage of storm-water and such water as may be applied or discharged on the site in performance of the Work. Drainage facilities (and pumping operations as necessary) shall be adequate to prevent damage to the Work, the site and adjacent property. Drains shall not be blocked by any of the Contractor's activities as flooding may be caused by any impedance to existing storm water flow.

C. Existing drainage channels and conduits shall be cleaned, enlarged or supplemented as necessary to carry all increased runoff attributable to Contractor's operations. Dikes shall be constructed as necessary to divert increased runoff from entering adjacent property (except in natural channels), to protect Owner's facilities and the Work, and to direct water to drainage channels or conduits. Ponding shall be provided as necessary to prevent downstream flooding. The Contractor must obtain permission from the Owner before beginning any of the above-mentioned work.

1.07 DEBRIS CONTROL

A. Remove debris, empty crates, waste, etc. from building and site at the end of each day's work and leave grounds clean and orderly. Keep driveways, entrances and walks clean and clear at all times.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION
SECTION 01600

MATERIAL AND EQUIPMENT

PART 1 - GENERAL

1.01 RELATED REQUIREMENTS

A. Section 01620 - Storage and Protection

1.02 DESCRIPTION

A. Material and equipment incorporated into the Work:

1. Conform to applicable specifications and standards.
2. Comply with size, make, type and quality specified or as specifically approved in writing by the Engineer.
3. Do not use material or equipment for any purpose other than that for which it is designed or is specified.
4. Whenever an article, device or piece of equipment specified herein (or as indicated on the Drawings) is referred to in the singular number, such reference shall apply to as many such articles as are indicated on the Drawings or required to complete the installation within the general intent of the Contract Documents.

B. Contractor shall be fully responsible for all materials and equipment which he has furnished, and shall furnish necessary replacements at any time prior to expiration of the Correction Period.

C. Off-site storage arrangements shall be acceptable to Owner for all materials and equipment not incorporated into the work but included in Applications for Payment. Such off-site storage arrangements shall be presented in writing, and shall afford adequate and satisfactory security and protection. Off-site storage facilities shall be accessible to Engineer.

D. Existing materials and equipment removed, and not reused or suitable for salvage, shall become Contractor's property.

E. Any items damaged in removal, storage or handling through carelessness or improper procedures shall be replaced by Contractor in kind or with new items.

F. Existing materials and equipment removed by Contractor shall not be reused in the Work except where so specified or indicated.

G. All items mentioned in these Contract Documents shall be handled in conformance with this Section, Section 01620, instructions in the related Sections, and manufacturer's literature.
H. The security of Owner furnished equipment shall become the responsibility of the Contractor upon taking delivery of the items at the office of the Owner.

1.03 MANUFACTURER'S INSTRUCTIONS

A. When Contract Documents require that installation of Work shall comply with manufacturer's printed instructions, obtain and distribute copies of such instructions to parties involved in the installation, including two copies to Engineer.

1. Maintain one set of complete instructions at the job site during installation and until Project completion.

B. Handle, install, connect, clean, condition and adjust products in strict accordance with such instructions and in conformity with specified requirements.

1. Should job conditions or specified requirements conflict with manufacturer's instructions, consult with Engineer for further instructions.

2. Do not proceed with such Work without clear instructions.

C. Perform Work in accordance with manufacturer's instructions. Do not omit any preparatory step or installation procedure unless specifically modified or exempted by Contract Documents.

1.04 TRANSPORTATION AND HANDLING

A. Arrange deliveries of products in accordance with construction schedules, coordinate to avoid conflicts and delays with Work and conditions at the site.

B. Deliver products in undamaged condition, in manufacturer's original containers or packaging with identifying labels intact and legible. Labels shall indicate manufacturer and product name, description, mixing and application instructions, limitations, cautions and warnings.

C. Immediately upon delivery, inspect shipments to ensure proper material, color, type, quantities, and to assure compliance with the Contract Documents and approved submittals and that the products are undamaged.

D. Provide equipment and personnel to handle products by methods to prevent soiling or damage to the product or packaging.

1.05 PROTECTION AFTER INSTALLATION

A. Provide substantial coverings as necessary to protect installed products from damage from traffic and subsequent construction operations. Remove coverings when no longer needed.

PART 2 - PRODUCTS
2.01 EVIDENCE OF COMPLIANCE

A. All material and equipment used in the completion of this work shall be accompanied by certificates of compliance with the applicable requirements of the specifications. These certificates shall state date of manufacture, manufacturer, local representative, component sources and other pertinent specified facts of manufacture.

PART 3 - EXECUTION (Not Used)

END OF SECTION
SECTION 01620

STORAGE AND PROTECTION

PART 1 - GENERAL

1.01 RELATED REQUIREMENTS
   A. None

1.02 DESCRIPTION
   A. All materials shall be suitably packaged (in manufacturer's original packaging with labels and seals intact) to facilitate handling and protect against damage during storage. Painted surfaces shall be protected against impact, abrasion, discoloration, and other damage. All painted surfaces which are damaged prior to acceptance of equipment shall be repainted to the satisfaction of the Engineer.

   B. Each item, package, or bundle of material shall be tagged or marked as identified in the delivery schedule or on the Shop Drawings. Complete packing lists and bills of material shall accompany each shipment.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.01 STORAGE, GENERAL
   A. Store products, immediately on delivery, in accordance with manufacturer's instructions. Protect until installed.

   B. Arrange storage in a manner to provide access for maintenance of stored items and for inspection.

   C. Store and handle paints and products subject to spillage in areas where spills will not deface surfaces.

   D. Flammable or hazardous materials:
      1. Store minimum quantities in protected areas.
      2. Provide appropriate type fire extinguishers near storage areas.
      3. Observe manufacturer's precautions and applicable ordinances and regulations.

3.02 EXTERIOR STORAGE
   A. Provide substantial platforms, blocking, or skids, to support fabricated products above ground; slope to provide drainage. Protect products from soiling and staining.
STORAGE AND PROTECTION

B. For products subject to discoloration or deterioration from exposure to the elements, cover with impervious sheet material. Provide ventilation to avoid condensation.

C. Store loose granular materials on clean, solid surfaces such as pavement, or on rigid sheet materials, to prevent mixing with foreign matter.

D. Provide surface drainage to prevent erosion, pollution by mixing and ponding of water.

E. Prevent mixing of refuse or chemically injurious materials or liquids.

3.03 MAINTENANCE OF STORAGE

A. Periodically inspect stored products on a scheduled basis.

B. Verify that storage facilities comply with manufacturer's product storage requirements.

C. Verify that manufacturer's required environmental conditions are maintained continually.

D. Verify that surfaces of products exposed to the elements are not adversely affected; that any weathering of finishes is acceptable under requirements of Contract Documents.

END OF SECTION
SECTION 01630

PRODUCT OPTIONS AND SUBSTITUTIONS

PART 1 - GENERAL

1.01 GENERAL

A. These Contract Documents include provisions for use of equivalent materials and equipment. Requests for review of equivalency shall be submitted in accordance with the Contract Documents and as herein specified.

1.02 SUBSTITUTIONS OF MATERIALS OR EQUIPMENT

A. Whenever, in the plans or project specifications, any materials, process or equipment is specified by patent, proprietary or brand name, or name of manufacturer, such wording is intended to establish the quality and type of materials, processes and equipment, and shall be deemed to be followed by the words "or approved equal". Lists of acceptable materials in the plans or specifications are not intended to be comprehensive lists, or in order of preference.

B. The Contractor shall be responsible for all costs associated with substitution all equipment including all engineering and construction costs resulting therefrom if approved by the Engineer.

C. Requests for substitution of equal products for those specified shall be submitted for approval to the Engineer as defined in Sections 7.04 & 7.05 of the General Conditions.

D. In the event the Contractor obtains engineer’s approval for equipment substitution, the Contractor shall, at his own expense, make all resulting changes to the structures, enclosures, buildings, piping or electrical systems as required to accommodate the proposed equipment. Revised detail drawings illustrating the substituted equipment and all other associated parts of the Work shall be prepared by the Contractor and submitted to the Engineer prior to acceptance.

E. Manufactured products shall be installed in accordance with the manufacturer's recommendations. Products, when delivered to the site, shall be labeled as to the manufacturer's name and catalog number; also, products shall have manufacturer's certification that the product conforms to specifications.

F. If required by the Engineer, the Contractor, at his expense, shall have the proposed material tested as to its physical and chemical characteristics, durability, finish efficiency, dimensions, and suitability for its intended use. The method of test shall be subject to approval, and test results shall be reported promptly to the Engineer. Material shall not be installed until approved.

G. No additional payment will be made for revisions in the project made necessary by the substituted equipment, materials or product, and no extension of contract time will be granted because of the use of substituted materials, processes or equipment.
1.03 SAMPLES

A. Samples shall be of sufficient size and quantity to clearly illustrate:

1. Functional characteristics of the product with integrally related parts and attachment devices.
2. Full range of color texture, and pattern.

B. Label each sample with identification required for transmittal letter.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.01 PROCEDURE

A. Submit a separate request for each product, supported with complete data, drawings and samples as appropriate including changes required in other elements of the Work because of the substitution, effect on construction schedule, cost data comparing the proposed substitution with the specified products, comparison if availability of maintenance, service and replacement cost.

1. Any supporting test data or results shall use the same test procedures for the proposed substitution and the specified products to facilitate comparison.

B. Request for substitution constitutes a representation that the Contractor:

1. Has investigated the proposed product and determined that it is equal to or superior in all respects to that specified.
2. Will provide the same or better warranties, bonds and guarantees for the substitution as for the specified product.
3. Will coordinate the installation of an accepted substitution into the Work and make the Work complete in all respects.
4. Waives all claims for additional costs, related to the substitution that may subsequently become apparent.

END OF SECTION
SECTION 01700

CONTRACT CLOSEOUT

PART 1 - GENERAL

1.01 REQUIREMENTS INCLUDED

A. Comply with requirements stated in the General and Supplementary Conditions of the Contract and in the Specifications for administrative procedures in closing out the Work.

1.02 RELATED WORK

A. General and Supplementary Conditions of the Contract. Fiscal provisions, legal submittals and additional administrative requirements.

1.03 CLEANING

A. Before final acceptance, the Contractor shall remove from the site and adjacent property all surplus materials, weeds, bushes, rubbish and temporary structures; shall satisfactorily restore all property which has been worn, rutted or damaged during the work; and shall leave the site in a presentable condition. Upon completion of work in connection with drainage structures, the Contractor shall remove all obstructions to the flow of water from inside all structures, channels, and culverts whether new or old. No direct payment will be made for this work.

B. Remove all temporary labels.

C. Clean site. Sweep paved areas.

D. Remove all waste and surplus material from site.

1.04 SUBSTANTIAL COMPLETION

A. When Contractor considers the Work is substantially complete, he shall submit to the Engineer (3 copies each):

1. A written notice that the Work, or designated portion thereof, is substantially complete.

2. A list of items to be completed or corrected.

B. Within a reasonable time after receipt of such notice, the Engineer will make an inspection to determine the status of completion.

C. Should the Engineer determine that the Work is not substantially complete:

1. Engineer will promptly notify the Contractor in writing, giving the reasons therefor.
2. Contractor shall remedy the deficiencies in the Work, and send a second written notice of substantial completion to the Engineer.

3. Engineer will re-inspect the Work.

D. When the Engineer finds that the Work is substantially complete, he may:

1. Prepare and deliver to the Owner a notification of Substantial Completion on an appropriate form with the Contractor's list of items to be completed or corrected as verified and amended by the Engineer before final payment.

2. After consideration of any objections made by the Owner as provided in Conditions of the Contract, and when Engineer considers that the Work is substantially complete, he will countersign and deliver to the Owner and the contractor a definite notification of Substantial Completion with a revised list of items to be completed or corrected.

1.05 FINAL INSPECTION

A. When Contractor considers the Work is complete, he shall submit written notification that (3 copies):

1. Contract Documents have been reviewed.

2. Work has been inspected for compliance with Contract Documents.

3. Work has been completed in accordance with Contract Documents.

4. Work is completed and ready for final inspection.

5. All items noted from the Substantial Completion inspection have been completed or corrected.

B. Engineer will make an inspection to verify the status of completion with reasonable promptness after receipt of such notification.

C. Should Engineer consider that the Work is incomplete or defective:

1. Engineer will promptly notify the Contractor in writing, listing the incomplete or defective work.

2. Contractor shall take immediate steps to remedy the stated deficiencies and send a second written notification to Engineer stating that the Work is complete.

3. Engineer will reinspect the Work.

D. When the Engineer finds that the Work is acceptable under the Contract Documents, he shall request the Contractor to make closeout submittals, including Application for Final Payment.
1.06 **REINSPECTION FEES**

A. Should Engineer perform reinspection due to failure of the Work to comply with the claims of status of completion made by the Contractor:

1. Owner will compensate Engineer for such additional services.

2. Owner will deduct the amount of such compensation from the final payment to the Contractor.

1.07 **CONTRACTOR’S CLOSEOUT SUBMITTALS TO ENGINEER**

A. Project Record Documents.

B. Warranties, Guarantees and Bonds. All warranty periods shall begin on the date of Final Acceptance.

C. Spare parts and Maintenance Materials.

D. Reports of all required tests and demonstrations.

E. Evidence of Payment and Release of Liens: In accordance with requirements of General and Supplementary Conditions.

1.08 **FINAL ADJUSTMENT OF ACCOUNTS**

A. Submit a final statement of accounting to the Engineer.

B. Statement shall reflect all adjustments to the Contract Sum:

1. The original Contract Sum.

2. Additions and deductions resulting from:

   a. Previous Change Orders.

   b. Quantity reconciliations.

   c. Deductions for liquidated damages.

   d. Deductions for re-inspection payments.

   e. Deductions for overtime inspection payments.

   f. Other adjustments.

3. Total Contract Sum, as adjusted.

4. Previous payments.
5. Sum remaining due.

C. Engineer will prepare a final Change Order, reflecting approved adjustments to the Contract Sum which were not previously made by Change Orders.

1.09 FINAL APPLICATION FOR PAYMENT

A. Contractor shall submit the final Application for Payment in accordance with procedures and requirements stated in the General and Supplementary Conditions of the Contract.

1.10 SUPPLEMENTAL LIQUIDATED DAMAGES

A. After the establishment of a date of Substantial Completion, the Contractor shall have 30 days to complete any outstanding items of Work remaining to be completed or corrected as listed on a final punch list made a part of the Substantial Completion Package. If upon expiration of said 30 days the outstanding items of Work have not been completed, liquidated damages in the amount agreed to in this contract will be reinstated for every day in which the outstanding items of Work have not been completed. Furthermore, the Owner shall not release monies withheld until all outstanding items of Work have been completed.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION
SECTION 01732

SELECTIVE DEMOLITION

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. Section Includes:

1. Demolition and removal of selected portions of building wall and timber frame.
2. Demolition and removal of selected site elements.
3. Demolition of existing elevator support posts and appurtenances.
4. Removal of existing double doors, man door and frames.
5. Removal of existing timber ramp.

B. Related Requirements:

1. Division 1 Section "Summary" for restrictions on the use of the premises, Owner-occupancy requirements, and phasing requirements.

1.03 MATERIALS OWNERSHIP

A. Unless otherwise indicated, demolition waste becomes property of Contractor.

B. Historic items, relics, antiques, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, and other items of interest or value to Owner that may be uncovered during demolition remain the property of Owner.

1. Carefully salvage in a manner to prevent damage and promptly return to Owner.

1.04 PREINSTALLATION MEETINGS

A. Pre-demolition Conference: Conduct conference at Project site.

1. Inspect and discuss condition of construction to be selectively demolished.
2. Review and finalize selective demolition schedule and verify availability of materials, demolition personnel, equipment, and facilities needed to make progress and avoid delays.

3. Review areas where existing construction is to remain and requires protection.

1.05 INFORMATIONAL SUBMITTALS

A. Proposed Protection Measures: Submit report, including drawings, that indicates the measures proposed for protecting individuals and property, for dust control. Indicate proposed locations and construction of barriers.

1.06 FIELD CONDITIONS

A. Owner will occupy portions of building immediately adjacent to selective demolition area. Conduct selective demolition so Owner's operations will not be disrupted.

B. Hazardous Materials: It is not expected that hazardous materials will be encountered in the Work.

1. If suspected hazardous materials are encountered, do not disturb; immediately notify Engineer and Owner. Hazardous materials will be removed by Owner under a separate contract.

C. Storage or sale of removed items or materials on-site is not permitted.

D. Utility Service: Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.

1. Maintain fire-protection facilities in service during selective demolition operations.

PART 2 - PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

A. Regulatory Requirements: Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.

B. Standards: Comply with ANSI/ASSE A10.6 and NFPA 241.

PART 3 - EXECUTION

3.01 EXAMINATION
A. Verify that utilities have been disconnected and capped before starting selective demolition operations.

B. Review record documents of existing construction provided by Owner. Owner does not guarantee that existing conditions are same as those indicated in record documents.

C. Survey existing conditions and correlate with requirements indicated to determine extent of selective demolition required.

D. When unanticipated mechanical, electrical, or structural elements that conflict with intended function or design are encountered, investigate and measure the nature and extent of conflict. Promptly submit a written report to Architect.

3.02 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

A. Existing Services/Systems to Remain: Maintain services/systems indicated to remain and protect them against damage.

1. Comply with requirements for existing services/systems interruptions specified in Division 1 Section "Summary."

B. Existing Services/Systems to Be Removed, Relocated, or Abandoned: Locate, identify, disconnect, and seal or cap off indicated utility services and mechanical/electrical systems serving areas to be selectively demolished.

1. Owner will arrange to shut off indicated services/systems when requested by Contractor.

2. Arrange to shut off indicated utilities with utility companies.

3. If services/systems are required to be removed, relocated, or abandoned, provide temporary services/systems that bypass area of selective demolition and that maintain continuity of services/systems to other parts of building.

4. Disconnect, demolish, and remove fire-suppression systems, plumbing, and HVAC systems, equipment, and components indicated to be removed.

   a. Piping to Be Removed: Remove portion of piping indicated to be removed and cap or plug remaining piping with same or compatible piping material.

   b. Piping to Be Abandoned in Place: Drain piping and cap or plug piping with same or compatible piping material.

   c. Equipment to Be Removed: Disconnect and cap services and remove equipment.
B Street Water Treatment Plant & 
North Water Treatment Plant Improvements 
City of Meridian

d. Equipment to Be Removed and Reinstalled: Disconnect and cap services and remove, clean, and store equipment; when appropriate, reinstall, reconnect, and make equipment operational.
e. Equipment to Be Removed and Salvaged: Disconnect and cap services and remove equipment and deliver to Owner.
f. Ducts to Be Removed: Remove portion of ducts indicated to be removed and plug remaining ducts with same or compatible ductwork material.
g. Ducts to Be Abandoned in Place: Cap or plug ducts with same or compatible ductwork material.

3.03 PREPARATION

A. Site Access and Temporary Controls: Conduct selective demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.

1. Comply with requirements for access and protection specified in Division 1 Section "Temporary Facilities and Controls."

B. Temporary Facilities: Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.

3.04 SELECTIVE DEMOLITION, GENERAL

A. General: Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:

1. Proceed with selective demolition systematically, from higher to lower level. Complete selective demolition operations above each floor or tier before disturbing supporting members on the next lower level.

2. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping, to minimize disturbance of adjacent surfaces. Temporarily cover openings to remain.

3. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame-cutting operations. Maintain portable fire-suppression devices during flame-cutting operations.

4. Maintain adequate ventilation when using cutting torches.
5. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.

6. Remove structural framing members and lower to ground by method suitable to avoid free fall and to prevent ground impact or dust generation.

7. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.

B. Removed and Salvaged Items:

1. Clean salvaged items.

2. Pack or crate items after cleaning. Identify contents of containers.

3. Store items in a secure area until delivery to Owner.

4. Transport items to Owner's storage area indicated on drawings.

5. Protect items from damage during transport and storage.

C. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition.

3.05 SELECTIVE DEMOLITION PROCEDURES FOR SPECIFIC MATERIALS

A. Concrete: Demolish in small sections. Using power-driven saw, cut concrete to a depth of at least 3/4 inch (19 mm) at junctures with construction to remain. Dislodge concrete from reinforcement at perimeter of areas being demolished, cut reinforcement, and then remove remainder of concrete. Neatly trim openings to dimensions indicated.

B. Concrete: Demolish in sections. Cut concrete full depth at junctures with construction to remain and at regular intervals using power-driven saw, then remove concrete between saw cuts.

C. Masonry: Demolish in small sections. Cut masonry at junctures with construction to remain, using power-driven saw, then remove masonry between saw cuts.

D. Concrete Slabs-on-Grade: Saw-cut perimeter of area to be demolished, then break up and remove.

3.06 DISPOSAL OF DEMOLISHED MATERIALS
A. General: Except for items or materials indicated to be reused, salvaged, reinstalled, or otherwise indicated to remain Owner's property, remove demolished materials from Project site and legally dispose of them in an EPA-approved landfill.

1. Do not allow demolished materials to accumulate on-site.
2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
3. Remove debris from elevated portions of building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.
4. Comply with requirements specified in Division 1 Section "Construction Waste Management."

B. Burning: Do not burn demolished materials.

3.07 CLEANING

A. Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before selective demolition operations began.

END OF SECTION
SECTION 02200

EARTHWORK

PART 1 - GENERAL

1.01 SCOPE

A. The CONTRACTOR shall perform earthwork indicated and required for construction of the WORK, complete and in place, in accordance with the Contract Documents.

1.02 CONTRACTOR SUBMITTALS

A. The CONTRACTOR shall submit samples of materials proposed for the WORK in accordance with the requirements in Section 01300 - Contractor Submittals. Sample sizes shall be as determined by the testing laboratory.

PART 2 - PRODUCTS

2.01 SELECT BACKFILL MATERIAL

A. Sand/Clay/Gravel:

1. The Sand/Clay/Gravel shall be a well blended soil and gravel mixture that is free of deleterious matter of every description and shall contain no clay lumps.

2. Sand/Clay/Gravel shall meet the following gradation classification requirements with a plasticity index (PI) between eight (8) and eighteen (18):

<table>
<thead>
<tr>
<th>Sieve Size</th>
<th>% Passing</th>
</tr>
</thead>
<tbody>
<tr>
<td>2”</td>
<td>100</td>
</tr>
<tr>
<td>#8</td>
<td>50-80</td>
</tr>
<tr>
<td>#40</td>
<td>50-100</td>
</tr>
<tr>
<td>#200</td>
<td>20-45</td>
</tr>
</tbody>
</table>

Material Passing #8 (Binder)

3. Sand/Clay/Gravel backfill material shall be compacted to 95% maximum density, unless specified otherwise, in accordance with ASTM D698 specifications at the optimum moisture content with a tolerance of -1% to +3%.

B. Riversand:

1. The riversand shall be a well blended soil mixture that is free of deleterious matter of every description and shall contain no clay lumps.

2. Riversand shall meet the following gradation classification requirements with a plasticity index (PI) between eight (8) and eighteen (18):
### Material Passing #8 (Binder)

<table>
<thead>
<tr>
<th>Sieve Size</th>
<th>% Passing</th>
</tr>
</thead>
<tbody>
<tr>
<td>2&quot;</td>
<td>100</td>
</tr>
<tr>
<td>#8</td>
<td>50-80</td>
</tr>
<tr>
<td>#40</td>
<td>50-100</td>
</tr>
<tr>
<td>#200</td>
<td>20-45</td>
</tr>
</tbody>
</table>

3. Riversand backfill material shall be compacted to 95% maximum density, unless specified otherwise, in accordance with ASTM D698 specifications at the optimum moisture content with a tolerance of -1% to +3%.

### Course Aggregate:

1. Course Aggregate shall be crushed limestone that is free of deleterious matter of every description.

2. Course Aggregate shall meet the following gradation classification requirements:

<table>
<thead>
<tr>
<th>Sieve Size</th>
<th>Percent Passing</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-1/2&quot;</td>
<td>100</td>
</tr>
<tr>
<td>1&quot;</td>
<td>90-100</td>
</tr>
<tr>
<td>3/4&quot;</td>
<td>70-100</td>
</tr>
<tr>
<td>#4</td>
<td>35-65</td>
</tr>
<tr>
<td>#40</td>
<td>12-32</td>
</tr>
<tr>
<td>#200</td>
<td>5-12</td>
</tr>
</tbody>
</table>

The fraction of stone passing the #4 sieve shall be non-plastic.

3. Course Aggregate backfill material shall be compacted to 95% maximum density, unless specified otherwise, in accordance with ASTM D698 specifications at the optimum moisture content with a tolerance of -1% to +3%.

### SOIL MATERIALS

2.02

A. Satisfactory soil materials are defined as those complying with American Association of State Highway and Transportation Officials (AASHTO) M145, soil classification Groups A-1, A-2, A-3, A-4, A-5, A-6 and A-7 inclusive with a liquid limit (LL) less than or equal to 50 and/or a plastic index (PI) less than or equal to 25.

B. Unsatisfactory soil materials are those defined in AASHTO M145 soil classification groups A-2-5, A-2-6, A-2-7, A-5, A-6 and A-7 inclusive with a liquid limit (LL) greater than or equal to 50 and/or a plastic index (PI) greater than 25 and A-8, such as peat and other highly organic soils.

C. Backfill and Fill Materials: Satisfactory soil materials free of clay, rock, or gravel larger than 2" in any dimension, free of debris, waste, frozen materials, vegetable and other deleterious matter.
2.03   **GEOTEXTILE FABRIC**

A. Geotextile fabric shall consist of a non-woven fabric composed of at least 85% by weight of polyolefins, polyesters, or polyamides. The geotextile fabric shall be resistant to chemical attack, rot, and mildew and shall have no tears or defects, which adversely alter its physical properties. Edges of geotextile fabric shall be finished to prevent the outer yarn from pulling away from the fabric. The geotextile shall be resistant to abrasion from the movement of adjacent roadbed material and aggregate.

B. The geotextile shall be provided in rolls wrapped with an opaque protective covering. Each roll of fabric shall be wrapped individually and the protective covering shall be adequate for long or short-term storage. A tag or other method of identification shall be attached to each wrapped roll of fabric indicating the following:

1. Manufacturer’s name and address.
2. Date of manufacture of fabric.
3. Manufacturer’s order number.
4. Number or symbol of manufacturer’s production run.
5. Customer order number.
6. Weight per sq. yd. of fabric.
7. Width of roll.
8. Length of roll.

C. Compliance, Inspection, and Sampling Requirements

1. A competent laboratory must be maintained by the producer of the geotextile at the point of manufacture to insure quality control in accordance with ASTM testing procedures. That laboratory shall maintain records of its quality control results and provide said results to the Engineer upon request.

2. The certification shall be based on average roll minimum values and shall include the following:

   a. Name of manufacturer.
   b. Chemical composition.
   c. Product description.
   d. Statement of compliance to specification requirements.
   e. Signature of legally authorized official attesting to the information required.
   f. Purchaser.

D. Geotextile fabric shall meet the following minimum requirements:

<table>
<thead>
<tr>
<th>Test Description</th>
<th>Minimum Value</th>
<th>Standard Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>AOS, US Sieve, Min.</td>
<td>70</td>
<td>ASTM-D-4751</td>
</tr>
<tr>
<td>Grab Tensile, Pound, Min.</td>
<td>180</td>
<td>ASTM-D-4632</td>
</tr>
<tr>
<td>Percent Elongation @ Failure, Min.</td>
<td>50</td>
<td>ASTM-D-4632</td>
</tr>
<tr>
<td>Burst Strength, PSI, Min.</td>
<td>290</td>
<td>ASTM-D-3787</td>
</tr>
<tr>
<td>Puncture, Pound, Min.</td>
<td>75</td>
<td>ASTM-D-4833</td>
</tr>
<tr>
<td>Trapezoidal Tear Strength, Pound, Min.</td>
<td>50</td>
<td>ASTM-D-4533</td>
</tr>
<tr>
<td>Permeability (Gal/Min/Ft2)</td>
<td>115</td>
<td>ASTM-D-4491</td>
</tr>
</tbody>
</table>
E. The average roll minimum value (weakest principle direction) for strength properties of any roll tested from the manufacturing lot or lots or particular shipment shall be in excess of the average roll minimum value (weakest principle direction) stipulated.

F. The geotextile shall be tinted or otherwise treated to prevent the occurrence of snowblindness of handling personnel.

2.04 MATERIALS TESTING

A. Soils testing of samples submitted by the CONTRACTOR will be done by a testing laboratory of the OWNER's choice and at the OWNER's expense. At its discretion, the ENGINEER may request that the CONTRACTOR supply samples for testing of any material used in the WORK.

B. Particle size analysis of soils and aggregates will be performed using ASTM D 422 - Standard Test Method for Particle-Size Analysis of Soils.

2.05 IDENTIFICATION TAPE

A. Direct Bury Piping: CONTRACTOR shall provide and install conductive tracers not more than 18" below the ground service above all buried pipelines. Tape shall be 3" wide, with aluminum foil core, 0.5 mil thick, encased in a protective inert plastic jacket, 5,000 PSI minimum tensile strength, 2.5 lbs per inch per 1,000 feet minimum mass, color coded in accordance with APWA Uniform Color Code for the pipeline service to be identified, Lineguard “Type III” or Reef Industries “Terra Tape D” or Equal.

PART 3 - EXECUTION

3.01 EXCAVATION AND BACKFILLING - GENERAL

A. Except when specifically provided to the contrary, excavation shall include the removal of materials, including obstructions that would interfere with the proper execution and completion of the WORK. The removal of such materials shall conform to the lines and grades indicated or ordered. Unless otherwise indicated, the entire Site shall be stripped of vegetation and debris and shall be grubbed, and such material shall be removed from the Site prior to performing any excavation or placing any fill. The CONTRACTOR shall furnish, place, and maintain supports and shoring that may be required for the sides of excavations. Excavations shall be sloped or otherwise supported in a safe manner in accordance with applicable State safety requirements and the requirements of OSHA Safety and Health Standards for Construction (29CFR1926). The CONTRACTOR shall provide quantity surveys where so required to verify quantities for unit price contracts. Surveys shall be performed prior to beginning WORK and upon completion by a surveyor licensed in the state where the Site is located.
B. The CONTRACTOR shall remove and exclude water, including stormwater, groundwater, irrigation water, and wastewater, from excavations. Dewatering wells, wellpoints, sump pumps, or other means shall be used to remove water and continuously maintain groundwater at a level at least 2 feet below the bottom of excavations before the excavation WORK begins at each location. Water shall be removed and excluded until backfilling is complete and field soils testing has been completed.

3.02 OVER-EXCAVATION

A. Indicated: Where areas are indicated to be over-excavated, excavation shall be to the depth indicated, and backfill shall be installed to the grade indicated.

B. Not Indicated: When ordered to over-excavate areas deeper and/or wider than required by the Contract Documents, the CONTRACTOR shall over-excavate to the dimensions ordered and backfill to the indicated grade.

C. Neither Indicated Nor Ordered: Any over-excavation carried below the grade ordered or indicated shall be backfilled and compacted to the required grade with the indicated material as part of the WORK

3.03 DISPOSAL OF EXCESS EXCAVATED MATERIAL

A. Unless otherwise indicated, excess excavated material shall be the property of the CONTRACTOR. The CONTRACTOR shall be responsible for the removal and disposal of excess excavated material.

B. Any excess material, not required for this project and not stockpile, shall be hauled from the site and delivered by the Contractor to a legal storage area offsite. Excess material shall become the property of the Contractor and shall be disposed of properly.

C. All unsuitable material shall be hauled from the site and disposed of legally and properly as directed by the Engineer.

D. The Contractor shall provide at his expense disposal areas and submit written permission from the property owner of the disposal site.

E. The Contractor shall be responsible for providing adequate topsoil material suitable for seeding to establish the finish grade on site.

3.04 GRADING

A. Uniformly grade areas within limits of grading indicated on the drawings, including adjacent transition areas to produce a smooth, uniform, finished surface.
   1. Construction shall conform to the section, slope and dimensions shown on the plans.
2. The subgrade finish tolerance shall be within 0.1 foot of the elevation shown on the plans.

3. Where settling occurs before Project correction period elapses, remove finished surfacing, backfill with additional soil material, compact, and reconstruct surfacing.

B. Grade areas adjacent to structure to drain away and to prevent ponding. All surfaces shall be shaped to prevent ponding of water. Finished surfaces shall be free from irregular surface changes.

3.05 INSTALLATION OF GEOTEXTILES

A. Rolls shall be kept dry and wrapped such that they are protected from the elements during shipping and storage. At no time shall the geotextile fabric be exposed to ultraviolet light for a period exceeding fourteen (14) days. Rolls shall be stored in a manner that protects them from the elements. If stored outdoors, they shall be elevated and protected with a waterproof cover.

B. In foundation applications, the installation area shall be prepared by clearing all debris or obstructions that may damage the geotextile. All native vegetation, roots, and topsoil shall be removed from the roadway subgrade prior to geotextile placement. Clearing and grubbing operation shall conform to Section 02100 – Site Preparation of these specifications.

C. The subgrade shall be prepared as described herein prior to geotextile placement.

D. The geotextile shall be unrolled as smoothly as possible on the prepared subgrade in the direction of construction traffic. Geotextile rolls shall be overlapped in the directions of the subbase placement. The geotextile shall be overlapped a minimum of one foot for separation applications.

E. Damaged geotextiles as defined by the Engineer, shall be repaired or replaced immediately. The damaged area plus an additional three feet around the damaged area shall be cleared of all fill material. A geotextile patch extending three feet beyond the perimeter of the damage shall be constructed as directed by the Engineer. Sewing of the geotextile patch may be required over soft subgrades as directed by the Engineer. Damaged geotextile shall be repaired at no additional cost to the Owner. Repair of geotextiles shall be in accordance with the manufacturer’s recommendations. The Engineer shall have the right to reject the geotextile material, if in the opinion of the Engineer, damage, or deterioration of the material is excessive. Such rejected materials shall be replaced with acceptable material at no additional cost to the Owner.

F. Traffic will not be permitted directly on the geotextile. Sudden stops or turns by equipment operating on aggregate placed over geotextile shall be avoided. The Contractor shall replace at no additional cost to the Owner any damage to the geotextile after installation.

3.06 BACKFILL
A. Backfill shall not be dropped directly upon any structure or pipe. Backfill shall not be placed around or upon any structure until the concrete has attained sufficient strength to withstand the loads imposed. Backfill around water-retaining structures shall not be placed until the structures have been tested, and the structures shall be full of water while backfill is being placed.

B. Except for drainrock materials being placed in over-excavated areas or trenches, backfill shall be placed after water is removed from the excavation and the trench sidewalls and bottom have been dried to a moisture content suitable for compaction.

C. Immediately prior to placement of backfill materials, the bottoms and sidewalls of trenches and structure excavations shall have loose, sloughing, or caving soil and rock materials removed. Trench sidewalls shall consist of excavated surfaces that are in a relatively undisturbed condition before placement of backfill materials.

D. Backfill materials shall be placed and spread evenly in layers. When compaction is achieved using mechanical equipment, the layers shall be evenly spread so that when compacted each layer shall not exceed 6-inches in thickness.

E. When compaction is achieved using flooding and jetting methods, each layer shall not exceed 3-feet in thickness after compaction.

F. During spreading, each layer shall be thoroughly mixed as necessary to promote uniformity of material in each layer.

G. Where the backfill material moisture content is below the optimum moisture content, water shall be added before or during spreading until the proper moisture content is achieved. Where the backfill material moisture content is too high to permit the indicated degree of compaction, the material shall be dried until the moisture content is satisfactory.

3.07 STRUCTURE EXCAVATION AND BACKFILL

A. Compaction of Fill, Backfill, and Embankment Materials

1. Each layer backfill materials as defined herein, where the material is graded such that 10 percent or more passes a No. 4 sieve, shall be mechanically compacted to the indicated percentage of density. Equipment that is consistently capable of achieving the required degree of compaction shall be used, and each layer shall be compacted over its entire area while the material is at the required moisture content.

2. Each layer of coarse granular backfill materials with less than 10 percent passing the No. 4 sieve shall be compacted by means of at least 2 passes from a vibratory compactor that is capable of obtaining the required density in 2 passes and that is acceptable to the ENGINEER.
B. Flooding, ponding, and jetting shall not be used for backfill around structures, final backfill materials, or aggregate base materials.

C. Equipment weighing more than 10,000 pounds shall not be used closer to walls than a horizontal distance equal to the vertical depth of the fill above undisturbed soil at that time. Hand operated power compaction equipment shall be used where use of heavier equipment is impractical or restricted due to weight limitations.

D. Bedding and backfill material shall be placed and spread evenly in approximately horizontal layers. Each layer shall be moistened or aerated as necessary.

1. Bedding material for structures shall be placed in lifts and compacted. The initial lift may be twenty-four (24") inches thick followed by lifts of twelve (12") inches thereafter.

2. Structural backfill shall be placed in lifts not exceeding twelve (12") inches and compacted.

E. Compaction Requirements

1. The following compaction requirements shall be in relation to the material’s maximum dry density as determined by ASTM D698 – Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort.

2. Schedule

<table>
<thead>
<tr>
<th>Location or Use of Fill or Backfill</th>
<th>Percentage of Maximum Dry Density</th>
</tr>
</thead>
<tbody>
<tr>
<td>Structural Backfill</td>
<td>95</td>
</tr>
<tr>
<td>Topsoil</td>
<td>80</td>
</tr>
<tr>
<td>Aggregate bedding</td>
<td>95</td>
</tr>
</tbody>
</table>

3.08 PIPELINE TRENCH EXCAVATION AND BACKFILL

A. Unless otherwise indicated or ordered, excavation for pipelines and utilities shall be open-cut trenches with minimum widths as indicated.

B. The bottom of the trench shall be excavated uniformly to the grade of the bottom of the pipe bedding.

C. The maximum amount of open trench permitted in any one location shall be the length necessary to accommodate the amount of pipe installed in a single day. Trenches shall be fully backfilled at the end of each day or, in lieu thereof, shall be covered by heavy steel plates adequately braced and capable of supporting vehicular traffic in those locations where it is impractical to backfill at the end of each day. These requirements for backfilling or use of steel plate will be waived in cases where the trench is located further than 100-feet from any traveled roadway or occupied structure.
In such cases, however, barricades and warning lights meeting appropriate safety requirements shall be provided and maintained.

D. Where pipelines are to be installed in embankments, fills, or structure backfills, the fill shall be constructed to a level at least one-foot above the top of the pipe before the trench is excavated. Upon completion of the embankment or structural backfill, a trench conforming to the appropriate detail may be excavated and the pipe may be installed.

E. If a moveable trench shield is used during excavation operations, the trench width shall be wider than the shield so that the shield is free to be lifted and then moved horizontally without binding against the trench sidewalls and causing sloughing or caving of the trench walls. If the trench walls cave or slough, the trench shall be excavated as an open excavation with sloped sidewalls or with trench shoring, as indicated and as required by the pipe structural design.

F. If a moveable trench shield is used during excavation, pipe installation, and backfill operations, the shield shall be moved by lifting the shield free of the trench bottom or backfill and then moving the shield horizontally. The CONTRACTOR shall not drag trench shields along the trench causing damage or displacement to the trench sidewalls, the pipe, or the bedding and backfill.

G. Placing and Spreading of Backfill Materials

1. Each layer of coarse granular backfill materials with less than 10 percent passing the No. 4 sieve shall be compacted by means of at least 2 passes from a vibratory compactor that is capable of achieving the required density in 2 passes and that is acceptable to the ENGINEER. Where such materials are used for pipe zone backfill, vibratory compaction shall be used at vertical intervals of the lesser of (1) one half the diameter of the pipe, or (2) twenty four-inches, measured in the uncompacted state. In addition, these materials shall be subjected to vibratory compaction at the springline of the pipe and the top of the pipe zone backfill, regardless of whether that dimension is less than 24-inches or not.

2. Each layer of backfill material with greater than 10 percent passing the No. 4 sieve shall be compacted using mechanical compactors suitable for the WORK. The material shall be placed and compacted under the haunch of the pipe and up each side evenly so as not to move the pipe during the placement of the backfill. The material shall be placed in lifts that will not exceed 6-inches when compacted to the required density.

H. Pipe zone backfill materials that are granular may be compacted by a combination of flooding and vibration using concrete vibrators or by jetting, when acceptable to the ENGINEER.

I. Backfill around and over pipelines that is mechanically compacted shall be compacted using light, hand operated vibratory compactors and rollers that do not damage the pipe. After completion of at least 2-feet of compacted backfill over the top of pipeline,
compaction equipment weighing no more than 8,000 pounds may be used to complete the trench backfill.

J. Pipe and Utility Trench Backfill

1. Pipe Zone Backfill

   a. Definitions: The pipe zone is defined as that portion of the vertical trench cross-section lying between a plane below the bottom surface of the pipe and a plane at a point above the top surface. The bedding is defined as that portion of pipe zone backfill material between the trench subgrade and the embedment is defined as that portion of the pipe zone backfill material between the bedding and a level line at the centerline of the pipe.

   b. After compacting the bedding, the CONTRACTOR shall perform a final trim using a stringline for establishing grade, such that each pipe section when first laid will be continually in contact with the bedding along the extreme bottom of the pipe. Excavation for pipe bells and welding shall be made as required.

   c. The pipe zone shall be backfilled with the indicated backfill material. Pipe zone backfill materials shall be manually spread evenly around the pipe, maintaining the same height on both sides of the pipe so that when compacted the pipe zone backfill will provide uniform bearing and side support. The CONTRACTOR shall exercise care to prevent damage to the pipeline coating, cathodic bonds, and the pipe itself during the installation and backfill operations.

2. Trench Zone Backfill: After the pipe zone backfill has been placed, backfilling of the trench zone may proceed. The trench zone is defined as that portion of the vertical trench cross-section lying as indicated between a plane above the top surface of the pipe and a plane at a point 18-inches below the finished surface grade, or if the trench is under pavement, 18-inches below the roadway subgrade. If flooding, ponding, or jetting is used the pipe shall be filled with water to prevent flotation.

3. Final Backfill: Final backfill is defined as backfill in the trench cross-sectional area within 18-inches of finished grade, or if the trench is under pavement, backfill within 18-inches of the roadway subgrade.

K. Install identification tape as indicated.

L. If a moveable trench shield is used during backfill operations, the shield shall be lifted to a location above each layer of backfill material prior to compaction of the layer. The CONTRACTOR shall not displace the pipe or backfill while the shield is being moved.

M. The following compaction test requirements shall be in accordance with ASTM D 698 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort.
### Location or Use of Fill or Backfill

<table>
<thead>
<tr>
<th></th>
<th>Percentage of Maximum Dry Density</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pipe Zone, Trench Zone, and Final Backfill</td>
<td>95</td>
</tr>
</tbody>
</table>

#### 3.09 DEWATERING

**A.** See Section 02140 – Dewatering for detail dewatering requirements.

**B.** Do not allow water to accumulate in excavations. Remove water to prevent softening of foundation bottoms, undercutting footings, and soils changes detrimental to stability of subgrades and foundations. Provide and maintain pumps, well points, sumps, suction and discharge lines, and other dewatering system components necessary to convey water away from excavations.

**C.** Convey water removed from excavations and rainwater to collecting or run-off areas. Establish and maintain temporary drainage ditches and other diversions outside excavation limits for each structure. Do not use trench excavations as temporary drainage ditches.

**D.** The water level within the excavations shall be continuously maintained at a level which will provide a stable subgrade until completion of backfill to a point two (2) feet above natural groundwater. Structural concrete shall not be placed in water. The dewatering system shall prevent loss of foundation materials and shall have reliable stand-by equipment and power supply.

#### 3.10 FIELD TESTING

**A.** Field soils testing will be done by a testing laboratory of the OWNER's choice at the OWNER's expense, except as indicated below.

**B.** Where soil material is required to be compacted to a percentage of maximum density, the maximum density at optimum moisture content will be determined in accordance with ASTM D698. Field density in-place tests will be performed in accordance with ASTM D 1556 - Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method, ASTM D 2922 - Standard Test Methods for Density of Soil and Soil-Aggregate in Place By Nuclear Methods (Shallow Depth), or by such other means acceptable to the ENGINEER.

**C.** In case the test of the fill or backfill show non-compliance with the required density, the CONTRACTOR shall accomplish such remedy as may be required to insure compliance. Subsequent testing to show compliance shall be by a testing laboratory selected by the OWNER and paid by the CONTRACTOR.

END OF SECTION
SECTION 02260

EXCAVATION SUPPORT AND PROTECTION

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes temporary excavation support and protection systems.

1.02 PERFORMANCE REQUIREMENTS

A. Furnish, install, monitor, and maintain excavation support and protection system capable of supporting excavation sidewalls and of resisting soil and hydrostatic pressure and superimposed and construction loads.

1. Delegated Design: Contractor shall design temporary cofferdams excavation support and protection system(s), that are required to construct the work shown on the drawings and shall include comprehensive engineering analysis by a qualified Mississippi licensed professional engineer, using performance requirements and design criteria indicated.

2. Prevent surface water from entering excavations by grading, dikes, or other means.

3. All temporary excavation support structures shall be designed with a minimum factor of safety of 1.30, including all earth, water and surcharge loadings.

1.03 SUBMITTALS

A. Shop Drawings for Information: Prepared by or under the supervision of a qualified professional engineer for excavation support and protection systems.

1. Include Shop Drawings signed and sealed by the qualified Mississippi licensed professional engineer responsible for their preparation.

B. Qualification Data: For Installer and professional engineer.

1.04 QUALITY ASSURANCE

A. Pre-installation Conference: Conduct conference at Project site.

1.05 PROJECT CONDITIONS

A. Survey Work: Engage a qualified land surveyor or professional engineer to survey adjacent existing buildings, structures, and site improvements; establish exact elevations at fixed points to act as benchmarks. Clearly identify benchmarks and record existing elevations.

1. During installation of excavation support and protection systems, regularly resurvey benchmarks, maintaining an accurate log of surveyed elevations and positions for comparison with original elevations and positions. Promptly notify Architect if
changes in elevations or positions occur or if cracks, sags, or other damage is evident in adjacent construction.

PART 2 - PRODUCTS

2.01 MATERIALS

A. General: Provide materials that are either new or in serviceable condition.

B. Structural Steel: ASTM A 36/A 36M, ASTM A 690/A 690M, or ASTM A 992/A 992M.

C. Steel Sheet Piling: ASTM A 328/A 328M, ASTM A 572/A 572M, or ASTM A 690/A 690M; with continuous interlocks.

D. Wood Lagging: Lumber, mixed hardwood, nominal rough thickness of 3 inches.

E. Cast-in-Place Concrete: ACI 301, of compressive strength required for application.

F. Reinforcing Bars: ASTM A 615/A 615M, Grade 60.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Sheet Piling: Before starting excavation, install one-piece sheet piling lengths and tightly interlock to form a continuous barrier. Accurately place the piling, using templates and guide frames unless otherwise recommended in writing by the sheet piling manufacturer. Limit vertical offset of adjacent sheet piling to 60 inches. Accurately align exposed faces of sheet piling to vary not more than 2 inches from a horizontal line and not more than 1:120 out of vertical alignment. Internal bracing of wales may be required. Design any required bracing system that would have the least impact on construction efficiencies in building the concrete waste water treatment sub structure.

B. Bracing: Locate bracing to clear columns, floor framing construction, and other permanent work. If necessary to move brace, install new bracing before removing original brace.

1. Do not place bracing where it will be cast into or included in permanent concrete work unless otherwise approved by the Engineer.
2. Install internal bracing, if required, to prevent spreading or distortion of braced frames.
3. Maintain bracing until structural elements are supported by other bracing or until permanent construction is able to withstand lateral earth and hydrostatic pressures.

3.02 REMOVAL AND REPAIRS

A. Remove excavation support and protection systems when construction has progressed sufficiently to support excavation and bear soil and hydrostatic pressures. Remove in stages to avoid disturbing underlying soils or damaging structures, pavements, facilities, and utilities.
1. Temporary Excavation supports that cannot be removed for any reason, (such as pulling bent sheet piling) remove excavation support and protection systems to a minimum depth of 24 inches below overlaying construction.

END OF SECTION
SECTION 02300

EARTHWORK-STRUCTURAL

PART 1 - GENERAL

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

1.02 SUMMARY
A. Section Includes:
   1. Backfilling pit hole from removal of elevator support assembly.

1.03 QUALITY ASSURANCE
A. Geotechnical Testing Agency Qualifications: Qualified according to ASTM E 329 and ASTM D 3740 for testing indicated.

1.04 PROJECT CONDITIONS
A. Utility Locator Service: Notify utility locator service for area where Project is located before beginning earth moving operations.

B. Do not commence earth moving operations until temporary erosion- and sedimentation-control measures, specified in Division 1 Section “Temporary Facilities and Controls are in place.

PART 2 - PRODUCTS

2.01 SOIL MATERIALS
A. Sand: ASTM C 33; fine aggregate.

PART 3 - EXECUTION

3.01 PREPARATION
A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earth moving operations.
B. Protect and maintain erosion and sedimentation controls during earth moving operations.
C. Protect subgrades and foundation soils from freezing temperatures and frost. Remove temporary protection before placing subsequent materials.

3.02 BACKFILL

A. Place and compact backfill in excavations or pit promptly, but not before completing the following:
   1. Construction below finish grade including, where applicable, subdrainage, dampproofing, waterproofing, and perimeter insulation.
   2. Surveying locations of underground utilities for Record Documents if applicable.
   3. Testing and inspecting underground utilities if applicable.
   4. Removing trash and debris.
   5. Removing temporary shoring and bracing, and sheeting.

B. Place backfill on subgrades free of mud, frost, snow, or ice.

3.03 COMPACTION OF BACKFILLS AND FILLS

A. Place backfill and fill soil materials in layers not more than 8 inches in loose depth for material compacted by heavy compaction equipment, and not more than 4 inches in loose depth for material compacted by hand-operated tampers.

B. Place backfill and fill soil materials evenly on all sides of structures to required elevations, and uniformly along the full length of each structure.

C. Compact soil materials to not less than the following percentages of maximum dry unit weight according to ASTM D 698:
   1. Under structures, building slabs, steps, and pavements, compact each layer of backfill or fill soil material (12” max) at 95 percent.

3.04 FIELD QUALITY CONTROL

A. Special Inspections: Owner will engage a qualified special inspector to perform the following special inspections:
   1. Determine prior to placement of fill that site has been prepared in compliance with requirements.
2. Determine that fill material and maximum lift thickness comply with requirements.

3. Determine, at the required frequency, that in-place density of compacted fill complies with requirements.

B. Testing Agency: Owner will engage a qualified geotechnical engineering testing agency to perform tests and inspections.

C. Allow testing agency to inspect and test subgrades and each fill or backfill layer. Proceed with subsequent earth moving only after test results for previously completed work comply with requirements.

D. Testing agency will test compaction of soils in place according to ASTM D 1556, ASTM D 2167, ASTM D 2922, and ASTM D 2937, as applicable. Tests will be performed at the following locations and frequencies:

1. Building Slab Areas: At subgrade and at each compacted fill and backfill layer, at least one test for every 2000 sq. ft. or less of paved area or building slab, but in no case fewer than three tests.

E. When testing agency reports that subgrades, fills, or backfills have not achieved degree of compaction specified, scarify and moisten or aerate, or remove and replace soil materials to depth required; recompact and retest until specified compaction is obtained.

3.05 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Remove surplus satisfactory soil and waste materials, including unsatisfactory soil, trash, and debris, and legally dispose of them off Owner's property.

B. Transport surplus satisfactory soil to designated storage areas on Owner's property. Stockpile or spread soil as directed by Architect.

1. Remove waste materials, including unsatisfactory soil, trash, and debris, and legally dispose of them off Owner's property.

END OF SECTION
SECTION 03300

CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. Section includes cast-in-place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes, for the following:

1. Elevator Pit Modifications

1.03 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Design Mixtures: For each concrete mixture. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.

1. Indicate amounts of mixing water to be withheld for later addition at Project site.

C. Steel Reinforcement Shop Drawings: Placing drawings that detail fabrication, bending, and placement. Include bar sizes, lengths, material, grade, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, splices and laps, mechanical connections, tie spacing, hoop spacing, and supports for concrete reinforcement.

D. Fiber reinforcement.

E. Material test reports and certificates of compliances.

F. Qualification Data: For Installer, Ready-Mixed Concrete Manufacturer & Testing Agency.

G. Material Certificates: For each of the following, signed by manufacturers:

1. Cementitious materials.

2. Admixtures.
3. Fiber reinforcement.
5. Steel reinforcement and accessories.
6. Curing compounds.
8. Adhesives.

1.04 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer who employs on Project personnel qualified as ACI-certified Flatwork Technician and Finisher and a supervisor who is an ACI-certified Concrete Flatwork Technician.

1. Post-Installed Concrete Anchors Installers: ACI-certified Adhesive Anchor Installer.

B. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.

1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities."

C. Testing Agency Qualifications: An independent agency, qualified according to ASTM C 1077 and ASTM E 329 for testing indicated.

1. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-1 or an equivalent certification program.

2. Personnel performing laboratory tests shall be ACI-certified Concrete Strength Testing Technician and Concrete Laboratory Testing Technician - Grade I. Testing Agency laboratory supervisor shall be an ACI-certified Concrete Laboratory Testing Technician - Grade II.

D. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:

1. ACI 301, "Specifications for Structural Concrete,"
2. ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."
1.05 DELIVERY, STORAGE, AND HANDLING

A. Steel Reinforcement: Deliver, store, and handle steel reinforcement to prevent bending and damage.

PART 2 - PRODUCTS

2.01 STEEL REINFORCEMENT

A. Reinforcing Bars: ASTM A 615, Grade 60, deformed.

2.02 REINFORCEMENT ACCESSORIES

A. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire reinforcement in place. Manufacture bar supports from steel wire, plastic, or precast concrete according to CRSI's "Manual of Standard Practice," of greater compressive strength than concrete and as follows:

2.03 CONCRETE MATERIALS

A. Cementitious Material: Use the following cementitious materials, of the same type, brand, and source, throughout Project:

1. Portland Cement: ASTM C150, Type I, II, or I/II.

2. Fly Ash and Raw or Calcined Natural Pozzolan: ASTM C618.


4. Slag: ASTM C989; Grade 80; ground granulated blast furnace slag.

5. Blended Hydraulic Cements: ASTM C595

B. Normal-Weight Aggregates: ASTM C33, graded, 1-1/2-inch nominal maximum coarse-aggregate size.

1. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.

C. Water: ASTM C94 and potable.


F. Chemical Admixtures: Provide admixtures certified by manufacturer to be compatible with other admixtures and that will not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.

1. Water-Reducing Admixture: ASTM C494, Type A.

2. Retarding Admixture: ASTM C494, Type B.

3. Water-Reducing and Retarding Admixture: ASTM C494, Type D.

4. High-Range, Water-Reducing Admixture: ASTM C494, Type F.

5. High-Range, Water-Reducing and Retarding Admixture: ASTM C494, Type G.

6. Plasticizing and Retarding Admixture: ASTM C1017, Type II.

2.04 FIBER REINFORCEMENT

A. Synthetic Monofilament Micro-Fiber: Monofilament polypropylene micro-fibers engineered and designed for use in concrete, complying with ASTM C1116, Type III, 1/2 to 1 inch long.

B. Synthetic Macro-Fiber: Synthetic macro-fibers engineered and designed for use in concrete, complying with ASTM C1116, Type III, 1 to 2-1/4 inches long.

2.05 CURING MATERIALS

A. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.

B. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. when dry.

C. Moisture-Retaining Cover: ASTM C171, polyethylene film or white burlap-polyethylene sheet.

D. Water: Potable.

E. Clear, Solvent-Borne, Membrane-Forming Curing and Sealing Compound: ASTM C1315, Type 1, Class A.

F. Clear, Waterborne, Membrane-Forming Curing and Sealing Compound: ASTM C1315, Type 1, Class A.
2.06 RELATED MATERIALS

A. Epoxy Bonding Adhesive: ASTM C 881, two-component epoxy resin, capable of humid curing and bonding to damp surfaces, of class suitable for application temperature and of grade to suit requirements, and as follows:

1. Epoxy Bonding Agent shall be in accordance with ASTM D695 and shall have a minimum of 10,800 psi compressive strength. Bonding Agent shall also have a 14-day bond strength of 3,000 psi and shall be in accordance with ASTM C882.

B. Epoxy Grout: Shall meet ASTM C 827 and have a 7-day minimum compressive strength of 15,000 psi.

1. Manufacturers
   a. Five Star
   b. Or Approved Equal
   c. Install and apply according to manufacturer’s recommendations

C. Non-shrink, Non-metallic Cement based Grout: Non-Shrink, Non-Metallic Grout shall be in accordance with ASTM C827 and ASTM C1107-13, and have a minimum compressive strength 8,000 psi at 28 days. Contractor shall submit grout detail for Engineer’s approval.

1. Manufacturers
   a. Five Star
   b. Sika
   c. Euclid
   d. Or Approved Equal

D. Adhesive Anchoring System

E. Product: Powers Fastener Pure 50+ or approved equal

1. Conforms to requirements of ASTM C 881, Types I, II, IV and V, Grade 3, Classes B & C,

2. Tested in accordance with ACI 355.4 / ASTM E488, and ICC-ES AC308 for use in concrete
3. Evaluated and qualified by an accredited independent testing laboratory for recognition in

4. cracked and uncracked concrete including seismic and wind loading

5. Install per manufacturer’s recommendations

2.07 CONCRETE MIXTURES, GENERAL

A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, according to ACI 301.

B. Proportion normal-weight concrete mixture as follows for structural concrete:

1. Minimum Compressive Strength: 4000 psi at 28 days.

2. Unit Weight: 145 pcf

3. Maximum Water-Cementitious Materials Ratio: 0.45.

4. Slump Limit: 4 inches (+/- 1”) at point of delivery.

5. Air Content: 3.5 percent (+/- 1.5 Percent) at point of delivery for 1 1/2”-inch nominal maximum aggregate size.

6. Maximum calcium aluminate content not to exceed 5% and 8% for Type I and II, respectively.

7. Maximum expansion of hydraulic cement mortar when tested using ASTM C1012 at six months: 0.10%.

C. Proportion light-weight concrete mixture as follows for trough topping slab:

1. Minimum Compressive Strength: 3000 psi at 28 days.

2. Unit Weight: 105-115 pcf

3. Slump Limit: 4 inches (+/- 1”) at point of delivery.

4. Air Content:

   a. Do not use an air-entraining admixture or allow total air content to exceed 3 percent for concrete used in trowel-finished floors.

5. Synthetic Micro-Fiber: Uniformly disperse in concrete mixture at manufacturer's recommended rate, but not less than a rate of 1.0 lb/cu. yd.
6. Synthetic Macro-Fiber: Uniformly disperse in concrete mixture at manufacturer's recommended rate, but not less than a rate of 4 lb/cu. yd.

2.08 FABRICATING REINFORCEMENT

A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

2.09 CONCRETE MIXING

A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94 and ASTM C1116, and furnish batch ticket information.

1. When air temperature is between 85 and 90 deg F, reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.

PART 3 - EXECUTION

3.01 EMBEDDED ITEMS

A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

3.02 STEEL REINFORCEMENT

A. General: Comply with CRSI's "Manual of Standard Practice" for placing reinforcement.

3.03 CONCRETE PLACEMENT

A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections have been performed.

B. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete will be placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, submit construction joints for Engineer’s review prior to placement. Deposit concrete to avoid segregation.

1. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301.

C. Cold Weather Placement: Comply with ACI 301.

1. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
2. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.

D. Hot Weather Placement: Comply with ACI 301.

1. Maintain concrete temperature below 90 deg F at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.

2. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.

3.04 FINISHING FORMED SURFACES

A. Rough-Formed Finish: As-cast concrete texture imparted by form-facing material with tie holes and defects repaired and patched. Remove fins and other projections that exceed specified limits on formed-surface irregularities.

1. Apply to concrete surfaces not exposed to public view.

B. Smooth-Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defects. Remove fins and other projections that exceed specified limits on formed-surface

3.05 FINISHING FLOORS AND SLABS

A. General: Comply with ACI 302.1R recommendations for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.

B. Broom Finish: Apply a broom finish to exterior concrete platforms, steps, ramps, elevator closure slabs and elsewhere as indicated.

1. Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber-bristle broom perpendicular to main traffic route. Coordinate required final finish with Architect before application.

3.06 CONCRETE PROTECTING AND CURING

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and ACI 305.1 for hot-weather protection during curing.
B. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h before and during finishing operations. Apply according to manufacturer’s written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.

C. Cure concrete according to ACI 308.1, by one or a combination of the following methods:

1. Moisture Curing: Keep surfaces continuously moist for not less than seven days.

2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period using cover material and waterproof tape.

3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer’s written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.

3.07 CONCRETE SURFACE REPAIRS

A. Defective Concrete: Repair and patch defective areas when approved by Engineer. Remove and replace concrete that cannot be repaired and patched to Engineer’s approval.

3.08 FIELD QUALITY CONTROL

A. Testing and Inspecting: Owner will engage an inspector and qualified testing and inspecting agency to perform field tests and inspections and prepare test reports.

1. Testing Services: Tests shall be performed according to ACI 301.

B. Inspections:

1. Verification of use of required design mixture.

2. Concrete placement, including conveying and depositing.

3. Curing procedures.

4. Verification of concrete strength before removal of shores and forms from beams and slabs.
C. Concrete Tests: Testing of composite samples of fresh concrete obtained according to ASTM C 172 shall be performed according to the following requirements:

1. Testing Frequency: Obtain one composite sample for each day's pour of each concrete mixture for first 50 cubic yards of concrete. Additional tests will be required for each 100 cubic yards. The amount required should be rounded up (for instance, 60 cubic yards would require two tests).
   a. When frequency of testing will provide fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.

2. Slump: ASTM C 143; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture. Perform additional tests when concrete consistency appears to change.

3. Air Content: ASTM C 231, pressure method, for normal-weight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.

   a. Cast and laboratory cure three sets of three 4” x 8” standard cylinder specimens for each composite sample.
   b. Test one set of laboratory-cured specimens at 3 to 7 days.
   c. Test one set of laboratory-cured specimens at 28 days.
   d. Hold one set of laboratory-cured specimens.
   e. A compressive-strength test shall be the average compressive strength from a set of two specimens obtained from same composite sample and tested at age indicated.

5. Strength of each concrete mixture will be satisfactory if every average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi.

6. Test results shall be reported in writing to Construction Manager, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture
proportions and materials, compressive breaking strength, and type of break for all compressive tests.

7. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Construction Manager. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42 or by other methods as directed by Construction Manager.

8. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

9. Correct deficiencies in the Work that test reports and inspections indicate do not comply with the Contract Documents.

END OF SECTION
SECTION 04810

UNIT MASONRY ASSEMBLIES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. This Section includes unit masonry assemblies consisting of the following:

1. Concrete masonry units (CMUs).
2. Mortar and grout.
3. Reinforcing steel.
4. Masonry joint reinforcement.
5. Ties and anchors.
6. Miscellaneous masonry accessories.

1.03 DEFINITIONS

A. Reinforced Masonry: Masonry containing reinforcing steel in grouted cells.

1.04 PERFORMANCE REQUIREMENTS

A. Provide structural unit masonry that develops indicated net-area compressive strengths (f'm) at 28 days.

B. Determine net-area compressive strength (f'm) 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.

1.05 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: For the following:

1. Masonry Units: Show sizes, profiles, coursing, and locations of special shapes.
B Street Water Treatment Plant &  
North Water Treatment Plant Improvements  
City of Meridian

2. Reinforcing Steel: Detail bending and placement of unit masonry reinforcing bars.  
Comply with ACI 315, "Details and Detailing of Concrete Reinforcement."

C. Qualification Data: For testing agency.

D. Material Certificates: Include statements of material properties indicating compliance  
with requirements including compliance with standards and type designations within  
standards. Provide for each type and size of the following:

1. Masonry units.
   a. Include material test reports substantiating compliance with requirements.
   b. For masonry units used in structural masonry, include data and calculations  
      establishing average net-area compressive strength of units.

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.


7. Anchors, ties, and metal accessories.

E. Mix Designs: For each type of mortar and grout. Include description of type and  
   proportions of ingredients.

1. Include test reports, per ASTM C 780, for mortar mixes required to comply with  
   property specification.

2. Include test reports, per ASTM C 1019, for grout mixes required to comply with  
   compressive strength requirement.

F. 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.

G. Cold-Weather Procedures: Detailed description of methods, materials, and equipment  
to be used to comply with cold-weather requirements.
1.06 QUALITY ASSURANCE
   A. Testing Agency Qualifications: An independent agency qualified according to ASTM C 1093 for testing indicated, as documented according to ASTM E 548.

   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, through one source from a 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 a single manufacturer for each cementitious component and from one source or producer for each aggregate.

1.07 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 lifting and emptying into dispensing silo. Store preblended, dry mortar mix in delivery containers on elevated platforms, under cover, and in a dry location or in a metal dispensing silo with weatherproof cover.

   E. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

1.08 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 down both sides and hold cover securely in place.

      2. Where 1 wythe of multiwythe masonry walls is completed in advance of other wythes, secure cover a minimum of 24 inches 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 3 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 and above and will remain so until masonry has dried, but not less than 7 days after completing cleaning.


PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

1. Products: Subject to compliance with requirements, provide one of the products specified.

2. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.02 MASONRY UNITS, GENERAL

A. Defective Units: Referenced masonry unit standards may allow a certain percentage of units to exceed tolerances and to contain chips, cracks, or other defects exceeding limits
stated in the standard. Do not use units where such defects, including dimensions that vary from specified dimensions by more than stated tolerances, will be exposed in the completed Work or will impair the quality of completed masonry.

2.03 CONCRETE MASONRY UNITS (CMUs)

A. Shapes: Provide shapes indicated and as follows:
   1. Provide special shapes for lintels, corners, jambs, sashes, movement joints, headers, bonding, and other special conditions.
   2. Provide square-edged units for outside corners, unless otherwise indicated.

B. Concrete Masonry Units: ASTM C 90.
   1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 2800 psi.
   2. Weight Classification: Normal weight.
   3. Size (Width): Manufactured to dimensions 3/8 inch less than nominal dimensions.

2.04 CONCRETE AND MASONRY LINTELS

A. General: Provide either concrete or masonry lintels, at Contractor's option, complying with requirements below.

B. Concrete Lintels: Precast units made from concrete matching concrete masonry units in color, texture, and compressive strength and with reinforcing bars indicated or required to support loads indicated. Cure precast lintels by same method used for concrete masonry units.

2.05 MORTAR AND GROUT MATERIALS

A. 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.

B. Hydrated Lime: ASTM C 207, Type S.

C. Portland Cement-Lime Mix: Packaged blend of Portland cement complying with ASTM C 150, Type I or Type III, and hydrated lime complying with ASTM C 207, Type S.

D. 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 thick, use aggregate graded with 100 percent passing the No. 16 sieve.

3. White-Mortar Aggregates: Natural white sand or crushed white stone.

E. Aggregate for Grout: ASTM C 404.

F. 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:
   a. Addiment Incorporated; Mortar Kick.
   b. Euclid Chemical Company (The); Accelguard 80.
   d. Sonneborn, Div. of ChemRex; Trimix-NCA.
   e. Or Approved Equal

G. Water: Potable.

2.06 REINFORCEMENT

A. Uncoated Steel Reinforcing Bars: ASTM A 615, Grade 60.

B. Masonry Joint Reinforcement, General: ASTM A 951.

1. Interior Walls: Hot-dip galvanized, carbon steel.

2. Exterior Walls: Hot-dip galvanized, carbon steel.

3. Wire Size for Side Rods: W2.8 or 0.188-inch diameter.

4. Wire Size for Cross Rods: W2.8 or 0.188-inch diameter.

5. Spacing of Cross Rods, Tabs, and Cross Ties: Not more than 16 inches o.c.

6. Provide in lengths of not less than 10 feet, with prefabricated corner and tee units.

C. Masonry Joint Reinforcement for Single-Wythe Masonry: Either ladder or truss type with single pair of side rods.

D. Masonry Joint Reinforcement for Veneers Anchored with Seismic Masonry-Veneer Anchors: Single 0.188-inch- diameter, hot-dip galvanized, carbon-steel continuous wire.
2.07 TIES AND ANCHORS

A. Materials: Provide ties and anchors specified in subsequent paragraphs that are made from materials that comply with eight subparagraphs below, unless otherwise indicated.
   2. Galvanized Steel Sheet: ASTM A 653, Commercial Steel, G60 zinc coating.

2.08 MISCELLANEOUS ANCHORS

A. Post-installed Anchors: Provide chemical or torque-controlled expansion anchors, with capability to sustain, without failure, a load equal to six times the load imposed when installed in solid or grouted unit masonry and equal to four times the load imposed when installed in concrete, as determined by testing per ASTM E 488 conducted by a qualified independent testing agency.
   1. Corrosion Protection: Carbon-steel components zinc plated to comply with ASTM B 633, Class Fe/Zn 5 (5 microns) for Class SC 1 service condition (mild).

2.09 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 or urethane.

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. Reinforcing Bar Positioners: Wire units designed to fit into mortar bed joints spanning masonry unit cells with loops for holding reinforcing bars in center of cells. Units are formed from 0.142-inch steel wire, hot-dip galvanized after fabrication. Provide units with either two loops or four loops as needed for number of bars indicated.
   1. Products:
      a. Dayton Superior Corporation, Dur-O-Wal Division; D/A 810, D/A 812 or D/A 817.
      c. Hohmann & Barnard, Inc.; #RB or #RB-Twin Rebar Positioner.
d. Wire-Bond; O-Ring or Double O-Ring Rebar Positioner.

2.10 MASONRY CLEANERS

A. Proprietary Acidic 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.

1. Manufacturers:
   a. Diedrich Technologies, Inc.
   b. EaCo Chem, Inc.
   c. ProSoCo, Inc.

2.11 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. Limit cementitious materials in mortar to portland cement and lime.

3. Limit cementitious materials in mortar for exterior and reinforced masonry to portland cement and lime.

4. 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. Mortar for Unit Masonry: Comply with ASTM C 270, Property Specification. Provide the following types of mortar for applications stated unless another type is indicated.

1. For reinforced masonry, use Type O or N.

C. 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. Provide grout with a slump of 8 to 11 inches as measured according to ASTM C 143/C 143M.
D. Epoxy Pointing Mortar: Mix epoxy pointing mortar to comply with mortar manufacturer's written instructions.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of 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.

3.02 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. Comply with construction tolerances in ACI 530.1/ASCE 6/TMS 602 and with the following:

1. 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, 1/4 inch in 20 feet, or 1/2 inch maximum.

2. For vertical alignment of exposed head joints, do not vary from plumb by more than 1/4 inch in 10 feet, or 1/2 inch maximum.

3. 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, 1/4 inch in 20 feet, or 1/2 inch maximum.

4. For exposed bed joints, do not vary from thickness indicated by more than plus or minus 1/8 inch, with a maximum thickness limited to 1/2 inch. Do not vary from bed-joint thickness of adjacent courses by more than 1/8 inch.

5. For exposed head joints, do not vary from thickness indicated by more than plus or minus 1/8 inch. Do not vary from adjacent bed-joint and head-joint thicknesses by more than 1/8 inch.

6. For faces of adjacent exposed masonry units, do not vary from flush alignment by more than 1/16 inch except due to warpage of masonry units within tolerances specified for warpage of units.

7. For exposed bed joints and head joints of stacked bond, do not vary from a straight line by more than 1/16 inch from one masonry unit to the next.

3.03 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 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. Bond and interlock each course of each wythe at corners. Do not use units with less than nominal 4-inch 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 concrete masonry units with grout 24 inches 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 clearance between end of anchor rod and end of tube. Space anchors 48 inches o.c., unless otherwise indicated.

3.04 MORTAR BEDDING AND JOINTING

A. Lay hollow concrete masonry units as follows:
   1. With webs fully bedded in mortar in all courses of piers, columns, and pilasters.
   2. With webs fully bedded in mortar in grouted masonry, including starting course on footings.
   3. With entire units, including areas under cells, fully bedded in mortar at starting course on footings where cells are not grouted.

B. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness, unless otherwise indicated.

3.05 MASONRY JOINT REINFORCEMENT
A. General: Install entire length of longitudinal side rods in mortar with a minimum cover of 5/8 inch on exterior side of walls, 1/2 inch elsewhere. Lap reinforcement a minimum of 6 inches.

1. Space reinforcement not more than 16 inches o.c.

2. Provide reinforcement not more than 8 inches above and below wall openings and extending 12 inches beyond openings.
   a. Reinforcement above is in addition to continuous reinforcement.

B. Cut and bend reinforcing units as directed by manufacturer for continuity at corners, returns, offsets, column fireproofing, pipe enclosures, and other special conditions.

3.06 ANCHORING MASONRY TO STRUCTURAL MEMBERS

A. Anchor masonry to structural members where masonry abuts or faces structural members to comply with the following:

1. Provide an open space not less than 1/2 inch in width between masonry and structural member, unless otherwise indicated. Keep open space free of mortar and other rigid materials.

2. Anchor masonry to structural members with anchors embedded in masonry joints and attached to structure.

3. Space anchors as indicated, but not more than 24 inches o.c. vertically and 36 inches o.c. horizontally.

3.07 LINTELS

A. Provide concrete or masonry lintels where shown and where openings of more than 12 inches for brick-size units and 24 inches for block-size units are shown without structural steel or other supporting lintels.

B. Provide minimum bearing of 8 inches at each jamb, unless otherwise indicated.

3.08 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 temporary 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.

3.09 FIELD QUALITY CONTROL

A. Inspectors: Owner will engage qualified independent inspectors to perform inspections and prepare reports. Allow inspectors access to scaffolding and work areas, as needed to perform inspections.

1. Place grout only after inspectors have verified compliance of grout spaces and grades, sizes, and locations of reinforcement.

B. Testing Agency: Contractor will engage a qualified independent testing and inspecting agency to perform field tests and inspections indicated below and prepare test reports:

1. Payment for these services will be made by Contractor.
2. Retesting of materials failing to comply with specified requirements shall be done at Contractor’s expense.

C. Testing Frequency: One set of tests for each 5000 sq. ft. of wall area or portion thereof.

D. Grout Test (Compressive Strength): For each mix provided, per ASTM C 1019.

3.10 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 Engineer’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 masonry with a proprietary acidic cleaner applied according to manufacturer’s written instructions.

6. Clean concrete masonry by cleaning method indicated in NCMA TEK 8-2A applicable to type of stain on exposed surfaces.

3.11 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
SECTION 04813

BRICK MASONRY ASSEMBLIES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. Section Includes:

1. Face brick.
2. Mortar and grout.
3. Ties and anchors.
4. Embedded flashing.
5. Miscellaneous masonry accessories.

B. Related Sections:

1. Division 5 Section "Metal Fabrications" for furnishing steel for brick masonry.

1.03 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: For the following:

1. Masonry Units: Show sizes, profiles, coursing, and locations of special shapes.
2. Fabricated Flashing: Detail corner units, end-dam units, and other special applications.

C. Samples for Verification: For each type and color of the following:

1. Concrete facing brick.
2. Face brick, in the form of straps of five or more bricks.
3. Mortar. Make Samples using same sand and mortar ingredients to be used on Project.

1.04 INFORMATIONAL SUBMITTALS

A. Material Certificates: For each type and size of the following:

1. Masonry units.
   a. For brick, include size-variation data verifying that actual range of sizes falls within specified tolerances.

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. Anchors, ties, and metal accessories.

B. Cold-Weather[ and Hot-Weather] Procedures: Detailed description of methods, materials, and equipment to be used to comply with requirements.

1.05 QUALITY ASSURANCE

A. 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.

B. 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.

C. Masonry Standard: Comply with ACI 530.1/ASCE 6/TMS 602 unless modified by requirements in the Contract Documents.

1.06 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 weatherproof dispensing silos.

E. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

1.07 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. 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.

C. 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.
B Street Water Treatment Plant &
North Water Treatment Plant Improvements
City of Meridian

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.

D. Hot-Weather Requirements: Comply with hot-weather construction requirements
contained in ACI 530.1/ASCE 6/TMS 602.

PART 2 - PRODUCTS

2.01 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.

2.02 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

1. Products: Match Face Brick for existing building.

   a. Size - Match Face Brick for existing building.
b. Color - Match Face Brick for existing building.

2.03 MORTAR MATERIALS

A. 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.

B. Hydrated Lime: ASTM C 207, Type S.

C. Portland Cement-Lime Mix: Packaged blend of portland cement and hydrated lime containing no other ingredients.

D. Masonry Cement: ASTM C 91.

E. Mortar Cement: ASTM C 1329.

F. Mortar Pigments: Natural and synthetic iron oxides and chromium oxides, compounded for use in mortar mixes and complying with ASTM C 979. Use only pigments with a record of satisfactory performance in masonry mortar.

G. Colored Cement Product: Packaged blend made from portland cement and hydrated lime, masonry cement or mortar cement and mortar pigments, all complying with specified requirements, and containing no other ingredients.

1. Formulate blend as required to produce color as required to match the existing building.

H. 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. Colored-Mortar Aggregates: Natural sand or crushed stone of color necessary to produce required mortar color.

I. 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.

2.04 REINFORCEMENT

A. Masonry Joint Reinforcement, General: ASTM A 951/A 951M.
B. Masonry Joint Reinforcement for Veneers Anchored with Seismic Masonry-Veneer Anchors: Single 0.187-inch- (4.76-mm-) diameter, [hot-dip galvanized, carbon] [stainless]-steel continuous wire.

2.05 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:


B. Wire Ties, General: Unless otherwise indicated, size wire ties to extend at least halfway through veneer but with at least 5/8-inch cover on outside face. Outer ends of wires are bent 90 degrees and extend 2 inches parallel to face of veneer.

C. 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 thick, steel sheet, galvanized after fabrication.

2. Tie Section: Triangular-shaped wire tie, sized to extend within 1 inch of masonry face, made from 0.187-inch diameter, stainless steel wire

2.06 MISCELLANEOUS ANCHORS

A. Unit Type Inserts in Concrete: Cast-iron or malleable-iron wedge-type inserts.

B. Dovetail Slots in Concrete: Furnish dovetail slots with filler strips, of slot size indicated, fabricated from 0.034-inch, galvanized steel sheet.

2.07 EMBEDDED FLASHING MATERIALS

A. Metal Flashing: Provide metal flashing complying with SMACNA's "Architectural Sheet Metal Manual" and as follows:

1. Stainless Steel: ASTM A 240/A 240M, Type 304, 0.016 inch (0.40 mm) thick.

2. Fabricate continuous flashings in sections 96 inches long minimum, but not exceeding 12 feet. Provide splice plates at joints of formed, smooth metal flashing.
3. Fabricate through-wall metal flashing embedded in masonry from stainless steel with ribs at 3-inch intervals along length of flashing to provide an integral mortar bond.

4. Fabricate through-wall flashing with drip edge unless otherwise indicated. Fabricate by extending flashing 1/2 inch out from wall, with outer edge bent down 30 degrees and hemmed.

B. Application: Unless otherwise indicated, use the following:

1. Where flashing is indicated to receive counterflashing, use metal flashing.

2. Where flashing is indicated to be turned down at or beyond the wall face, use metal flashing.

2.08 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. Bond-Breaker Strips: Asphalt-saturated, organic roofing felt complying with ASTM D 226, Type I (No. 15 asphalt felt).

C. 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 in diameter, in length required to produce 2-inch exposure on exterior and 18 inches in cavity. Use only for weeps.

2. Cellular Plastic Weep/Vent: One-piece, flexible extrusion made from UV-resistant polypropylene copolymer, full height and width of head joint and depth 1/8 inch less than depth of outer wythe, in color selected from manufacturer's standard.

3. Mesh Weep/Vent: Free-draining mesh, made from polyethylene strands, full height and width of head joint and depth 1/8 inch (3 mm) less than depth of outer wythe; in color selected from manufacturer's standard.

2.09 MORTAR 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.
2. Use portland cement-lime, masonry cement or mortar cement mortar unless otherwise indicated.

3. 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 Type N unless another type is indicated.

D. Pigmented Mortar: Use colored cement product to match existing wall

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine 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.

3.02 INSTALLATION, GENERAL

A. Leave openings for equipment to be installed before completing masonry. After installing equipment, complete masonry to match the construction immediately adjacent to opening.

B. 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.

C. 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.

D. Matching Existing Masonry: Match coursing, bonding, color, and texture of existing masonry.

3.03 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 or minus 1/4 inch.

2. For location of elements in plan do not vary from that indicated by more than plus or minus 1/2 inch.

3. For location of elements in elevation do not vary from that indicated by more than plus or minus 1/4 inch in a story height or 1/2 inch 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), 1/4 inch in 20 feet (6 mm in 6 m), or 1/2 inch (12 mm) 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), 3/8 inch in 20 feet (9 mm in 6 m), or 1/2 inch (12 mm) 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), 1/4 inch in 20 feet (6 mm in 6 m), or 1/2 inch (12 mm) 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), 3/8 inch in 20 feet (9 mm in 6 m), or 1/2 inch (12 mm) 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.

3.04 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, match the existing wall.

C. 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.

D. Built-in Work: As construction progresses, build in items specified in this and other Sections. Fill in solidly with masonry around built-in items.

3.05 MORTAR BEDDING AND JOINTING

A. Lay hollow brick as follows:
   1. With face shells fully bedded in mortar and with head joints of depth equal to bed joints.
   2. With entire units, including areas under cells, fully bedded in mortar at starting course on footings.

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. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness unless otherwise indicated.

3.06 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 inch 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.

3.07 ANCHORING MASONRY VENEERS
A. Anchor masonry veneers to concrete backup with masonry-veneer anchors to comply with the following requirements:

1. Embed tie sections, connector sections and continuous wire in masonry joints. Provide not less than 2 inches 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 o.c. vertically and 24 inches o.c. horizontally, with not less than 1 anchor for each 2 sq. ft. of wall area. Install additional anchors within 12 inches of openings and at intervals, not exceeding 8 inches, around perimeter.

3.08 LINTELS

A. Install steel lintels where indicated.

B. Provide minimum bearing of 8 inches at each jamb unless otherwise indicated.

3.09 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 masonry-veneer walls, extend flashing through veneer, across air space behind veneer, and up face of sheathing at least 8 inches (200 mm); with upper edge tucked under building paper or building wrap, lapping at least 4 inches (100 mm).

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.
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 specified weep/vent products to form weep holes.

2. 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.

3. Space weep holes 24 inches o.c. unless otherwise indicated.

4. Space weep holes formed from wicking material 24 inches o.c.

5. Trim wicking material flush with outside face of wall after mortar has set.

3.10 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 meet specified requirements shall be done at Contractor's expense.

B. Inspections: Level 1 special inspections according to the "International Building Code."

1. Begin masonry construction only after inspectors have verified proportions of site-prepared mortar.

C. Mortar Aggregate Ratio Test (Proportion Specification): For each mix provided, according to ASTM C 780.

3.11 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."

3.12 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.

B. Waste Disposal as Fill Material: Dispose of clean masonry waste, including excess or soil-contaminated sand, waste mortar, and broken masonry units, by crushing and mixing with fill material as fill is placed.

1. Crush masonry waste to less than 4 inches (100 mm) in each dimension.

2. Mix masonry waste with at least two parts of specified fill material for each part of masonry waste. Fill material is specified in Division 2 Section "Earthwork."
3. Do not dispose of masonry waste as fill within 18 inches (450 mm) of finished grade.

C. Excess Masonry Waste: Remove excess clean masonry waste that cannot be used as fill, as described above, and other masonry waste, and legally dispose of off Owner's property.

END OF SECTION 04813
SECTION 05500

METAL FABRICATIONS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. Section Includes:

1. Steel framing and supports for overhead door.
2. Steel framing and support for gratings.
3. Structural steel door frames.
4. Steel framing and supports for applications where framing and supports are not specified in other Sections.
5. Loading dock lift.

B. Related Sections:

1. Division 3 Section "Cast-in-Place Concrete" for installing anchor bolts, steel pipe sleeves, slotted-channel inserts, wedge-type inserts and other items cast into concrete.
2. Division 4 Section "Unit Masonry Assemblies" for installing loose lintels, anchor bolts, and other items built into unit masonry.

1.03 ACTION SUBMITTALS

A. Product Data: For the following:

1. Paint products.
2. Grout.
3. Loading dock lift.
B. Shop Drawings:

1. Show fabrication and installation details for metal fabrications.
   a. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items.

2. Loading dock lift
   a. Include plans, elevations, sections, and details of the lift after the field dimensions have been verified.
   b. Show installed fit for the lift and equipment.

1.04 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified professional engineer.

B. Mill Certificates: Signed by manufacturers of stainless-steel certifying that products furnished comply with requirements.

1.05 PROJECT CONDITIONS

A. Field Measurements: Verify actual locations of walls and other construction contiguous with metal fabrications by field measurements before fabrication.

1.06 COORDINATION

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 and steel weld plates and angles for casting into concrete. 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.

PART 2 - PRODUCTS

2.01 METALS, GENERAL
A. Metal Surfaces, General: Provide materials with smooth, flat surfaces unless otherwise indicated. For metal fabrications exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.

2.02 FERROUS METALS

A. Steel Plates, Shapes, and Bars: ASTM A 36.

B. Steel Tubing: ASTM A 500, cold-formed steel tubing.

C. Channels & Angles: ASTM A572 Gr. 50 or A709 Gr. 50 High Strength Steel.

D. Steel Pipe: ASTM A 53, standard weight (Schedule 40) unless otherwise indicated.

2.03 FASTENERS

A. General: Unless otherwise indicated, provide Type 304 stainless-steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B 633, Class Fe/Zn 5, at exterior walls. Select fasteners for type, grade, and class required.

B. Steel Bolts and Nuts: Regular hexagon-head bolts, ASTM A3125, Gr. A325; with hex nuts, ASTM A 563; and, where indicated, flat washers.

C. Anchor Bolts: ASTM F 1554, Grade 36, of dimensions indicated; with nuts, ASTM A 563; and, where indicated, flat washers.

1. Hot-dip galvanize or provide mechanically deposited, zinc coating where item being fastened is indicated to be galvanized.

2.04 MISCELLANEOUS MATERIALS

2.05 FABRICATION, GENERAL

A. Shop Assembly: Preassemble items in the shop to greatest extent possible. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.

B. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.

C. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.
D. Form exposed work with accurate angles and surfaces and straight edges.

E. Fabricate seams and other connections that will be exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.

F. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.

2.06 MISCELLANEOUS FRAMING AND SUPPORTS

A. General: Provide steel framing and supports not specified in other Sections as needed to complete the Work.

B. Fabricate units from steel shapes, plates, and bars of welded construction unless otherwise indicated. Fabricate to sizes, shapes, and profiles indicated and as necessary to receive adjacent construction.

1. Fabricate units from slotted channel framing where indicated.

2. Furnish inserts for units installed after concrete is placed.

C. Galvanize miscellaneous framing and supports where indicated.

2.07 LOADING DOCK LIFT

A. Provide Electric-Hydraulic BEHLT Lift Table by Beacon or approved equal.

B. General Requirements:

1. Verify all existing dimensions before placing orders for equipment.

C. Performance Requirements:

1. The lift shall fit in the existing elevator pit.
   a. 1" maximum gap between the lift table and any adjacent surfaces.

2. The lift shall fit flush with the existing floor in the lowered position.

3. The lift shall fit flush with the loading door in the raised position.

4. The lift shall have a 2000 lb capacity.

5. Power requirements:
   a. 2 HP motor maximum.
b. 3 phase
c. 460 volts

D. The contractor is responsible to verify proper fit and functionality of the lift prior to placing an order. The contractor shall incur any cost associated with correcting fit and function errors.

2.08 STRUCTURAL-STEEL DOOR FRAMES

A. Fabricate structural-steel door frames from steel shapes, plates, and bars of size and to dimensions indicated, fully welded together, with 5/8-by-1-1/2-inch steel channel 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 10 inches o.c. Reinforce frames and drill and tap as necessary to accept finish hardware.

1. Provide with integrally welded steel strap anchors for securing door frames into adjoining concrete or masonry.

B. Extend bottom of frames to floor elevation indicated with steel angle clips welded to frames for anchoring frame to floor with expansion shields and bolts.

C. Galvanize steel frames.

2.09 MISCELLANEOUS STEEL TRIM

A. Unless otherwise indicated, fabricate units from steel shapes, plates, and bars of profiles shown with continuously welded joints and smooth exposed edges. Miter corners and use concealed field splices where possible.

B. Provide cutouts, fittings, and anchorages as needed to coordinate assembly and installation with other work.

1. Provide with integrally welded steel strap anchors for embedding in concrete or masonry construction.

C. Galvanize exterior miscellaneous steel trim.

2.10 LOOSE STEEL LINTELS

A. Fabricate loose steel lintels from steel angles and shapes of size indicated for openings and recesses in masonry walls and partitions at locations indicated. Fabricate in single lengths for each opening unless otherwise indicated. Weld adjoining members together to form a single unit where indicated.
B. Size loose lintels to provide bearing length at each side of openings equal to 1/12 of clear span but not less than 8 inches unless otherwise indicated.

C. Galvanize loose steel lintels located in exterior walls.

2.11 FINISHES, GENERAL

A. Comply with NAAMM’s “Metal Finishes Manual for Architectural and Metal Products” for recommendations for applying and designating finishes.

B. Finish metal fabrications after assembly.

C. Finish exposed surfaces to remove tool and die marks and stretch lines, and to blend into surrounding surface.

2.12 STEEL AND IRON FINISHES

A. Galvanizing: Hot-dip galvanize items as indicated to comply with ASTM A 153/A 153M for steel and iron hardware and with ASTM A 123/A 123M for other steel and iron products.

1. All structural steel shall be hot dip galvanized.

PART 3 - EXECUTION

3.01 INSTALLATION, GENERAL

A. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.

B. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.

C. Fastening to In-Place Construction: Provide anchorage devices and fasteners where metal fabrications are required to be fastened to in-place construction. Provide threaded fasteners for use with concrete and masonry inserts, toggle bolts, through bolts, lag screws, wood screws, and other connectors.

D. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.
3.02 INSTALLING MISCELLANEOUS FRAMING AND SUPPORTS

A. General: Install framing and supports to comply with requirements of items being supported, including manufacturers' written instructions and requirements indicated on Shop Drawings.

B. Anchor supports for operable partitions securely to and rigidly brace from building structure.

C. Support steel girders on solid grouted masonry, concrete, or steel pipe columns. Secure girders with anchor bolts embedded in grouted masonry or concrete or with bolts through top plates of pipe columns.

1. Where grout space under bearing plates is indicated for girders supported on concrete or masonry, install as specified in "Installing Bearing and Leveling Plates" Article.

D. Install pipe columns on concrete footings with grouted baseplates. Position and grout column baseplates as specified in "Installing Bearing and Leveling Plates" Article.

1. Grout baseplates of columns supporting steel girders after girders are installed and leveled.

3.03 INSTALLING BEARING AND LEVELING PLATES


B. Set bearing and leveling plates on wedges, shims, or leveling nuts. After bearing members have been positioned and plumbed, tighten anchor bolts. Do not remove wedges or shims but, if protruding, cut off flush with edge of bearing plate before packing with grout.

1. Use nonshrink grout, either metallic or nonmetallic, in concealed locations where not exposed to moisture; use nonshrink, nonmetallic grout in exposed locations unless otherwise indicated.

2. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

3.04 ADJUSTING AND CLEANING

A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas. Paint uncoated and abraded areas with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.
1. Apply by brush or spray to provide a minimum 2.0-mil (0.05-mm) dry film thickness.

B. Touchup Painting: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in Division 9 painting Sections.

C. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780.
SECTION 08110

METAL DOORS AND FRAMES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. Section Includes:
   1. Standard hollow metal doors and frames.
   2. Folding security gate

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" for door hardware for hollow metal doors.

1.03 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.

1.04 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. 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.

1.05 QUALITY ASSURANCE

A. Source Limitations: Obtain hollow metal work from single source from single manufacturer.

1.06 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-high wood blocking. Do not store in a manner that traps excess humidity.

1. Provide minimum 1/4-inch space between each stacked door to permit air circulation.
1.07 **PROJECT CONDITIONS**

A. Field Measurements: Verify actual dimensions of openings by field measurements before fabrication.

1.08 **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**

2.01 **MANUFACTURERS**

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following or approved equal:

1. Ceco Door Products; an Assa Abloy Group company.
2. Curries Company; an Assa Abloy Group company.
3. Steelcraft; an Ingersoll-Rand company.
4. Approved Equal.

2.02 **MATERIALS**

A. Cold-Rolled Steel Sheet: ASTM A 1008/, Commercial Steel (CS), Type B; suitable for exposed applications.

B. Hot-Rolled Steel Sheet: ASTM A 1011, 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 or A60 metallic coating.

D. Frame Anchors: ASTM A 591/A 591M, Commercial Steel (CS), 40Z 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. Mineral-Fiber Insulation: ASTM C 665, Type I (blankets without membrane facing); consisting

2.03 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. Thermal-Rated (Insulated) Doors: Where indicated, provide doors fabricated with thermal-resistance value (R-value) of not less than 4.0 deg F x h x sq. ft./Btu when tested according to ASTM C 1363.

      1. Locations: Exterior doors and interior doors where indicated.


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. Heavy Duty, Full Flush and Seamless.


2. Doors shall be full flush made of cold rolled 18 gauge prime quality galvanized steel, A60 coating, with 1/8” bevel in 2” hinge lock edges. Doors shall be fully sealed.

3. Doors shall be 1 ¾” thick.

4. Doors shall have continuous vertical mechanical interlocking joints at lock and hinge edges.
5. Reinforcing channels made from 14 gage cold-rolled steel shall be provided at the top and bottom of doors and shall be spot welded within the doors.

6. Provide 12 gage cold rolled steel surface closure reinforcement.

7. Doors shall be mortised and reinforced for hinges and locks.

8. Doors shall have approved core completely filling void spaces inside the doors and shall be bonded to both inside faces of the panels.

9. Doors shall be bonderized and shall be coated with primer. See Specification 09900 and 09912 for door frame painting schedule.

10. Door shall have a top cap water seal and a vinyl gasket bottom seal.

C. Hardware Reinforcement: Fabricate according to ANSI/SDI A250.6 with reinforcing plates from same material as door face sheets.

D. Fabricate concealed stiffeners and hardware reinforcement from either cold- or hot-rolled steel sheet.

2.04 STANDARD HOLLOW METAL FRAMES

A. General: Comply with ANSI/SDI A250.8 and with details indicated for type and profile.


1. Fabricate frames with mitered or coped corners.

2. Frames for Steel Doors: 16 Ga -0.053-inch thick steel sheet.

3. Frames shall be set-up, arc welded and ground smooth.

4. Frames shall be furnished with two (2) rubber bumpers installed at the factory.

5. Frames shall be mortised and reinforced for strikes and hinges. Strike and hinge reinforcements shall be completely enclosed and protected by guards welded in place.


C. Hardware Reinforcement: Fabricate according to ANSI/SDI A250.6 with reinforcement plates from same material as frames.
2.05 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 thick, with corrugated or perforated straps not less than 2 inches wide by 10 inches long; or wire anchors not less than 0.177 inch thick.

B. Floor Anchors: Formed from same material as frames, not less than 0.042 inch 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 height adjustment. Terminate bottom of frames at finish floor surface.

2.06 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.


1. Color and Gloss: As selected by Architect from manufacturer's full range.

PART 3 - EXECUTION

3.01 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.

3.02 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.

3.03 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. Install door silencers in frames before grouting.

   c. Remove temporary braces necessary for installation only after frames have been properly set and secured.
d. Check plumbness, squareness, and twist of frames as walls are constructed. Shim as necessary to comply with installation tolerances.

2. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor, and secure with 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. Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames and masonry with grout.

4. 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.

5. 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.

3.04 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 08331

OVERHEAD COILING DOORS

PART 1 - GENERAL

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

1.02 SUMMARY
   A. This Section includes the following types of overhead coiling doors:
      1. Insulated Service doors.
   B. Related Sections include the following:
      1. Division 8 Section "Door Hardware" for lock cylinders and keying.

1.03 DEFINITIONS
   A. Operation Cycle: One complete cycle of a door begins with the door in the closed
      position. The door is then moved to the open position and back to the closed position.

1.04 PERFORMANCE REQUIREMENTS
   A. Structural Performance: Provide overhead coiling doors capable of withstanding the
      effects of gravity loads and the following loads and stresses without evidencing
      permanent deformation of door components:
      1. Wind Load: Minimum pressure of 25 psf.
   B. Operation-Cycle Requirements: Design overhead coiling door components and operator
      to operate for not less than 10,000 cycles.

1.05 SUBMITTALS
   A. Product Data: For each type and size of overhead coiling door and accessory. Include
      details of construction relative to materials, dimensions of individual components,
      profiles, and finishes. Provide roughing-in diagrams, operating instructions, and
      maintenance information. Include the following:
1. Setting drawings, templates, and installation instructions for built-in or embedded anchor devices.

2. Motors: Show nameplate data and ratings; characteristics; mounting arrangements; size and location of winding termination lugs, conduit entry, and grounding lug; and coatings.

B. Shop Drawings: For special components and installations not dimensioned or detailed in manufacturer's data sheets.

C. Installer Certificates: Signed by manufacturer certifying that installers comply with specified requirements.

1.06 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experienced installer who is an authorized representative of the overhead coiling door manufacturer for both installation and maintenance of units required for this Project.

B. Source Limitations: Obtain overhead coiling doors through one source from a single manufacturer.

1. Obtain operators and controls from the overhead coiling door manufacturer.

C. Listing and Labeling: Provide electrically operated fixtures specified in this Section that are listed and labeled.

1. The Terms "Listed" and "Labeled": As defined in NFPA 70, Article 100.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Insulated Service Door: Overhead coiling door formed with curtain of interlocking slats.

B. 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:

C. Manufacturer: Subject to compliance with requirements, provide products by one of the following:

1. Cookson MFI 5F

2. Or Approved Equal
B Street Water Treatment Plant &
North Water Treatment Plant Improvements
City of Meridian


2.02 DOOR CURTAIN MATERIALS AND CONSTRUCTION

A. Door Curtain: Fabricate overhead coiling door curtain of interlocking slats, designed to withstand wind loading indicated, in a continuous length for width of door without splices. Unless otherwise indicated, provide slats of material thickness recommended by door manufacturer for performance, size, and type of door indicated, and as follows:

1. Steel Door Curtain Slats: Structural-quality, cold-rolled galvanized steel sheets complying with ASTM A 653, with A60 zinc coating.

B. Endlocks: Manufacturer's standard locks on not less than alternate curtain slats for curtain alignment and resistance against lateral movement.

C. Windlocks: Malleable-iron castings secured to curtain slats with galvanized rivets or high-strength nylon, as required to comply with wind load.

D. Bottom Bar: Manufacturer's standard continuous channel or tubular shape, either stainless-steel or aluminum extrusions to suit type of curtain slats.

1. Astragal: Provide a replaceable, adjustable, continuous, compressible gasket of flexible vinyl, rubber, or neoprene, between angles or fitted to shape, as a cushion bumper for interior door.

2. Provide motor-operated doors with combination bottom astragal and sensor edge.

E. Curtain Jamb Guides: Fabricate curtain jamb guides of angles, or channels and angles of material and finish to match curtain slats, with sufficient depth and strength to retain curtain, to allow curtain to operate smoothly, and to withstand loading. Provide continuous integral wear strips to prevent metal-to-metal contact and minimize noise of travel and removable stops on guides to prevent overtravel of curtain.

2.03 HOODS AND ACCESSORIES

A. Hood: Form to entirely enclose coiled curtain and operating mechanism at opening head and act as weatherseal. Contour to suit end brackets to which hood is attached. Roll and reinforce top and bottom edges for stiffness. Provide closed ends for surface-mounted hoods and fascia for any portion of between-jamb mounting projecting beyond wall face. Provide intermediate support brackets as required to prevent sag.

1. Fabricate steel hoods, for steel doors, of not less than 0.028-inch thick, hot-dip galvanized steel sheet with A60 zinc coating, complying with ASTM A 653.
2. **Shape**: Round.

**B. Weatherseals**: Provide replaceable, adjustable, continuous, compressible weatherstripping gaskets fitted to bottom and at top of exterior doors, unless otherwise indicated. At door head, use 1/8-inch-thick, replaceable, continuous sheet secured to inside of curtain coil hood.

1. Provide motor-operated doors with combination bottom weatherseal and sensor edge.

2. In addition, provide replaceable, adjustable, continuous, flexible, 1/8-inch-thick seals of flexible vinyl, rubber, or neoprene at door jambs for a weathertight installation.

**C. 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.

**D. Chain Lock Keeper**: Suitable for padlock.

**E.** Where door unit is power operated, provide safety interlock switch to disengage power supply when door is locked.

**F.** Provide automatic-closing device inoperative during normal door operations, with governor unit complying with requirements of NFPA 80, with easily tested and reset release mechanism, and designed to be activated by the following:

1. **Governor**: Oscillating type.

### 2.04 COUNTERBALANCING MECHANISM

**A. General**: Counterbalance doors by means of adjustable-tension steel helical torsion spring, mounted around a steel shaft and contained in a spring barrel connected to door curtain with required barrel rings. Use grease-sealed bearings or self-lubricating graphite bearings for rotating members.

**B. Counterbalance Barrel**: Fabricate spring barrel of 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. of span under full load.

**C.** Provide spring balance of 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. Provide cast-steel barrel plugs to secure ends of springs to barrel and shaft.
D. Fabricate torsion rod for counterbalance shaft of cold-rolled steel, sized to hold fixed spring ends and carry torsional load.

E. Brackets: Provide mounting brackets of manufacturer's standard design, either cast-iron or cold-rolled steel plate with bell-mouth guide groove for curtain.

2.05 FINISHES, GENERAL

A. General: Comply with NAAMM’s "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. 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. Finish surface is galvanized. No primer or finish paint coat is required.

2.06 MANUAL DOOR OPERATORS

A. Equip door with manufacturer's recommended manual door operator unless another type of door operator is indicated.

2.07 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. 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:
B Street Water Treatment Plant &
North Water Treatment Plant Improvements
City of Meridian

a. Phase: Three phase.

b. Volts: 480 V.

c. Hertz: 60.

2. Motor Type and Controller: Reversible motor and controller (disconnect switch) for motor exposure indicated.

3. Motor Size: 1/2 hp min. Shall be 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.

D. 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.

E. 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.


G. 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.

H. Motor Removal: Design operator so motor may be removed without disturbing limit-switch adjustment and without affecting emergency manual operation.

I. Door Finish:

1. Baked-Enamel or Powder-Coated Finish: Color as selected by Architect from manufacturer's full range.

PART 3 - EXECUTION

3.01 INSTALLATION

A. General: Install door and operating equipment complete with necessary hardware, jamb and head mold strips, anchors, inserts, hangers, and equipment supports according to Shop Drawings, manufacturer's written instructions, and as specified.

3.02 ADJUSTING

A. Lubricate bearings and sliding parts; adjust doors to operate easily, free from warp, twist, or distortion and fitting weathertight for entire perimeter.

3.03 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain overhead coiling doors.

1. Review data in the maintenance manuals. Refer to Division 1 Section "Operation and Maintenance Data."

2. Schedule training with Owner with at least 7 days' advance notice.

END OF SECTION
SECTION 08710

DOOR HARDWARE

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. Section includes:

1. Mechanical door hardware for the following:
   a. Overhead coiling door
   b. Standard hollow metal door and frames
   c. Folding security gate.

B. Related Sections:

1. Division 8 Section "Metal Doors and Frames"
2. Division 8 Section "Overhead Coiling Doors"

1.03 SUBMITTALS

A. Product Data: For each type of product indicated. Include construction and installation details, material descriptions, dimensions of individual components and profiles, and finishes.

B. Other Action Submittals:

1. Door Hardware Schedule: Prepared by or under the supervision of Installer, detailing fabrication and assembly of door hardware, as well as installation procedures and diagrams. Coordinate final door hardware schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.

   a. Submittal Sequence: Submit door hardware schedule concurrent with submissions of Product Data, Samples, and Shop Drawings. Coordinate
submission of door hardware schedule with scheduling requirements of other work to facilitate the fabrication of other work that is critical in Project construction schedule.

C. List of related door devices specified in other Sections for each door and frame.

1.04 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Product Certificates: For electrified door hardware, from the manufacturer.
   1. Certify that door hardware approved for use on types and sizes of labeled fire-rated doors complies with listed fire-rated door assemblies.

C. Product Test Reports: For compliance with accessibility requirements, based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified testing agency, for door hardware on doors located in accessible routes.

D. Warranty: Special warranty specified in this Section.

1.05 CLOSEOUT SUBMITTALS

A. Maintenance Data: For each type of door hardware to include in maintenance manuals. Include final hardware and keying schedule.

1.06 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. Door Hardware.

1.07 QUALITY ASSURANCE

A. Installer Qualifications: Supplier of products and an employer of workers trained and approved by product manufacturers.

B. Source Limitations: Obtain each type of door hardware from a single manufacturer.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Inventory door hardware on receipt and provide secure lock-up for door hardware delivered to Project site.
B. Tag each item or package separately with identification coordinated with the final door hardware schedule, and include installation instructions, templates, and necessary fasteners with each item or package.

C. Deliver keys to manufacturer of key control system for subsequent delivery to Owner.

1.09 COORDINATION

A. Installation Templates: Distribute for doors, frames, and other work specified to be factory prepared. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.

B. Security: Coordinate installation of door hardware, keying, and access control with Owner's security consultant.

1.10 WARRANTY

A. Special Warranty: Manufacturer’s standard form in which manufacturer agrees to repair or replace components of door hardware that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Structural failures including excessive deflection, cracking, or breakage.

b. Faulty operation of doors and door hardware.

c. Deterioration of metals, metal finishes, and other materials beyond normal weathering and use.

2. Warranty Period: Three years from date of Substantial Completion, unless otherwise indicated.

a. Exit Devices: Two years from date of Substantial Completion.

1.11 MAINTENANCE SERVICE

A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions for Owner’s continued adjustment, maintenance, and removal and replacement of door hardware.

PART 2 - PRODUCTS

2.01 SCHEDULED DOOR HARDWARE
A. Provide door hardware for each door as scheduled to comply with requirements in this Section.

1. Door Hardware Sets: Provide quantity, item, size, finish or color indicated, and named manufacturers' products complying with BHMA designations referenced.

2. Sequence of Operation: Provide electrified door hardware function, sequence of operation, and interface with other building control systems indicated.

B. Designations: Requirements for design, grade, function, finish, size, and other distinctive qualities of each type of door hardware are indicated in Part 3 "Door Hardware Schedule" Article. Products are identified by using door hardware designations, as follows:

2.02 HINGES

A. Hinges: BHMA A156.1. Heavy Duty

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings and schedule or comparable product by one of the following:

   a. Baldwin Hardware Corporation.

   b. Hager Companies.

   c. IVES Hardware; an Ingersoll-Rand company.

   d. McKinney Products Company; an ASSA ABLOY Group company.

   e. Approved equal.

2.03 MECHANICAL LOCKS AND LATCHES

A. Lock Functions: As indicated in door hardware schedule.

B. ANSI/BHMA A 156.2-1989, Series 4000, Grade 2 Falcon. B-Series.

C. Lock Throw: Comply with testing requirements for length of bolts required for labeled fire doors, and as follows:

   1. Bored Locks: Minimum 1/2-inch (19-mm) latchbolt throw.
D. Lock Backset: 2-3/4 inches, unless otherwise indicated.

E. Lock Trim:

1. Description: As indicated on Drawings.
2. Levers: Forged.
5. Dummy Trim: Match knob and lever lock trim and escutcheons.

F. Strikes: Provide manufacturer's standard strike with strike box for each lock bolt or latchbolt complying with requirements indicated for applicable lock or latch and with strike box and curved lip extended to protect frame; finished to match lock or latch.

1. Strikes for Bored Locks and Latches: BHMA A156.2.
2. Aluminum-Frame Strike Box: Manufacturer's special strike box fabricated for aluminum framing.

G. Bored Locks: BHMA A156.2; Grade 2; Series 4000.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Corbin Russwin Architectural Hardware; n ASSA ABLOY Group Company.
   b. Falcon Lock; An Ingersoll-Rand Company.
   c. Yale Security Inc.; an ASSA ABLOY Group company.
   d. Approved equal.

2.04 EXIT DEVICES AND AUXILIARY ITEMS

A. Exit Devices and Auxiliary Items: BHMA A156.3.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
B Street Water Treatment Plant &  
North Water Treatment Plant Improvements  
City of Meridian

a. Corbin Russwin Architectural Hardware; an ASSA ABLOY Group company.

b. Yale Security Inc.; an ASSA ABLOY Group company.

c. Approved equal.

2.05 LOCK CYLINDERS

A. Standard Lock Cylinders: BHMA A156.5, Grade 1 unless Grade 2 is indicated.

B. Cylinders: Manufacturer's standard tumbler type, constructed from brass or bronze, stainless steel, or nickel silver, and complying with the following:

1. Number of Pins: Six.

C. Manufacturers:

1. Corbin Russwin Architectural Hardware; an ASSA ABLOY Group company (CR).
2. SARGENT Manufacturing Company; an ASSA ABLOY Group company (SGT).
3. Schlage Commercial Lock Division; an Ingersoll-Rand Company (SCH).
4. Yale Commercial Locks and Hardware; an ASSA ABLOY Group company (YAL).
5. Or Approved Equal

2.06 KEYING

A. Keying System: Factory registered, complying with guidelines in BHMA A156.28, Appendix A. Incorporate decisions made in keying conference, and as follows:

1. Master Key System: Cylinders are operated by a master key.

B. Keys: Nickel silver.

2.07 OPERATING TRIM

A. Standard: BHMA A156.6.

B. Materials: Fabricate from brass, unless otherwise indicated.

C. Manufacturers:

1. Rockwood Manufacturing Company (RM).
2. Trimco (TBM).

2.08 SURFACE CLOSERS

A. Surface Closers: BHMA A156.4; rack-and-pinion hydraulic type with adjustable sweep and latch speeds controlled by key-operated valves and forged-steel main arm. Comply with manufacturer’s written recommendations for size of door closers depending on size of door, exposure to weather, and anticipated frequency of use. Provide factory-sized closers, adjustable to meet field conditions and requirements for opening force.

1. Manufacturers:
   a. Corbin Russwin Architectural Hardware; an ASSA ABLOY Group company (CR).
   b. DORMA Architectural Hardware; Member of The DORMA Group North America (DAH).
   c. LCN Closers; an Ingersoll-Rand Company (LCN).
   d. SARGENT Manufacturing Company; an ASSA ABLOY Group company (SGT).
   e. Yale Commercial Locks and Hardware; an ASSA ABLOY Group company (YAL).

2. Type: Heavy Duty.

2.09 DOOR GASKETING

A. Door Gasketing: BHMA A156.22; air leakage not to exceed 0.50 cfm per foot (0.000774 cu. m/s per m) of crack length for gasketing other than for smoke control, as tested according to ASTM E 283; with resilient or flexible seal strips that are easily replaceable and readily available from stocks maintained by manufacturer.

B. Manufacturers:
   1. Hager Companies (HAG).
   2. National Guard Products (NGP).

2.10 THRESHOLDS
A. Thresholds: BHMA A156.21; fabricated to full width of opening indicated.

B. Manufacturers:
   1. Hager Companies (HAG).
   2. National Guard Products (NGP).

2.11 FABRICATION

A. Manufacturer's Nameplate: Do not provide products that have manufacturer's name or trade name displayed in a visible location except in conjunction with required fire-rated labels and as otherwise approved by Architect.
   1. Manufacturer's identification is permitted on rim of lock cylinders only.

B. Base Metals: Produce door hardware units of base metal indicated, fabricated by forming method indicated, using manufacturer's standard metal alloy, composition, temper, and hardness. Furnish metals of a quality equal to or greater than that of specified door hardware units and BHMA A156.18.

C. Fasteners: Provide door hardware manufactured to comply with published templates prepared for machine, wood, and sheet metal screws. Provide screws that comply with commercially recognized industry standards for application intended, except aluminum fasteners are not permitted. Provide Phillips flat-head screws with finished heads to match surface of door hardware, unless otherwise indicated.
   1. Concealed Fasteners: For door hardware units that are exposed when door is closed, except for units already specified with concealed fasteners. Do not use through bolts for installation where bolt head or nut on opposite face is exposed unless it is the only means of securely attaching the door hardware. Where through bolts are used on hollow door and frame construction, provide sleeves for each through bolt.
   2. Fire-Rated Applications:
      a. Wood or Machine Screws: For the following:
         1. Hinges mortised to doors or frames; use threaded-to-the-head wood screws for wood doors and frames.
         2. Strike plates to frames.
3. Closers to doors and frames.

b. Steel Through Bolts: For the following unless door blocking is provided:

1. Surface hinges to doors.

2. Closers to doors and frames.


3. Spacers or Sex Bolts: For through bolting of hollow-metal doors.

4. Gasketing Fasteners: Provide noncorrosive fasteners for exterior applications and elsewhere as indicated.

2.12 FINISHES

A. Provide finishes complying with BHMA A156.18 as indicated in door hardware schedule.

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine doors and frames, with Installer present, for compliance with requirements for installation tolerances, labeled fire-rated door assembly construction, wall and floor construction, and other conditions affecting performance.

B. Examine roughing-in for electrical power systems to verify actual locations of wiring connections before electrified door hardware installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Steel Doors and Frames: For surface applied door hardware, drill and tap doors and frames according to ANSI/SDI A250.6.
B. Wood Doors: Comply with DHI WDHS.5 "Recommended Hardware Reinforcement Locations for Mineral Core Wood Flush Doors."

3.03 INSTALLATION

A. Mounting Heights: Mount door hardware units at heights indicated on Drawings to comply with the following unless otherwise indicated or required to comply with governing regulations.


B. Install each door hardware item to comply with manufacturer's written instructions. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation of surface protective trim units with finishing work specified in Division 9 Sections. Do not install surface-mounted items until finishes have been completed on substrates involved.

1. Set units level, plumb, and true to line and location. Adjust and reinforce attachment substrates as necessary for proper installation and operation.

2. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors according to industry standards.

C. Hinges: Install types and in quantities indicated in door hardware schedule but not fewer than the number recommended by manufacturer for application indicated or one hinge for every 30 inches (750 mm) of door height, whichever is more stringent, unless other equivalent means of support for door, such as spring hinges or pivots, are provided.

D. Key Control System: Tag keys and place them on markers and hooks in key control system cabinet, as determined by final keying schedule.

E. Thresholds: Set thresholds for exterior doors and other doors indicated in full bed of sealant complying with requirements specified in Division 7 Section "Joint Sealants."

F. Perimeter Gasketing: Apply to head and jamb, forming seal between door and frame.

G. Door Bottoms: Apply to bottom of door, forming seal with threshold when door is closed.

3.04 ADJUSTING

A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final
operation of heating and ventilating equipment and to comply with referenced accessibility requirements.

1. Door Closers: Adjust sweep period to comply with accessibility requirements and requirements of authorities having jurisdiction.

3.05 CLEANING AND PROTECTION

A. Clean adjacent surfaces soiled by door hardware installation.

B. Clean operating items as necessary to restore proper function and finish.

C. Provide final protection and maintain conditions that ensure that door hardware is without damage or deterioration at time of Substantial Completion.

B Street Water Treatment Plant &
North Water Treatment Plant Improvements
City of Meridian

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SECTION 09910

PAINTING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. The Work includes all labor, materials and equipment necessary to complete the work specified herein, including surface preparation, painting and finishing of interior and exterior exposed items and surfaces throughout Project, except as otherwise indicated. Also included is field painting of exposed bare and covered pipes and exposed steel except as otherwise indicated.

B. Paint exposed surfaces whether or not colors are designated in schedules except where material is specifically noted as a surface not to be painted. Where items or surfaces are not specifically mentioned, paint same as adjacent similar materials or areas. If color or finish is not designated, the Architect will select these from standard colors available for materials systems specified.

C. The terms "paint" or "painting" as used in this section means all coating systems materials including primers, sealers, stains, oil, alkyd, latex, vinyl, polyurethane, epoxy and enamel-type paints and the application of these materials.

D. All items not to be painted shall be fully protected from paint, over-spray, solvents or any damage due to painting work.

E. Areas to paint include the following, but are not necessarily limited to:

1. Hollow metal doors and frames (Man Doors)

2. Metal Fabrications Carbon Steel not factory finish coated or galvanized.

3. Unit Masonry Walls.

F. The Contractor shall examine the Specifications for the various other trades and shall thoroughly familiarize himself with all their provisions regarding painting. All surfaces that are left unfinished by the requirements of the other Sections, except “Items Not Included” in this Section, shall be painted or finished as part of the Work covered by this Section.
1.03 RELATED WORK

A. Division 5 Sections for all exposed steel members with primers specified in this Section.

B. Division 8 Sections for factory doors with primers specified in this Section.

1.04 SUBMITTALS

A. Submit a complete list of products and product data on each product indicating manufacturer, brand name, quality and type of paint for each surface to be painted as per Section 01340.

B. Product Data: For each type of product indicated.

1. Requests for substitution shall include manufacturer's literature for each product giving the name, generic type, descriptive information and evidence of satisfactory past performance. Submittals shall include the following performance data as certified by a qualified testing:

   a. Abrasion Fed. Test Method Std. No. 141, Method 6192, CS-17 Wheel, 1,000 grams load.

   b. Adhesion Elcometer Adhesion Tester.

   c. Exterior Exposure Exposed at 45 degrees facing ocean.

   d. Hardness ASTM D3363-74

   e. Humidity ASTM D2247-68

   f. Salt Spray (FOG) ASTM B117-73

C. Samples for Initial Selection:

1. Submit duplicate 12” x 12” samples for each color selection for each type of paint as per schedules for this Section. One approved sample of each color shall be kept at the job office.

D. Product List: For each product indicated, include the following:

1. Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules.

1.05 QUALITY ASSURANCE
A. Product manufacturer shall specialize in manufacturing quality paint and finish products. All paint material if possible shall be manufactured by one company.

B. Installer shall be a company specializing in performing work in this section with minimum 5 year commercial painting experience.

C. Paints and coatings shall not settle excessively, cake or thicken in the container. Any such material shall be removed from the site and not used.

D. All work in this section shall meet applicable requirements and recommendations of Painting and Decorating Contractors of America (PDCA).

E. This Work shall be scheduled and coordinated with other trades and shall not proceed until other Work and/or job conditions are as required to achieve satisfactory results.

F. MPI Standards:
   1. Products: Complying with MPI standards indicated and listed in "MPI Approved Products List."

1.06 DELIVERY, STORAGE, AND HANDLING

A. Approved paints shall be delivered in labeled, sealed, and undamaged containers. Labels shall include manufacturer name, paint type, brand color, coverage, surface preparation, drying time, clean up, color designation, mixing and reducing instructions.

B. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F.
   1. Take all necessary precautions to prevent fire, explosions, and other damage.
   2. All rags and paint or solvents must be stored in closed metal containers at all times.
   3. Store all paint materials in a single location, and as per manufacturer's recommendations.

1.07 SYSTEM INSPECTION TESTING

A. All surface preparation and repairs shall be approved by the Architect or Owner's Representative before primer is applied.
B. After application of each coating in the specified system and its surface has cured, measure its thickness with a properly calibrated Nordson Microtest Dry Film Thickness Gauge, or equivalent. (Use an instrument such as a Tooke gauge if a destructive tester is deemed necessary). Follow standard method for measurement of dry paint thickness with magnetic gages as outlined in Steel Structures Painting Council's SSPC-PA2-73T. The Engineer shall, at his direction, use the Contractor's or his own equipment to perform similar inspections.

C. Make as many determinations as needed to ensure the specified thickness values in each typical area. To all surfaces having less dry film thickness than specified, apply additional coat(s) at no extra cost to Owner to bring thickness up to specifications.

D. For immersed, interior surfaces, a non-destructive holiday detector (not to exceed 67.5 volts or that suggested by the coating manufacturer) shall be used. All identified pinholes shall be repaired in accordance with the manufacturer's printed recommendations and then re-tested.

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

1.08 PROJECT CONDITIONS

A. Environmental Requirements:

1. Strictly comply with manufacturer's recommendations as to conditions under which coatings can be applied.

2. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F for 24 hours prior to, during, and after application.

3. Do not apply coating in areas where dust is being generated. Surfaces shall be free of foreign matter. Spaces shall be dust free and broom clean.

4. Lighting shall be adequate as required for proper application, provided by applicator as necessary to supplement temporary lighting. Paint only during daylight hours.

5. Do not apply paints in snow, rain, fog, or mist; when relative humidity exceeds 85 percent; at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.

6. Do not paint porous surfaces which have a moisture content above 12%.
7. Ventilate interiors during application and drying.

B. Protection:

1. Cover or otherwise protect all finished work of other trades and surfaces not being painted. Repair damaged surfaces to the satisfaction of the Architect.

2. Remove finish hardware, accessories, light fixtures and cover plates, factory finished work, and similar items. Replace upon completion of painting.

3. Prevent any fire hazards. Remove empty paint containers from site.

1.09 EXTRA MATERIALS

A. Furnish extra materials described below that are from same production run (batch mix) as materials applied and that are packaged for storage and identified with labels describing contents.

1. Quantity: Furnish an additional 5 percent, but not less than 1 gal. of each material and color applied.

PART 2 - PRODUCTS

2.01 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:

1. Ameron/PPG

2. ICI Devoe (Canada).

3. ICI Paints.

4. Sherwin Williams

5. Tnemec

6. Approved Equal.
C. Gloss levels for paints required are as follows (ref. National Paint & Coatings Association - NPCA):

<table>
<thead>
<tr>
<th>Sheen Level</th>
<th>Test Method</th>
<th>Gloss Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flat</td>
<td>85 degree meter</td>
<td>Below 15</td>
</tr>
<tr>
<td>Eggshell</td>
<td>60 degree meter</td>
<td>5 to 20</td>
</tr>
<tr>
<td>Satin</td>
<td>60 degree meter</td>
<td>15 to 35</td>
</tr>
<tr>
<td>Semi-Gloss</td>
<td>60 degree meter</td>
<td>30 to 65</td>
</tr>
<tr>
<td>Gloss</td>
<td>60 degree meter</td>
<td>Over 65</td>
</tr>
</tbody>
</table>

2.02 MATERIALS

A. Provide best quality "first line" grade of each various type of coating as regularly manufactured by acceptable paint materials manufacturers. Do not use coatings having a lead content. Paint thinners and tints shall be products of same manufacturer as paints and shall be pure, best quality products. Contractor shall be responsible for compatibility of materials.

B. Submit paint schedule of acceptable manufacturer's products to the Engineer.

C. Coatings shall be ready mixed unless the products are field catalyzed coatings. Process pigments to a soft paste consistency capable of being readily and uniformly dispersed to a homogeneous coating. Good flow and brushing properties; capable of drying or curing free of streaks or sags.

D. No request for substitution will be considered which decreases the film thickness specified and/or the number of coats or changes the generic type of coating.

E. Application equipment items are not required to be new, but they shall be adequate and commensurate for the work and workmanship required herein.

F. Provide all required ladders, scaffolding, drop cloths, maskings, scrapers, tools, sandpaper, dusters and cleaning solvents as required to perform the work and achieve the results specified herein.

2.03 PAINT, GENERAL

A. Material Compatibility:

1. Provide materials for use within each paint system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.

2. For each coat in a paint system, provide products recommended in writing by manufacturers of topcoat for use in paint system and on substrate indicated.
B. Colors: As selected by Engineer from manufacturer's full range.

2.04 PRIMERS/SEALERS

A. Alkali-Resistant Primer: MPI #3.
   1. VOC Content: E Range of E2.

B. Bonding Primer (Water Based): MPI #17.
   1. VOC Content: E Range of E2.

C. Bonding Primer (Solvent Based): MPI #69.
   1. VOC Content: E Range of E2.

D. Wood-Knot Sealer: Sealer recommended in writing by topcoat manufacturer for use in paint system indicated.

2.05 BLOCK FILLERS

A. Block Filler, Latex, Interior/Exterior: MPI #4

2.06 METAL PRIMERS

A. Alkyd Anticorrosive Metal Primer: MPI #79.
   1. VOC Content: E Range of E2.

B. Quick-Drying Alkyd Metal Primer: MPI #76.
   1. VOC Content: E Range of E2.

2.07 EXTERIOR ALKYD PAINTS

A. Exterior Alkyd Enamel (Flat): MPI #8 (Gloss Level 1).
   1. VOC Content: E Range of E1.

B. Exterior Alkyd Enamel (Semigloss): MPI #94 (Gloss Level 5).
   1. VOC Content: E Range of E1.

C. Exterior Alkyd Enamel (Gloss): MPI #9 (Gloss Level 6).
   1. VOC Content: E Range of E1.
PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of work.

B. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.

C. Begin coating application only after unsatisfactory conditions have been corrected and surfaces are dry.
   1. Beginning coating application constitutes Contractor's acceptance of substrates and conditions.

3.02 PREPARATION

A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates and paint systems indicated.

B. Remove plates, machined surfaces, and similar items already in place that are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.
   1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.
   2. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.

C. All surfaces must be dry and free of foreign matter, grease, oil, dust, and surface defects before applying any paint or coating. Surfaces must be as required to obtain a sound sustaining bond between the surface and the coating.
   1. Remove incompatible primers and reprime substrate with compatible primers as required to produce paint systems indicated.
   2. Remove mildew with approved solution.
   3. Repair minor surface defects.
   4. Remove all rust from surfaces to be painted.
D. Moisture content of surface to be painted, shall not exceed twelve percent (12%). If moisture content is between eight percent (8%) and twelve percent (12%), prime with alkali resistant primer in place of specified primer.

E. All paint and coating materials must be thoroughly stirred and mixed.

F. Touch up all shop applied primers. All surfaces of steel or ferrous material that will become inaccessible after installation or by adjacent construction shall be fully coated prior to such inaccessibility.

G. Concrete Masonry Substrates: Remove efflorescence and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces to be painted exceeds that permitted in manufacturer's written instructions.

H. Steel Substrates: Remove rust and loose mill scale. Clean using methods recommended in writing by paint manufacturer.

I. Galvanized-Metal Substrates: Remove grease and oil residue from galvanized sheet metal fabricated from coil stock by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied paints.

3.03 APPLICATION

A. Each coat of paint shall be applied uniformly and completely over the entire surface with proper spreading rate listed by the related paint manufacturer.
   1. Use applicators and techniques suited for paint and substrate indicated.
   2. Paint surfaces behind movable items same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed items with prime coat only.

B. Tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of same material are to be applied. Tint undercoats to match color of topcoat, but provide sufficient difference in shade of undercoats to distinguish each separate coat.

C. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.

D. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.

E. Roller Applied Paint: Proper skill must be used to avoid all sags or lapping and excess paint lines from edge of roller. When cutting in with a brush is required, these areas
must be of same texture, color and hiding as adjacent areas to assure good uniform, consistent appearance.

F. Fill all voids and achieve a smooth surface. Pinholes will not be acceptable.

G. Exposed piping, conduits, ductwork, hangers and related or similar materials shall be painted.

3.04 FIELD QUALITY CONTROL

A. Testing of Paint Materials: Owner reserves the right to invoke the following procedure at any time and as often as Owner deems necessary during the period when paints are being applied:

1. Owner will engage the services of a qualified testing agency to sample paint materials being used. Samples of material delivered to Project site will be taken, identified, sealed, and certified in presence of Contractor.

2. Testing agency will perform tests for compliance of paint materials with product requirements.

3. Owner may direct Contractor to stop applying paints if test results show materials being used do not comply with product requirements. Contractor shall remove noncomplying-paint materials from Project site, pay for testing, and repaint surfaces painted with rejected materials. Contractor will be required to remove rejected materials from previously painted surfaces if, on repainting with complying materials, the two paints are incompatible.

3.05 CLEANING AND PROTECTION

A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.

B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.

C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.

D. Protect all painted surfaces from damage and soiling until Final Acceptance of project.

E. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.
3.06 GUARANTEE

A. All materials and workmanship for work in this section shall be guaranteed for one (1) year from the date of substantial completion of the project.

3.07 PAINTING SCHEDULE

A. INTERIOR PAINT SYSTEMS

1. Metal Fabrication Members
   a. Hot-Dip Galvanized surfaces shall not have an additional coating.

B. EXTERIOR PAINTING SCHEDULE

1. Hot Dipped Galvanized-Metal Substrates
   a. Hot-Dip Galvanized surfaces shall not have an additional coating.

2. Exterior Metal Doors and Frames: Alkyd System.
   a. Prime Coat: Galvanized-metal primer. MPI #134
      1. Sherwin Williams Pro Cryl Universal Primer, 2 Mil DFT
   b. Intermediate Coat: Exterior alkyd enamel matching topcoat. MPI #154, 4 Mil DFT
   c. Topcoat: Exterior alkyd enamel (semigloss), MPI #154
      1. Sherwin Williams Sher-Cryl HPA High Performance Acrylic @ 4.0 mils DFT

3. Unit Masonry/Concrete Block (Interior)
   a. 1st Coat    Tnemec Series 130 Envirofill 60-80 Sq. Ft/Gal
      Stripe Coat all cracks less than 1/64” with Tnemec Series 156 Enviro-Crete
   b. 2nd Coat   Tnemec Series 156 Enviro-Crete 6.0-8.0 dry mils
   c. 3rd Coat   Tnemec Series 156 Enviro-Crete 6.0-8.0 dry mils

END OF SECTION
SECTION 09940

PROTECTIVE COATINGS

PART 1 - GENERAL

1.01 SCOPE

A. This section covers field applied protective coatings, including surface preparation, protection of surfaces, inspection, and other appurtenant work for equipment and surfaces designated to be coated with heavy-duty maintenance coatings. Regardless of the number of coats previously applied, at least two field coats in addition to any shop coats or field prime coats shall be applied to all surfaces unless otherwise specified.

1.02 GENERAL

A. Cleaning, surface preparation, coating application, and thickness shall be as specified herein and shall meet or exceed the coating manufacturer's recommendations. When the manufacturer's minimum recommendations exceed the specified requirements, Contractor shall comply with the manufacturer's minimum recommendations. When equivalent products are acceptable to Engineer, Contractor shall comply with this Specification and the coating manufacturer's recommendations.

1. Governing Standards
   a. All cleaning, surface preparation, coating application, thickness, testing, and coating materials (where available) shall be in accordance with the referenced standards of the following AWWA, ANSI, NACE, SSPC, NSF, and ASTM.

2. Delivery and Storage
   a. All coating products shall be received and stored in accordance with the coating manufacturer's recommendations.

1.03 SUBMITTALS (Not Used)

1.04 QUALITY ASSURANCE (Not Used)

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Alternative Manufacturers
   1. In addition to the coatings listed herein, equivalent products of other manufacturers that distribute globally will also be acceptable.
B. Equivalent Coatings

1. Whenever a coating is specified by the name of a proprietary product or of a particular manufacturer or vendor, it shall be understood as establishing the desired type and quality of coating. Other manufacturers' coatings will be accepted, provided that sufficient information is submitted to enable Engineer to determine that the proposed coatings are equivalent to those named. Information on proposed coatings shall be submitted for review in accordance with the Submittals section. Requests for review of equivalency will be accepted only from Contractor and will be considered only after the contract has been awarded.

2.02 MATERIALS

A. All coatings shall be delivered to the job in original, unopened containers, with labels intact. Coatings shall be stored indoors and shall be protected against freezing. No adulterant, unauthorized thinner, or other material not included in the coating formulation shall be added to the coating for any purpose.

All coatings shall conform to the air quality regulations applicable at the location of use. Coating materials that cannot be guaranteed by the manufacturer to conform, whether or not specified by product designation, shall not be used.

With the exception of heat resistant coatings, the coatings specified have been selected on the basis of the manufacturer's statement that the VOC content of the product is 2.8 lbs per gallon or less; however, it shall be the Contractor's responsibility to use only coating materials that are in compliance with the requirements of all regulatory agencies. Local regulations may require some coatings to have a lower VOC content than specified herein. The coatings specified may meet the VOC limits in the unthinned (as shipped) condition but may exceed the limits if thinned according to the manufacturer's recommendations. In such case, the coatings shall not be thinned beyond the 2.8 lbs per gallon limit, and if the product cannot be thinned to suit the application method or temperature limits, another manufacturer's coating shall be used, subject to acceptance by Engineer.

Contractor shall be responsible for ensuring the compatibility of field coatings with each other or with any previously applied coatings. Coatings used in successive field coats shall be produced by the same manufacturer. The first field coat over shop coated or previously coated surfaces shall cause no wrinkling, lifting, or other damage to underlying coats.

All coatings used on surfaces that will be in contact with potable or treated water shall be certified as being in compliance with ANSI/NSF 61. Coatings that cannot be so certified, whether or not specified by manufacturer and by product designation, shall not be used.

1. Primers.
## Universal Primer (tie coat)

|-------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

## Epoxy Concrete Block Filler

|-------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

## Epoxy Concrete Filler and Surfacer

<table>
<thead>
<tr>
<th></th>
<th>PPG Amercoat &quot;Dimetate 9 Series&quot;, Carboline &quot;Carbo Zinc II Series&quot;, ICI Devoe &quot;Catha-Coat 304V&quot;, or Sherwin-Williams &quot;Zinc Clad II Series&quot;.</th>
</tr>
</thead>
</table>

## Intermediate and Finish Coatings.

|-----------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

## Surface Preparation

### A. All surfaces to be coated shall be clean and dry and shall meet the recommendations of the coating manufacturer for surface preparation. Freshly coated surfaces shall be protected from dust and other contaminants. Oil and grease shall be completely removed by use of solvents or detergents before mechanical cleaning is started. The gloss on previously coated surfaces shall be dulled if necessary for proper adhesion of topcoats.

Surfaces shall be free of cracks, pits, projections, or other imperfections that would interfere with the formation of a smooth, unbroken coating film, except for concrete block construction where a rough surface is an inherent characteristic.

When applying touchup coating or repairing previously coated surfaces, the surfaces to be coated shall be cleaned as recommended by the coating manufacturer, and the edges of the repaired area shall be feathered by sanding or wire brushing to produce a
smooth transition that will not be noticeable after the coating is applied. All coatings made brittle or otherwise damaged by heat of welding shall be completely removed.

1. **Galvanized Surfaces**
   a. Galvanized surfaces shall be prepared for coating according to the instructions of the manufacturer of the epoxy. Any chemical treatment of galvanized surfaces shall be followed by thorough rinsing with clean water.

2. **Ferrous Metal Surfaces**
   a. Ungalvanized ferrous metal surfaces shall be prepared for coating by using one or more of the following cleaning procedures specified here-in: solvents (SSPC-SP1); abrasive blasting (SSPC-SP5, -SP10, -SP6, or -SP7) power tools (SSPC-SP3 or -SP11); or hand tools (SSPC-SP2). Oil and grease shall be completely removed in accordance with SSPC-SP1 before beginning any other cleaning method. Surfaces of welds shall be scraped and ground as necessary to remove all slag and weld spatter. Tools which produce excessive roughness shall not be used.

All components of equipment that can be properly prepared and coated after installation shall be installed prior to surface preparation. Components that will be inaccessible after installation shall have the surfaces prepared and coated before installation. Motors, drive trains, and bearings shall be protected during surface preparation in accordance with the equipment manufacturer's recommendations.

All cut or sheared edges shall be ground smooth to a 1/8 inch minimum radius for all material 1/4 inch thickness and larger. For material thickness less than 1/4 inch all cut or sheared edges shall be ground smooth to a radius equal to 1/2 the material thickness. Grinding of rolled edges on standard shapes with a minimum radius of the 1/16 inch will not be required.

All ferrous metal surfaces shall have all welds ground smooth and free of all defects in accordance with NACE Standard SP0178, Appendix C, Designation C and sharp edges ground smooth, if not previously prepared in the shop. Instead of blending of the weld with the base metal as required by the NACE standard, it will be acceptable to furnish a welded joint that has a smooth transition of the weld to the base metal. All welds shall be ground smooth to ensure satisfactory adhesion of paint.

The cleaning methods and surface profiles specified herein are minimums, and if the requirements printed in the coating manufacturer's data sheets exceed the limits specified, the value printed on the data sheets shall become the minimum requirement.

1. **Ferrous Metal Surfaces – Non-immersion Service**
   a. Ferrous metal surfaces, including fabricated equipment, in non-immersion service shall be cleaned to the degree recommended by the
coating manufacturer for surfaces to be coated with coal tar epoxy, epoxy, and heat-resistant coatings, except galvanized surfaces.

Surface preparation of ferrous metal surfaces in non-immersion service shall consist of abrasive blast cleaning to SSPC-SP6, and the first application of coating shall be performed on the same day. If more surface area is prepared than can be coated in one day, the uncoated area shall be blast cleaned again to the satisfaction of Engineer. Surface profile shall be as recommended by coating manufacturer, but not less than 2.0 mils.

2. **Ferrous Metal Surfaces - Immersion Service**
   a. Surface preparation of ferrous metal surfaces in immersion service shall consist of abrasive blast cleaning to at least SSPC-SP10 and the first application of coating shall be performed on the same day. If more surface area is prepared than can be coated in one day, the uncoated area shall be blast cleaned again to the satisfaction of Engineer. Surface profile shall be as recommended by coating manufacturer, but not less than 3.5 mils.

3. **Concrete Surfaces**
   a. All concrete surfaces shall be free of objectionable substances and shall meet the coating manufacturer's recommendations for surface preparation. Any other surface preparation recommended by the coating material manufacturer shall be brought to Engineer's attention and may be incorporated into the work if acceptable to Engineer.

   All concrete surfaces shall be dry when coated and free from dirt, dust, sand, mud, oil, grease, and other objectionable substances. Oil and grease shall be completely removed by use of solvents or detergents before mechanical cleaning is started.

   New concrete shall have cured for at least 4 weeks before coating is applied as recommended by the material manufacturer. Concrete surfaces shall be tested for capillary moisture in accordance with ASTM D4263. There shall be no capillary moisture when coatings are applied on concrete.

   All surfaces to be coated shall be cleaned in accordance with ASTM D4258 and abraded in accordance with ASTM D4259. Surface profile shall be at least 25 percent of the dry film thickness specified for the coating system. Prior to application of the coating, the surfaces shall be thoroughly washed or cleaned by air blasting to remove all dust and residue. Spalled areas, voids, and cracks shall be repaired in accordance with the Concrete section and as acceptable to the Engineer. Fins and other surface projections shall be removed to provide a flush surface before application of coating.

   Except where epoxy is applied as damp-proofing, the concrete surfaces, including those with bug holes less than 1 inch in any dimension, shall be prepared when required and as recommended by the manufacturer, using an
epoxy concrete filler and surfacer. Where coating with a vinyl ester the concrete filler and surfacer shall be as recommended by the manufacturer to be compatible with vinyl ester.

4. **Concrete Block Surfaces**
   a. Voids and openings in concrete block surfaces shall be pointed. All exposed exterior surfaces and surfaces to be coated with epoxy, including the joints, shall be filled so that a continuous unbroken coating film is obtained.

5. **Copper Tubing**
   a. All flux residue shall be removed from joints in copper tubing. Immediately before coating is started, tubing shall be wiped with a clean rag soaked in xylol.

6. **Plastic Surfaces**
   a. All wax and oil shall be removed from plastic surfaces that are to be coated, including PVC and FRP, by wiping with a solvent compatible with the specified coating.

7. **Hardware**
   a. Hardware items such as bolts, screws, washers, springs, and grease fittings need not be cleaned prior to coating if there is no evidence of dirt, corrosion, or foreign material.

8. **Aluminum**
   a. When a coating system is required, remove all oil or deleterious substance with neutral detergent or emulsion cleaner or blast lightly with fine abrasive.

9. **Stainless Steel**
   a. When a coating system is required, surface preparation shall conform to the coating manufacturer's recommendations.

### 3.02 MIXING AND THINNING

A. Coating shall be thoroughly mixed each time any is withdrawn from the container. Coating containers shall be kept tightly closed except while coating is being withdrawn.

Coating shall be factory mixed to proper consistency and viscosity for hot weather application without thinning. Thinning will be permitted only as necessary to obtain recommended coverage at lower application temperatures. In no case shall the wet film thickness of applied coating be reduced, by addition of coating thinner or otherwise, below the thickness recommended by the coating manufacturer. Thinning shall be done in compliance with all applicable air quality regulations.

### 3.03 APPLICATION

A. Coating shall be applied in a neat manner that will produce an even film of uniform and proper thickness, with finished surfaces free of runs, sags, ridges, laps, and brush marks. Each coat shall be thoroughly dry and hard before the next coat is applied. Each coat shall be a different color, if available. In no case shall coating be applied at a rate of coverage greater than the maximum rate recommended by the coating manufacturer.
Coating failures will not be accepted and shall be entirely removed down to the substrate and the surface recoated. Failures include but are not limited to sags, checking, cracking, teardrops, fat edges, fisheyes, or delamination.

1. **Priming**
   a. Edges, corners, crevices, welds, and bolts shall be given a brush coat (stripe coat) of primer before application of the primer coat. The stripe coat shall be applied by a brush and worked in both directions. Special attention shall be given to filling all crevices with coating. When using zinc primers the stripe coat shall follow the initial prime coat.

   Abraded and otherwise damaged portions of shop-applied coating shall be cleaned and recoated as recommended by the manufacturer of the finish coating. Welded seams and other uncoated surfaces, heads and nuts of field-installed bolts, and surfaces where coating has been damaged by heat shall be given a brush coat of the specified primer. Before the specified spot or touchup coating of metal surfaces, edges, corners, crevices, welds, and bolts in the area of the spot or touchup coating shall be given a brush coat of primer. This patch, spot, or touchup coating shall be completed, and the paint film shall be dry and hard, before additional coating is applied.

2. **Epoxy**
   a. When used, epoxy shall be applied in accordance with the coating manufacturer's recommendations, including temperature limitations and protection from sunlight until top-coated.

   When concrete is to be coated, coatings shall not be applied to concrete surfaces in direct sunlight or when the temperature of the concrete is rising. Preferably the coating shall be applied when the temperature of the concrete is dropping.

   When applying high build epoxy coatings with a roller or brush and where a dry film thickness of at least 4-6 mils per coat is required, two or more coats shall be applied to achieve the recommended dry film thickness equal to a spray applied coating.

3. **Coal Tar Epoxy (Not Used)**

4. **Vinyl Ester**
   a. When used, the application of vinyl ester coating system, including time limits for recoating and temperature requirements of the materials, shall conform to the recommendations of the coating manufacturer.

5. **Film Thickness**
   a. The total coating film thickness including intermediate coats and finish coat, shall be not less than the following:

<table>
<thead>
<tr>
<th>Type of Coating</th>
<th>Minimum Dry Film Thickness</th>
</tr>
</thead>
<tbody>
<tr>
<td>Epoxy</td>
<td></td>
</tr>
<tr>
<td>Floors (two coats)</td>
<td>10 mils.</td>
</tr>
</tbody>
</table>
B Street Water Treatment Plant &
North Water Treatment Plant Improvements
City of Meridian

<table>
<thead>
<tr>
<th>Type of Coating</th>
<th>Minimum Dry Film Thickness</th>
</tr>
</thead>
<tbody>
<tr>
<td>Surfaces with first coat of epoxy and final coat of</td>
<td>7 mils (5 mils DFT for epoxy plus 2 mil DFT for aliphatic polyurethane).</td>
</tr>
<tr>
<td>aliphatic polyurethane</td>
<td></td>
</tr>
<tr>
<td>Surfaces with first and second coat of epoxy and</td>
<td>12 mils (10 mils DFT for epoxy plus 2 mils DFT for aliphatic polyurethane).</td>
</tr>
<tr>
<td>final coat of aliphatic polyurethane</td>
<td></td>
</tr>
<tr>
<td>Other surfaces (two coats)</td>
<td>10 mils.</td>
</tr>
<tr>
<td>Immersion service (three coats)</td>
<td>15 mils.</td>
</tr>
<tr>
<td>Flake-filled epoxy (two coats)</td>
<td>30 mils.</td>
</tr>
<tr>
<td>Vinyl ester</td>
<td>30 mils.</td>
</tr>
<tr>
<td>Zinc, epoxy, polyurethane</td>
<td></td>
</tr>
<tr>
<td>Surfaces with first coat of zinc, intermediate coat</td>
<td>10 mils, 3 mils zinc, 5 mils epoxy, plus 2 mils for aliphatic polyurethane.</td>
</tr>
<tr>
<td>of epoxy, and final coat of aliphatic polyurethane</td>
<td></td>
</tr>
<tr>
<td>Heat-resistant (silicone)</td>
<td>3 mils.</td>
</tr>
<tr>
<td>High heat-resistant (silicone)</td>
<td>3 mils.</td>
</tr>
<tr>
<td>Other (one coat)</td>
<td>5 mils.</td>
</tr>
<tr>
<td>Other (two coats)</td>
<td>10 mils.</td>
</tr>
</tbody>
</table>

6. **Weather Conditions**

a. Coatings shall not be applied, except under shelter, during wet, damp, or foggy weather, or when windblown dust, dirt, debris, or insects will collect on freshly applied coating.

Coatings shall not be applied at temperatures lower than the minimum temperature recommended by the coating manufacturer, or to metal surfaces such as tanks or pipe containing cold water, regardless of the air temperature, when metal conditions are likely to cause condensation. When necessary for proper application, a temporary enclosure shall be erected and kept heated until the coating has fully cured.

Coatings shall not be applied at temperatures higher than the maximum temperature recommended by the coating manufacturer. Where coatings are applied during periods of elevated ambient temperatures, Contractor and the coatings manufacturer shall be jointly responsible to ensure that proper application is performed including adherence to all re-coat window requirements. Precautions shall be taken to reduce the temperature of the surface application, especially for metal, at elevated temperatures above 100°F including shading application area from direct sunlight, applying coating in the...
evening or at night, and ventilating the area to reduce the humidity and temperature,

Vinyl ester coating materials, when required, shall be maintained during transportation, storage, mixing, and application at the temperature required by the coating manufacturer, 35°F to 90°F.

3.04 REPAIRING FACTORY FINISHED SURFACES (Not Used)

3.05 PROTECTION OF SURFACES

A. Throughout the work Contractor shall use drop cloths, masking tape, and other suitable measures to protect adjacent surfaces. Contractor shall be responsible for correcting and repairing any damage resulting from its or its subcontractors' operations. Coatings spilled or spattered on adjacent surfaces which are not being coated at the time shall be immediately removed. Exposed concrete or masonry not specified to be coated which is damaged by coatings shall be either removed and rebuilt or, where authorized by Owner, coated with two coats of masonry coating.

3.06 FIELD QUALITY CONTROL

A. The following inspection and testing shall be performed: surface profile, visual inspection, spark testing, adhesion testing, and wet and dry film thickness testing. All inspection and testing shall be witnessed by Engineer.

1. Surface Profile Testing
   a. The surface profile for ferrous metal surfaces shall be measured for compliance with the specified minimum profile. The surface profile for concrete shall comply with SSPC 13/NACE 6 Table 1 for severe service.

2. Visual Inspection
   a. The surface of the protective coatings shall be visually inspected.

3. Film Thickness
   a. Coating film thickness shall be verified by measuring the film thickness of each coat as it is applied and the dry film thickness of the entire system. Wet film thickness shall be measured with a gauge that will measure the wet film thickness within an accuracy of ±0.5 mil. Dry film thickness shall be measured in accordance with SSPC-PA 2.

4. Spark Testing
   a. Coatings shall be spark tested by the coating manufacturer using an acceptable electrical spark tester set at the recommended voltage. Engineer shall observe the spark testing and shall verify the testing equipment is working properly before the spark testing of the coating is started. The electrode movement shall be continuous and shall proceed in a systematic manner that will cover 110 percent of the coated surface.
Spark testing for coatings on metal shall be done in accordance with ASTM D5162. Spark testing for coating on concrete shall be done in accordance with ASTM D4787.

All detected holidays and pinholes shall be marked and repaired as recommended by the coating material manufacturer.

5. **Adhesion Testing**
   a. An adhesion test shall be conducted on a properly prepared and coated steel or concrete surface that is acceptable to the coating material manufacturer and Engineer. The test area shall be at least 2 square feet or larger to allow a minimum of three tests to be conducted. The test area shall be coated with the specified system and cured as recommended by the coating material manufacturer. Pull-off strength adhesion tests of the coating shall be conducted by the coating material manufacturer in accordance with ASTM D4541 for metal surfaces and ASTM D7234 for concrete surfaces. Elcometer or other tensile adhesion tester acceptable to the Engineer shall be used. At least three adhesion tests shall be conducted and the results averaged. Adhesion strength shall equal or exceed the minimum adhesion strength recommended by the coating material manufacturer and shall exceed the tensile strength of the concrete.

If the coating fails the adhesion test, the cause of the failure shall be determined and corrected before reconducting the test.

### 3.07 FIELD PRIMING SCHEDULE

A. In general, steel and cast iron surfaces of equipment are specified to be shop primed. Any such surfaces which have not been shop primed shall be field primed. Damaged or failed shop coatings which have been determined unsuitable by Engineer shall be removed and the surfaces shall be field coated, including prime coat (if any). Galvanized, aluminum, stainless steel, and insulated surfaces shall be field primed. Primers used for field priming, unless otherwise required for repair of shop primers, shall be:

<table>
<thead>
<tr>
<th>Surface To Be Primed</th>
<th>Material</th>
</tr>
</thead>
<tbody>
<tr>
<td>Equipment, surfaces to be coated with</td>
<td></td>
</tr>
<tr>
<td>Aliphatic polyurethane</td>
<td>Universal primer.</td>
</tr>
<tr>
<td>Epoxy</td>
<td>Same as finish coats.</td>
</tr>
<tr>
<td>Vinyl ester</td>
<td>Same as finish coats.</td>
</tr>
<tr>
<td>Steel and cast iron, surfaces to be</td>
<td></td>
</tr>
<tr>
<td>coated with</td>
<td></td>
</tr>
<tr>
<td>Epoxy</td>
<td>Same as finish coats or inorganic zinc.</td>
</tr>
<tr>
<td>Aluminum</td>
<td>Epoxy.</td>
</tr>
<tr>
<td>Galvanized</td>
<td>Epoxy.</td>
</tr>
</tbody>
</table>
Surface To Be Primed | Material
---|---
Copper | Epoxy.
Stainless steel | Epoxy.
Plastic surfaces, including PVC and FRP | Same as finish coats.
Insulated piping | As recommended by manufacturer of finish coats.
Concrete, surfaces to be coated with epoxy | 
For damp-proofing | Epoxy.
For all other surfaces | Epoxy concrete filler and surfacer.
Concrete block exposed in exterior locations | Epoxy concrete block filler.
Concrete block to be coated with epoxy | Epoxy concrete block filler.

Unless otherwise recommended by the coating manufacturer or specified herein, priming will not be required on concrete, or concrete block, nor on metal surfaces specified to be coated with epoxy enamel, coal tar epoxy, and heat-resistant coatings. Concrete surfaces to be coated with epoxy shall be filled with epoxy concrete filler and surfacer so that a continuous film is obtained, except where concrete is damp-proofed with epoxy.

### 3.08 FINISH COATING SYSTEMS

A. The following schedule lists coatings systems and coating surface designations. See below for a definition of the surface designations.

<table>
<thead>
<tr>
<th>Prefix</th>
<th>Surfaces</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Iron and steel (coated entirely in field)</td>
</tr>
<tr>
<td>A</td>
<td>Iron and steel (shop primed)</td>
</tr>
<tr>
<td>C</td>
<td>Concrete and concrete block</td>
</tr>
<tr>
<td>E</td>
<td>Equipment – submerged</td>
</tr>
<tr>
<td>E</td>
<td>Equipment – nonsubmerged</td>
</tr>
<tr>
<td>F</td>
<td>Nonferrous metal</td>
</tr>
<tr>
<td>G</td>
<td>Galvanized</td>
</tr>
<tr>
<td>H</td>
<td>High temperature</td>
</tr>
<tr>
<td>P</td>
<td>PVC and FRP</td>
</tr>
<tr>
<td>No.</td>
<td>Finish Coating Systems</td>
</tr>
<tr>
<td>-----</td>
<td>------------------------------------------------------------</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>1.</td>
<td>Epoxy – One coat</td>
</tr>
<tr>
<td>2.</td>
<td>Epoxy – Two coats</td>
</tr>
<tr>
<td>3.</td>
<td>Epoxy / NSF – Two coats</td>
</tr>
<tr>
<td>4.</td>
<td>Epoxy – Three coats</td>
</tr>
<tr>
<td>5.</td>
<td>Epoxy / NSF – Three coats</td>
</tr>
<tr>
<td>6.</td>
<td>Epoxy – First coat</td>
</tr>
<tr>
<td></td>
<td>Aliphatic polyurethane – Finish coat</td>
</tr>
<tr>
<td>7.</td>
<td>Epoxy – First and second coat</td>
</tr>
<tr>
<td></td>
<td>Aliphatic polyurethane – Finish coat</td>
</tr>
<tr>
<td>8.</td>
<td>Universal primer – First coat</td>
</tr>
<tr>
<td></td>
<td>Aliphatic polyurethane – Finish coat</td>
</tr>
<tr>
<td>9.</td>
<td>Medium consistency coal tar – Two coats</td>
</tr>
<tr>
<td>10.</td>
<td>Coal tar epoxy – Two coats</td>
</tr>
<tr>
<td>11.</td>
<td>Vinyl ester – Two coats</td>
</tr>
<tr>
<td>12.</td>
<td>Heat resistant – Two coats</td>
</tr>
<tr>
<td>13.</td>
<td>High heat resistant – Two coats</td>
</tr>
<tr>
<td>14.</td>
<td>Zinc primer – First coat</td>
</tr>
<tr>
<td></td>
<td>Epoxy – Intermediate coat</td>
</tr>
<tr>
<td></td>
<td>Aliphatic polyurethane – Final coat</td>
</tr>
<tr>
<td>15.</td>
<td>Flake-filled epoxy</td>
</tr>
</tbody>
</table>

1. **Surfaces Not To Be Coated**
   a. Unless otherwise specified, the following surfaces shall be left uncoated:
      1. Exposed aluminum, except ductwork.
      2. Polished or finished stainless steel. Unfinished stainless steel, except flashings and counter flashings, shall be coated.
      3. Nickel or chromium.
      4. Galvanized surfaces, except piping, conduit, ductwork, and other items specifically noted.
      5. Rubber and plastics, except as specified.
      7. FRP wastewater troughs.
8. Surfaces specified to be factory finished.

2. **Shop Finishing**
   a. Items to be shop finished include the following. Shop finishing shall be in accordance with the coating manufacturer’s recommendations.
      1. Other surfaces where blast cleaning cannot be or is not recommended to be performed in the field.
      2. Other items as otherwise specified.

3. **Field Coating**
   a. Items to be field coated include the following. Field coating shall be in accordance with the field priming schedule, the coating schedule, and the manufacturer’s recommendations.
      1. Surfaces not indicated to be shop finished and surfaces where blast cleaning can be performed in the field.
      2. Other items as otherwise specified.

3.09 **METAL SURFACES COATING SCHEDULE**

<table>
<thead>
<tr>
<th>Surface To Be Coated</th>
<th>Finish Coating System</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-galvanized structural and miscellaneous steel exposed to view or to the elements in exterior locations.</td>
<td>A6 A7 A14</td>
</tr>
<tr>
<td>Non-galvanized [and galvanized] structural and miscellaneous steel exposed to view inside buildings.</td>
<td>A2</td>
</tr>
<tr>
<td>Steel handrails, steel floor plates</td>
<td>A8</td>
</tr>
<tr>
<td>Unless otherwise specified, pumps, motors, speed reducers, and other machines and equipment exposed to view.</td>
<td>E8</td>
</tr>
<tr>
<td>Actuator surfaces for outdoor service, unless factory finished.</td>
<td>Outdoor – E7 E8</td>
</tr>
<tr>
<td></td>
<td>Indoor – E6 E8</td>
</tr>
<tr>
<td>Metal curbs for skylights and power roof ventilators.</td>
<td>A1</td>
</tr>
<tr>
<td>Heating and air conditioning units, convector covers, electrical equipment cabinets, and similar Items and equipment (unless factory finished) exposed to view.</td>
<td>E8</td>
</tr>
<tr>
<td>Surfaces of cranes and hoists exposed to view indoors.</td>
<td>E2 or E8</td>
</tr>
<tr>
<td>Surfaces of cranes and hoists exposed to the elements outdoors.</td>
<td>E7</td>
</tr>
<tr>
<td>Dockboard and metal parts of dock bumpers exposed to view or to the elements.</td>
<td>E8</td>
</tr>
<tr>
<td>Steel yard lighting poles exposed to view or to the elements.</td>
<td>A8</td>
</tr>
<tr>
<td>Surface To Be Coated</td>
<td>Finish Coating System</td>
</tr>
<tr>
<td>-----------------------------------------------------------------------------------</td>
<td>-----------------------</td>
</tr>
<tr>
<td>Cast Iron and steel piping inside buildings, including piping to be insulated, valves, fittings, flanges, bolts, supports, and accessories, and galvanized surfaces after proper priming.</td>
<td>A2</td>
</tr>
<tr>
<td>Cast Iron and steel piping in immersion service including inside buildings, including valves, fittings, flanges, bolts, supports, and accessories, and galvanized surfaces after proper priming.</td>
<td>A5</td>
</tr>
<tr>
<td>Cast Iron and steel piping above grade exposed to the elements and to view outdoors, including piping to be insulated, valves, fittings, flanges, bolts, supports, and accessories, and galvanized surfaces after proper priming.</td>
<td>A7 or A14</td>
</tr>
<tr>
<td>Copper pipe and tubing, including fittings and valves.</td>
<td>F2</td>
</tr>
<tr>
<td>Copper pipe and tubing, including fittings and valves exposed to view in exterior locations.</td>
<td>F7</td>
</tr>
<tr>
<td>Basin launders, troughs, weir plates, and accessories.</td>
<td>A5</td>
</tr>
<tr>
<td>All metal surfaces, unless otherwise specified, which will be submerged or buried, all or in part, including valves, but excluding piping laid in the ground.</td>
<td>E5</td>
</tr>
<tr>
<td>Miscellaneous castings, including manhole rings and covers, and manhole steps. (One coat, if not shop coated.)</td>
<td>E3</td>
</tr>
<tr>
<td>Cast iron and steel piping in manholes, wetwells, and similar locations, including valves fittings, flanges, bolts, supports, and accessories.</td>
<td>E5</td>
</tr>
<tr>
<td>All metal harness anchorage for buried piping.</td>
<td>A10</td>
</tr>
<tr>
<td>Cast iron filter surface wash piping inside filter boxes, including fittings, bolts, and supports.</td>
<td>E5</td>
</tr>
<tr>
<td>Exterior surfaces of extension hoppers and accessories for chemical feeders.</td>
<td>Outdoor – E7 Indoor – E2</td>
</tr>
<tr>
<td>Exterior surfaces of carbon steel chemical tanks.</td>
<td>Outdoor – A7 Indoor – A1</td>
</tr>
<tr>
<td>Supports and miscellaneous metal for equipment handling corrosive chemicals.</td>
<td>Outdoor – A7 Indoor – A2</td>
</tr>
<tr>
<td>Aluminum in contact with concrete.</td>
<td>F1</td>
</tr>
<tr>
<td>Boiler breeching and other surfaces which will be hot during operation.</td>
<td>H12</td>
</tr>
<tr>
<td>Vacuum pump discharge piping.</td>
<td>H12</td>
</tr>
</tbody>
</table>
### B Street Water Treatment Plant &
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<table>
<thead>
<tr>
<th>Surface To Be Coated</th>
<th>Finish Coating System</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aluminum and galvanized ductwork and conduit indoors.</td>
<td>F2 or G2</td>
</tr>
<tr>
<td>Aluminum and galvanized ductwork and conduit exposed to elements outdoors.</td>
<td>F7 or G7</td>
</tr>
<tr>
<td>Aluminum materials exposed to the elements outdoors.</td>
<td>F7</td>
</tr>
</tbody>
</table>

#### 3.10 CONCRETE AND MASONRY SURFACES COATING SCHEDULE

<table>
<thead>
<tr>
<th>Surface To Be Coated</th>
<th>Finish Coating System</th>
</tr>
</thead>
</table>
| All concrete and concrete block in corrosive area (Except floors and surfaces scheduled to receive other coatings) which are exposed to view. Chemical containment areas shall be coated in accordance to the Section 09880. | Indoor –C2
|                                                           | Outdoor –C7          |
| Interior surfaces of filter wash water flumes.            | C5                    |
| Filter wash water troughs.                                | C5                    |
| Interior surfaces of sludge drawoff boxes outside of the solids contact clarifier. | C10                  |
| Where indicated on the Drawings, walls, floors, and curbed areas, adjacent to corrosive chemical storage and feed equipment Chemical containment areas shall be coated in accordance to the Section 09880. | C2                    |
| All walls in contact with liquid where the opposite face forms a part of an interior room or dry pit. | C5                    |
| All walls in contact with treated or potable water where the opposite face is above grade or which form is a part of an interior room or a dry pit. | C5                    |
| All surfaces, including basin walls, in contact with treated or potable water. | C5                    |
| All interior surfaces of walls in solids contact clarifier where the wall is also part of an interior room or dry pit. | C5                    |
| All interior surfaces of walls in a clearwell where the wall is also part of an interior room or dry pit. | C5                    |
| Interior walls of filter boxes, full height above underdrains and including edges of walkways. | C5                    |
3.11 MISCELLANEOUS SURFACES COATING SCHEDULE

<table>
<thead>
<tr>
<th>Plastic Surfaces, including PVC</th>
<th>Outdoor – P6</th>
<th>Indoor – P2</th>
</tr>
</thead>
<tbody>
<tr>
<td>and FRP.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Piping Insulation</td>
<td>Outdoor – P6</td>
<td>Indoor – P2</td>
</tr>
</tbody>
</table>

3.12 PIPING IDENTIFICATION SCHEDULE

A. Exposed piping and piping in accessible chases shall be identified with lettering or tags designating the service of each piping system, marked with flow directional arrows, and color coded.

Piping scheduled to be color coded shall be completely coated with the indicated colors, except surfaces specified to remain uncoated shall include sufficiently long segments of the specified color to accommodate the lettering and arrows. All other piping shall be coated to match adjacent ceiling or wall surfaces, unless otherwise directed by Engineer.

1. Location
   a. Lettering and flow direction arrows shall be provided on pipe near the equipment served, adjacent to valves, on both sides of wall and floor penetrations, at each branch or tee, and at least every 50 feet in straight runs of pipe. If, in the opinion of Engineer, this requirement will result in an excessive number of labels or arrows, the number required shall be reduced as directed.

2. Metal Tags
   a. Where the outside diameter of pipe or pipe covering is 5/8 inch or smaller, aluminum or stainless steel tags shall be provided instead of lettering. Tags shall be stamped as specified and shall be fastened to the pipe with suitable chains. Pipe identified with tags shall be color coded as specified.

3. Lettering
   a. Lettering shall be painted or stenciled on piping or shall be applied as snap-on markers. Snap-on markers shall be plastic sleeves, Brady "BradySnap-On B-915", Seton "Setmark", or equal. Letter size shall be as follows:

<table>
<thead>
<tr>
<th>Outside Diameter of Pipe or Covering</th>
<th>Minimum Height of Letters</th>
</tr>
</thead>
<tbody>
<tr>
<td>5/8 inch and smaller</td>
<td>Metal tags -1/4 inch</td>
</tr>
<tr>
<td>3/4 to 4 inches</td>
<td>3/4 inch</td>
</tr>
<tr>
<td>5 inches and larger</td>
<td>2 inches</td>
</tr>
</tbody>
</table>

4. Color Coding and Lettering
   a. All piping for the following services shall be color coded. Bands shall be 6 inches wide spaced along the pipe at 5 foot intervals. For services not listed, the color coding and lettering shall be as directed by the Engineer.
### Piping Identification

<table>
<thead>
<tr>
<th>Service</th>
<th>Color of Pipe</th>
<th>Color of Letters</th>
</tr>
</thead>
<tbody>
<tr>
<td>Raw or Recycle</td>
<td>Olive Green</td>
<td>Black</td>
</tr>
<tr>
<td>Settled or Clarified</td>
<td>Aqua</td>
<td>Black</td>
</tr>
<tr>
<td>Finished or Potable</td>
<td>Dark Blue</td>
<td>White</td>
</tr>
<tr>
<td>Alum or Primary Coagulant</td>
<td>Orange</td>
<td>Black</td>
</tr>
<tr>
<td>Ammonia</td>
<td>White</td>
<td>Black</td>
</tr>
<tr>
<td>Carbon Slurry</td>
<td>Black</td>
<td>White</td>
</tr>
<tr>
<td>Caustic</td>
<td>Yellow with Green Band</td>
<td>Black</td>
</tr>
<tr>
<td>Chlorine (Gas and Solution)</td>
<td>Yellow</td>
<td>Black</td>
</tr>
<tr>
<td>Chlorine Dioxide</td>
<td>Yellow with Violet Band</td>
<td>White</td>
</tr>
<tr>
<td>Fluoride</td>
<td>Light Blue with Red Band</td>
<td>White</td>
</tr>
<tr>
<td>Lime Slurry</td>
<td>Light Green</td>
<td>Black</td>
</tr>
<tr>
<td>Ozone</td>
<td>Yellow with Orange Band</td>
<td>Black</td>
</tr>
<tr>
<td>Phosphate Compounds</td>
<td>Light Green with Red Band</td>
<td>White</td>
</tr>
<tr>
<td>Polymers or Coagulant Aids</td>
<td>Orange with Green Band</td>
<td>White</td>
</tr>
<tr>
<td>Potassium Permanganate</td>
<td>Violet</td>
<td>White</td>
</tr>
<tr>
<td>Soda Ash</td>
<td>Light Green with Orange Band</td>
<td>Black</td>
</tr>
<tr>
<td>Sulfuric Acid</td>
<td>Yellow with Red Band</td>
<td>White</td>
</tr>
<tr>
<td>Sulfur Dioxide</td>
<td>Light Green with Yellow Band</td>
<td>Black</td>
</tr>
<tr>
<td>Backwash Waste</td>
<td>Light Brown</td>
<td>Black</td>
</tr>
<tr>
<td>Sludge</td>
<td>Dark Brown</td>
<td>White</td>
</tr>
<tr>
<td>Sewer (Sanitary or Other)</td>
<td>Dark Gray</td>
<td>White</td>
</tr>
<tr>
<td>Compressed Air</td>
<td>Dark Green</td>
<td>White</td>
</tr>
<tr>
<td>Gas</td>
<td>Red</td>
<td>White</td>
</tr>
<tr>
<td>Other Lines</td>
<td>Light Gray</td>
<td>Black</td>
</tr>
</tbody>
</table>

Electrical conduit shall be coated to match adjacent ceiling or wall surfaces as directed by Engineer. Vent lines shall be coated to match surfaces they adjoin. In addition, special coating of the following items will be required:

<table>
<thead>
<tr>
<th>Item</th>
<th>Color</th>
</tr>
</thead>
<tbody>
<tr>
<td>Valve handwheels and levers</td>
<td>Red</td>
</tr>
</tbody>
</table>

Numerals at least 2 inches high shall be painted on or adjacent to all accessible valves, pumps, flowmeters, and other items of equipment which are identified on the Drawings or in the Specifications by number.

- END OF SECTION –
B Street Water Treatment Plant &
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SECTION 10200

LOUVERS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Fixed, extruded-aluminum.

1.2 PERFORMANCE REQUIREMENTS

A. 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.
   1. Wind Loads: 25 PSF.

B. 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.

1.3 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.

1.4 INFORMATIONAL SUBMITTALS

A. Product Test Reports: Based on tests performed according to AMCA 500-L.

1.5 MEASUREMENT AND PAYMENT

No separate measurement and payment will be made for the installation of the louvers and accessories. Payment will be included in the applicable Contract lump sum or unit prices for which the work is incidental thereto. Price and payment shall constitute full compensation for furnishing all plant, labor, materials, and equipment, including accessories, all as shown on the drawings and as specified herein. Payment shall be part of the bid item “Pre-engineered Building”
PART 2 - PRODUCTS

2.1 MATERIALS

A. Aluminium Extrusions: ASTM B 221, Alloy 6063-T5.

B. Aluminum Sheet: ASTM B 209, Alloy 3003 or 5005 with temper as required for forming, or as otherwise recommended by metal producer for required finish.

C. Fasteners: Use types and sizes to suit unit installation conditions.
   1. For fastening aluminum, use aluminum or 300 series stainless-steel fasteners.
   2. For color-finished louvers, use fasteners with heads that match color of louvers.

D. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.

2.2 FABRICATION, GENERAL

A. 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.

B. 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. Vertical Storm-Resistant Louver:
   1. Basis-of-Design Product: Subject to compliance with requirements, provide Greenheck EVH-301 or engineer approved equal.
   2. Louver Depth: 3 inches.
   3. Head/Sill Nominal Thickness: Not less than 0.062 inch
   4. Jamb Nominal Thickness: Not less than 0.081 inch
   5. Blade Nominal Thickness: Not less than 0.050 inch
   6. Louver Performance Ratings:
      a. Free Area: Not less than 8.4 sq. ft. for 48-inch-(1220-mm-) wide by 48-inch-high louver.
      b. Air Performance: Not more than 0.1-inch wg static pressure drop at 800 FPM free-area intake velocity.
c. Wind-Driven Rain Performance: Not less than 99.8 percent effectiveness when subjected to a rainfall rate of 3 inches per hour and a wind speed of 29 mph at a core-area intake velocity of 1336 FPM

7. AMCA Seal: Mark units with AMCA Certified Ratings Seal.

2.4 LOUVER SCREENS

A. General: Provide screen at louvers indicated.

1. Screen Location for Fixed Louvers: Interior face.

B. Secure screen frames to louver frames with stainless-steel machine screws, spaced a maximum of 6 inches from each corner and at 12 inches o.c.

C. Louver Screen Frames: Fabricate with mitered corners to louver sizes indicated.

1. Finish: Same finish as louver frames to which louver screens are attached

D. Louver Screening for Aluminum Louvers:

1. Insect Screening: Aluminum, 18-by-16 mesh, 0.012-inch wire.

2.5 ALUMINUM FINISHES

A. 2-coat 70% KYNAR 500®/HYLAR 5000® AAMA 2605 –Dry film thickness 1.2 mil. (AKA: Duranar®, Fluoropon®, Trinar®, Fluoropolymer, Polyvinylidene Fluoride, PVDF2)

1. Color selected by Owner.

PART 3 - EXECUTION

3.1 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. Provide perimeter reveals and openings of uniform width for sealants and joint fillers, as indicated.
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D. Repair damaged finishes so no evidence remains of corrective work. Return items that
cannot be refinished in the field to the factory and refinish entire unit or provide new
units.

E. Protect 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.

END OF SECTION 10200
SECTION 11060

EQUIPMENT INSTALLATION

PART 1 - GENERAL

1.01 SCOPE

A. This section covers installation of new equipment units that have been purchased by Contractor as part of this Work, or purchased by others under equipment specifications.

B. Startup requirements shall be as indicated in the Startup Requirements section.

1.02 GENERAL

A. Equipment installed under this section shall be erected and placed in proper operating condition in full conformity with drawings, specifications, engineering data, instructions, and recommendations of the equipment manufacturer, unless exceptions are noted by Engineer.

B. When pumping units are being installed, hydraulic considerations and definition of terms shall be as set forth in the Hydraulic Institute Standards.

C. Any equipment identified as being provided by others will be furnished complete for installation by Contractor. Technical specifications under which the equipment will be purchased are available.

D. Any existing equipment which is removed shall be handled as indicated in the Project Requirements section.

1.02.1 Coordination:

A. When manufacturer's field services are provided by the equipment manufacturer, Contractor shall coordinate the services with the equipment manufacturer. Contractor shall give Engineer written notice at least 30 days prior to the need for manufacturer's field services furnished by others.

B. Submittals for equipment furnished by others under each procurement contract will be furnished to Contractor upon completion of review by Engineer. Contractor shall review equipment submittals and coordinate with the requirements of the Work and the Contract Documents. Contractor accepts sole responsibility for determining and verifying all quantities, dimensions, and field construction criteria.

C. Flanged connections to equipment including the bolts, nuts, and gaskets are covered in the appropriate pipe specification section.

1.03 DELIVERY, STORAGE, AND HANDLING
1.03.1 **Storage:**

A. Upon delivery, all equipment and materials shall immediately be stored and protected by Contractor in accordance with the Handling and Storage section until installed in the Work. Equipment shall be protected by Contractor against damage and exposure from the elements. At no time shall the equipment be stored on or come into contact with the ground, grass, or any other type of vegetation. Contractor shall keep the equipment dry at all times.

**PART 2 - PRODUCTS**

2-1. **MATERIALS.** Materials shall be as follows:

Grout As specified in the Grout section.

**PART 3 - EXECUTION**

3.01 **INSTALLATION**

3.01.1 **General:**

A. The following items shall be installed by the Contractor:

Vertical Turbine Pumps  
Positive Displacement Blowers

B. Equipment shall not be installed or operated except by, or with the guidance of, qualified personnel having the knowledge and experience necessary to obtain proper results as specified in the Startup Requirements section.

C. Each equipment unit shall be leveled, aligned, and shimmed into position. Installation procedures shall be as recommended by the equipment manufacturer and as required herein. Shimming between machined surfaces will not be permitted.

D. Unless otherwise indicated or specified, all equipment shall be installed on concrete bases at least 6 inches high. Baseplates shall be anchored to the concrete base with required anchor bolts. For equipment with grouted bases, the space beneath shall be filled with grout as specified in the Grout section. The equipment base shall be grouted after initial fitting and alignment.

E. Anti-seize thread lubricant shall be liberally applied to the threaded portion of all stainless steel bolts during assembly.

F. When specified in the equipment sections, the equipment manufacturer will provide installation supervision and installation checks. For installation supervision, the manufacturer's field representative will observe, instruct, guide, and direct Contractor's erection or installation procedures as specified in the equipment specifications. For
installation checks, the manufacturer's field representative will inspect the equipment installation immediately following erection by Contractor, and observe the tests indicated in Startup Requirements section. The manufacturer's representatives will revisit the site as often as necessary to ensure installation satisfactory to Owner.

3.01.2 Pumping Units:

A. When pumping units are to be installed, the equipment shall be installed in accordance with the Hydraulic Institute Standards. When installing pumping units, the equipment base shall be grouted after initial fitting and alignment, but before final bolting of connecting piping. Special care shall be taken to maintain alignment of pumping unit components. No stresses shall be transmitted to the pump flanges. After final alignment and bolting, connections to pumping equipment shall be tested for applied piping stresses by loosening the flange bolts. If any movement or opening of the joints is observed, piping shall be adjusted to proper fit.

B. Couplings shall be realigned after grouting. Final coupling misalignment shall be within one-half of the coupling manufacturer's allowable tolerance.

3.01.2.1 Vertical Turbine Pumps:

A. When intermediate shafting is specified, the shafting shall be installed in accordance with the manufacturer's recommendations. Liquid level sensors shall operate freely and shall be adjusted to the levels indicated in the respective pump schedules, or in the electrical schematics or P&ID's. Each system of sensors will be furnished by others, and shall be installed complete with all required mounting brackets, weights, galvanized steel mounting pipes and accessories, control panel transformers, auxiliary relays, cables, and junction boxes.

3.01.3 Multistage Centrifugal Blowers:

A. Blowers shall be installed level and plumb. Blowers shall be handled and installed in accordance with the manufacturer's recommendations. Anchor bolt threads shall be dislocated (stripped) as needed to prevent tightening of anchor bolts beyond "finger tight".

B. Vibration isolation pads shall be installed between the blower unit baseplate and the concrete base.

C. The exposed finish shall be inspected after completing system installation, including pipe connections, fittings, valves, and specialties. Burrs, dirt, and construction debris shall be removed and damaged finishes, including chips, scratches, and abrasions shall be repaired.

D. The equipment shall be protected after installation, but prior to final acceptance by Owner. Protection provisions shall be as recommended by the manufacturer, and shall include provisions to prevent rust, mechanical damage, and foreign objects entering the equipment.
3.02 STARTUP AND TESTING

A. Startup requirements, and tests associated with startup shall be as indicated in the Startup Requirements section. Other field tests shall be as indicated in the specific equipment sections. Startup and tests required shall occur in the order listed in the following paragraphs. Tests shall not begin until any installation supervision and installation checks by the equipment manufacturer have been completed, except where noted below.

3.02.1 Preliminary Field Tests:

A. Preliminary field tests shall be conducted on all equipment by Contractor as indicated in the Startup Requirements section. When an installation check is specified in the equipment sections, the equipment manufacturer’s representative will participate in these tests to the extent described in the Startup Requirements section and in the equipment sections.

3.02.2 Field System Operation Tests:

A. Field system operation tests shall be conducted on all equipment by Contractor as indicated in the Startup Requirements section. When an installation check is specified in the equipment sections, the equipment manufacturer’s service personnel will participate in these tests to the extent described in the Startup Requirements section and in the equipment sections.

3.02.3 Field Demonstration Tests:

A. Field demonstration tests will be conducted by the equipment manufacturer on equipment as indicated and as specified in the equipment sections.

3.02.4 Field Performance Tests & Distribution Tests:

A. Field performance tests or distribution tests will be conducted by the equipment manufacturer on equipment as indicated and as specified in the equipment sections.

3.02.5 Field Baseline Performance Tests:

A. Field baseline performance tests shall be conducted by Contractor on the equipment indicated in the equipment sections, and the tests shall be performed as indicated. When indicated in the equipment sections, the equipment manufacturer will participate in these tests. This test shall not be considered an acceptance test, but rather a test to determine initial performance curves and efficiency just prior to the equipment entering service.

END OF SECTION
SECTION 11140

VERTICAL TURBINE PUMPS

PART 1.0 - GENERAL

1.01 SCOPE

A. This section covers the furnishing of vertical diffusion vane pumping units as indicated herein:

<table>
<thead>
<tr>
<th>Pump designation.</th>
<th>Backwash Supply Pump</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of pumps.</td>
<td>1</td>
</tr>
<tr>
<td>Pump P&amp;ID number</td>
<td>BW-PVW-001</td>
</tr>
</tbody>
</table>

B. Each pumping unit shall be complete with a pump, electric motor, pedestal, sub-base, anchor bolts, and all other appurtenances specified or required for proper operation.

C. Pump shall be interlocked with backwash motor operated valve (BW-VBF-01A) so that pump shall not operated while valve is 100% closed.

1.02 GENERAL

A. Equipment furnished under this section shall be fabricated and assembled in full conformity with drawings, specifications, engineering data, instructions, and recommendations of the equipment manufacturer, unless exceptions are noted by Engineer.

B. Related Specification Sections: 16269 Variable Frequency Controllers

1.02.1 General Equipment Stipulations:

A. The General Equipment Stipulations shall apply to all equipment furnished under this section. If requirements in this specification differ from those in the General Equipment Stipulations, the requirements specified herein shall take precedence.

1.02.2 Governing Standard:

A. Except as modified or supplemented herein, all vertical diffusion vane pumps shall conform to the applicable requirements of ANSI/AWWA E101-88 and the Hydraulic Institute Standards.

1.02.3 Tagging:
A. Each item of equipment and each part shipped separately shall be tagged and identified with indelible markings for the intended service. Tag number shall be clearly marked on all shipping labels and on the outside of all containers.

1.02.4 Power Supply:

A. Unless otherwise indicated, power supply to the equipment shall be 480 volts, 60 Hz, 3 phase.

1.03 SUBMITTALS

1.03.1 Drawings and Data:

A. Complete fabrication and assembly drawings, together with detailed specifications and data covering materials, parts, devices, and accessories forming a part of the equipment furnished, shall be submitted in accordance with the Submittals section. The data and specifications for each pumping unit shall include, but shall not be limited to, the following:

**Pumps**
- Name of manufacturer.
- Type and model.
- Design rotative speed.
- Diameter of discharge outlet.
- Diameter of line shafting.
- Type of lineshaft bearings.
- Diameter and wall thickness of pump column.
- Number of stages.
- Type of bowl bearings.
- Complete performance curves showing capacity versus head, NPSH required, pump efficiency, and bhp plotted to scales consistent with performance requirements.
- OD of pump bowls.
- Weight including bowls, column, and pedestal.

**Complete Pumping Unit**
- Max overall dimensions.
- Total weight including motor and base plate.
- Data on shop painting.

**Motors**
- As specified in the this section.

**Adjustable Frequency Drives**
- As specified in this section.

1.03.2 Operation and Maintenance Data and Manuals:

A. Adequate operation and maintenance information shall be supplied as required in the Submittals section. Operation and maintenance manuals shall be submitted in accordance with the Submittals section. The operation and maintenance manuals shall
be in addition to any instructions or parts lists packed with or attached to the equipment when delivered.

1.04 QUALITY ASSURANCE

1.04.1 Balance:

A. All rotating parts shall be accurately machined and shall be in as nearly perfect rotational balance as practicable. Excessive vibration shall be sufficient cause for rejection of the equipment. The mass of the unit and its distribution shall be such that resonance at normal operating speeds is avoided. In any case, the unfiltered vibration velocity, as measured at any point on the machine including the motor, shall not exceed the maximum vibration limit of the governing standard unless otherwise required.

B. At any operating speed, the ratio of rotative speed to the critical speed of a unit or its components shall be less than 0.8 or more than 1.3.

1.04.2 Efficiency Evaluation:

A. If the efficiency, as determined by the shop test, is below the specified minimum efficiency, Owner may, at his option, reject the unit.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Shipping shall be in accordance with the Shipping section. Handling and storage shall be in accordance with the Handling and Storage section.

1.06 SPARE PARTS AND ACCESSORIES

A. Spare parts shall be suitably packaged, with labels indicating the contents of each package. Spare parts shall be delivered to Owner as directed. The following spare parts shall be furnished.

<table>
<thead>
<tr>
<th>Spare Part</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Casing wearing rings</td>
<td>2</td>
</tr>
<tr>
<td>Impeller wearing rings</td>
<td>2</td>
</tr>
<tr>
<td>Sets of bowl bearings</td>
<td>2</td>
</tr>
<tr>
<td>Sets of lineshaft bearings</td>
<td>2</td>
</tr>
</tbody>
</table>

PART 2.0 - PRODUCTS

2.01 SERVICE CONDITIONS

A. The pumping units shall be suitable for the following service conditions:
# B Street Water Treatment Plant & North Water Treatment Plant Improvements
City of Meridian

<table>
<thead>
<tr>
<th>Environment Exposure</th>
<th>Outdoor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ambient Air Temperature</td>
<td>20 to 110°F</td>
</tr>
<tr>
<td>Liquid Temperature</td>
<td>50 to 85°F</td>
</tr>
<tr>
<td>Solids Concentration</td>
<td>0 to 5%</td>
</tr>
<tr>
<td>Pumps Start and Stop</td>
<td>Yes</td>
</tr>
<tr>
<td>Site Elevation</td>
<td>323 ft</td>
</tr>
<tr>
<td>Units Subject to Freezing Temperatures</td>
<td>Yes</td>
</tr>
<tr>
<td>Size of Solids</td>
<td>N/A in</td>
</tr>
<tr>
<td>Crane Facilities</td>
<td>No</td>
</tr>
</tbody>
</table>

2.02 PERFORMANCE AND DESIGN REQUIREMENTS

A. Pumping units shall be designed for the following performance and design requirements, at maximum speed unless otherwise noted:

**Backwash Supply Pump**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pump Tag Numbers</td>
<td>BW-PWV-001</td>
</tr>
<tr>
<td>Rated Head</td>
<td>20 ft</td>
</tr>
<tr>
<td>Capacity at Rated Head</td>
<td>5,400 gpm</td>
</tr>
<tr>
<td>Operating Range for Full Speed</td>
<td>10 to 15 psi</td>
</tr>
<tr>
<td>Continuous Operation</td>
<td></td>
</tr>
<tr>
<td>Maximum Nominal Pump Speed</td>
<td>900 rpm</td>
</tr>
<tr>
<td>Minimum Head at Reduced Speed</td>
<td>14 ft</td>
</tr>
<tr>
<td>Capacity at Minimum Head and Reduced</td>
<td>3,000 gpm</td>
</tr>
<tr>
<td>Speed</td>
<td></td>
</tr>
<tr>
<td>Approximate Minimum Pump Speed</td>
<td>630 rpm</td>
</tr>
<tr>
<td>Maximum Power Required at Pump Input</td>
<td>75 bhp</td>
</tr>
<tr>
<td>Shaft at Any Point in the Operating</td>
<td></td>
</tr>
<tr>
<td>Range</td>
<td></td>
</tr>
<tr>
<td>Maximum Power at Shutoff Head</td>
<td>75 bhp</td>
</tr>
</tbody>
</table>
VERTICAL TERBINE PUMP
DWSIRLF Project No. DWI-L380005-01 11140-5
B Street Water Treatment Plant & North Water Treatment Plant Improvements
City of Meridian

Efficiency. 82 %
Type of efficiency indicated. Pump
Efficiency calculated at. Rated head
Pump designed for reverse rotation. No
Maximum unfiltered vibration velocity. HIS in/s
Minimum nominal size of pump column. 20 in
Nominal size of pump discharge. 20 in
Nominal submergence range above wetwell floor (for wetwell mounted pumps). 3 to 10 ft
Vertical distance from wetwell floor to center line of above floor discharge (for wetwell mounted pumps). 14 ft

B. Minimum shop test pressure on bowl assembly shall be 1.5 times the shutoff head plus maximum suction pressure where applicable.
C. The pump setting shall be as indicated on drawings.
D. For design and rating purposes, the water to be pumped shall be assumed to have a temperature of 85°F.
E. Pump performance shall be stable and free from damaging cavitation, vibration, and noise in the operating head range. The performance of pumps with an enclosed impeller shall be based on a radial running clearance between the bowl wearing ring and the impeller of not less than 6 mils, or 0.5 mil per inch of wearing ring diameter, whichever is greater.

2.03 MATERIALS

<table>
<thead>
<tr>
<th>Component</th>
<th>Material</th>
</tr>
</thead>
<tbody>
<tr>
<td>Suction Strainer</td>
<td>Stainless steel</td>
</tr>
<tr>
<td>Pump Bowls</td>
<td>Cast iron, ASTM A48, Class 30.</td>
</tr>
<tr>
<td>Impellers</td>
<td>Silicon Bronze, ASTM B584 – 873.</td>
</tr>
<tr>
<td>Bowl Wearing Rings</td>
<td>Martensitic stainless steel, Brinell</td>
</tr>
<tr>
<td>Impeller Wearing Rings</td>
<td>Martensitic stainless steel, Brinell 200-250.</td>
</tr>
<tr>
<td>Bowl Assembly Shaft</td>
<td>Martensitic stainless steel, AISI Type 410 or 416.</td>
</tr>
<tr>
<td>Bowl Bearings</td>
<td>Bronze, ASTM B505-932, water lubricated, except suction case (bowl) bearing shall be permanently packed with water-resistant grease.</td>
</tr>
</tbody>
</table>

VERTICAL TERBINE PUMP
DWSIRLF Project No. DWI-L380005-01
BKI Project No. TU.17.019
Lineshaft, stainless steel

Martensitic stainless steel shaft, AISI Type 410 or 416, with Martensitic stainless steel couplings of dissimilar alloy.

Open Lineshaft Bearings

Goodrich "Cutless Rubber", water lubricated.

Lineshaft Bearing Retainer

Bronze, ASTM B584; ductile iron.

Threaded Pump Column

ASTM A53, Grade A standard weight steel pipe, with threaded couplings.

Stuffing Box Housing

Cast iron, ASTM A48, Class 30.

Stuffing Box Bearing

Bronze, ASTM B505-932, water, internal lubricated.

Stuffing Box Hardware

Corrosion-resistant metal.

Stuffing Box Packing

Braided, graphite impregnated carbon.

Water Slinger

Rubber or bronze.

Pedestal and Subbase

Cast iron or fabricated steel.

Pipe Thread Lubricant

Teflon paste type thread sealer suitable for potable water service where required.

Lineshaft Coupling Thread Lubricant

Jet-Lube "Nikal", John Crane "Thred Gard Nickel", Never-Seez "Pure Nickel Special", or Permatex "Nickel Anti-Seize".

Epoxy Coating

Ameron "Amerlock 400 High-Solids Epoxy Coating", Carboline "Carboguard 891", or Tnemec "Series N140 Pota-Pox Plus".

2.04 PUMP CONSTRUCTION

A. Each pump shall be the turbine type suitable for wetpit installation.

2.04.1 Suction Bowl Inlet:

A. Wetpit pumps shall be equipped with a flared suction bowl inlet.

2.04.2 Impellers and Bowls:

A. Impellers shall be accurately machined, dynamically balanced, and securely locked on the pump shaft. Impellers shall be enclosed.

B. Balance rings which depend upon close running clearances to reduce the load on the drive unit thrust bearing will not be acceptable unless otherwise indicated.

C. Pump bowls and impellers shall be equipped with wearing rings designed to maintain pump efficiency. Wearing rings shall be securely locked in place so that they will not move or loosen during any condition of operation or handling, including reverse rotation of the pump.
2.04.3 **Shafting:**

A. All pump shafting shall conform to the applicable sections of the governing standard. Shaft diameter shall be not less than the minimum permitted for the applicable driver nameplate power rating. Shafting shall be open.

2.04.4 **Lineshaft Sleeves:**

A. Not used.

2.04.5 **Shaft Couplings:**

A. Shaft couplings shall transmit the maximum combination of torque and thrust and shall maintain alignment between adjacent shaft sections. Couplings shall be threaded type.

B. During assembly, anti-seize thread lubricant shall be applied to male threads of all threaded connections.

2.04.6 **Bearing Retainers:**

A. Open lineshaft pumps shall have bearings mounted in streamlined spiders supported by the column assembly. Rubber bearings shall be positively held in place by shoulders, retainer rings, or other mechanical means.

2.04.7 **Pump Column:**

A. Pump column sections shall be so designed and constructed that accurate alignment will be obtained when the column is assembled. The type of couplings shall be threaded.

B. The pump column shall be long enough to locate the suction inlet a distance of at least equal to 1/3 times the bell diameter, but not more than 3/4 times the bell diameter above the wetwell floor.

2.04.8 **Lineshaft Stuffing Box:**

A. A high pressure stuffing box shall be provided at the top of the pump pedestal for sealing the lineshaft entry point.

B. High pressure lineshaft stuffing box housings shall contain a bronze bearing, a bypass water passage to the bearing terminating in a lantern ring or an annular port for relieving pressure on the stuffing box, at least four rings of packing, and a lantern ring opposite a grease passage for lubricating the packing. The gland halves shall be interlocked at assembly and held in position at all operating pressures by at least two bolts or studs. The bypass line shall contain a throttling valve for adjusting the amount of leakage at the gland.

2.04.9 **Pedestal:**
A. Each pump pedestal shall be designed to support the drive unit and the entire pump assembly. Suitable openings shall be provided for access to the stuffing box and other accessories. A registered connection or dowels shall be provided between the motor and the pedestal. The tolerance of the registered fit shall be less than the stuffing box bearing tolerance so that when installed the shaft will not touch the stuffing box bearing. A suitable stuffing box leakage collector with a 1/2 inch tapped drain opening shall be provided. Each pocket shall have a drain connection.

2.04.10 Pump Discharge Outlets:

A. Pump discharge outlets may have flanged ends. The pump discharge outlet shall be integral with the pedestal. The pump discharge outlet shall be above the floor.

B. The diameter and drilling of the flange shall conform to ANSI/ASME B16.1, Class 125.

2.04.11 Subbase:

A. A rigid subbase with rounded corners shall be provided to support each pedestal. Abutting surfaces between the subbase and the pedestal shall be machined to provide uniform bearing.

B. Each subbase shall have a center opening large enough to permit withdrawal of the entire pump assembly.

2.04.12 Shop Painting:

A. All iron and steel parts which will be in contact with pumped liquid or submerged after installation, including the inside of the pump column and all exterior surfaces below the subbase plate or mounting flange, shall be shop cleaned by blasting in accordance with the coating manufacturer's recommendations and painted with an epoxy coating system. The coating shall have a dry film thickness of at least 10 mils and shall consist of a prime (first) coat and one or more finish coats. At least 1 quart of the finish material shall be furnished with each pump for field touchup.

B. All other iron and steel surfaces, except stainless steel and machined surfaces, shall be protected with suitable protective coatings applied in the shop. Surfaces of the equipment that will be inaccessible after assembly shall be protected for the life of the equipment. Coatings shall be suitable for the environment where the equipment is installed. Exposed surfaces shall be finished, thoroughly cleaned, and filled as necessary to provide a smooth, uniform base for painting. Electric motors, speed reducers, starters, and other self-contained or enclosed components shall be shop primed or finished with an oil-resistant enamel or universal type primer suitable for top coating in the field with a universal primer and aliphatic polyurethane system.

C. Surfaces to be coated after installation shall be prepared for painting as recommended by the paint manufacturer for the intended service, and then shop painted with one or more coats of the specified primer.

2.05 ACCESSORIES
2.05.1 **Anti-Reverse Device:**

A. Where the pumping unit is specified to be designed for reverse rotation due to reverse flow, a backstop or non-reverse ratchet shall not be used. However, a self release coupling that prevents reverse rotation due to phase reversal may be used.

2.06 **DRIVE UNITS**

2.06.1 **Electric Motors:**

A. Electric motors shall be inverter duty, for use with an adjustable frequency type speed controller and shall be de-rated as required to compensate for harmonic heating effects and reduced self-cooling capability at low speed operation. Each motor shall not exceed a Class B temperature rise when operating in the installed condition at load with power received from the adjustable frequency drive. All motors driven by AFDS shall be supplied with full phase insulation on the end turns and shall meet the requirements of NEMA MG 1, Part 31. In addition to the requirements of NEMA MG 1, Part 31, motors shall be designed to be continually pulsed at the motor terminals with a voltage of 1600 volts ac.

B. Motors shall conform to the following:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Motor voltage</td>
<td>460, 3 phase</td>
</tr>
<tr>
<td>Frequency</td>
<td>60 Hz</td>
</tr>
<tr>
<td>Service factor</td>
<td>1.15</td>
</tr>
</tbody>
</table>

C. Motor nameplate horsepower shall be equal to or greater than the maximum load imposed by the driven equipment.

D. Motors shall be totally enclosed fan cooled motors shall meet NEMA MG 1 requirements for a guarded machine. Motors shall be furnished with drain holes and rotating shaft seals.

E. Motors shall have a NEMA weather protected enclosure. All exposed metal surfaces shall be protected, where practical, with a corrosion resistant polyester coating. Exposed uncoated surfaces shall be of a corrosion resistance metal. Enclosure exterior and interior surfaces, air gap surfaces, and windings shall be protected with a corrosion resistant polyester, polyurethane or epoxy coating.

F. The main conduit box shall be in accordance with NEMA MG 1. The main conduit box shall be diagonally split for easy access to the motor leads, and designed for rotation in 90-degree increments. A gasket shall be furnished between the halves of the box. Conduit openings in the main conduit box shall match the size and quantity of conduits indicated on the one line Drawings. The main conduit box shall be sized for all indicated accessory leads.

G. Motor power leads shall be wired into the main conduit box. All motor leads and their terminals shall be permanently marked in accordance with the requirements of NEMA MG 1, Part 2. Each lead marking shall be visible after taping of the terminals.
H. Motors shall have the direction of rotation marked by an arrow mounted visibly on the stator frame near the terminal housing, or on the nameplate, and the leads marked for phase sequence, T1, T2, T3, to correspond to the direction of rotation and supply voltage sequence.

I. Cable type leads shall be provided with Burndy Type YA or acceptable equal compression type connectors.

J. Motors shall be furnished with a ground connection.

K. Motors shall be furnished with at least one temperature switch per winding. Switch contacts shall be normally opened or closed as required by the adjustable frequency drive. The switches shall automatically reset on falling temperature. Switch leads shall be wired in series and shall be brought out to the motor terminal box for wiring in conduit.

L. Motor bearings shall be self-lubricating, shall have provisions for relubrication, and shall be designed to operate in an position or angle.

M. Motor bearings shall be antifriction type with $L_{10}$ life rating of 40,000 hours in accordance with ABMA standards.

N. All bearing mountings shall be designed to prevent the entrance of lubricant into the motor enclosure or dirt into the bearings, and shall be fitted with pipes, drain plugs, and fittings arranged for safe, easy relubrication from the outside of the motor while the motor is in service, as necessary.

O. Motors shall have torques and locked-rotor current in accordance with NEMA MG 1, Part 12.

P. Motor shaft shall be hollow type and shall be of a corrosion resistant material.

Q. For hollow shaft motors, an adjusting nut shall be provided at the top of the motor for raising or lowering the shafting to properly center the impellers in the bowls.

R. If the motor is not shop tested with the pump, certified motor efficiency data shall be furnished to the pump supplier based on tests conducted on the motor or on an identical motor.

2.06.2 Adjustable Frequency Drives:

A. Each pump shall be furnished with an adjustable frequency drive. The design of each adjustable frequency drive shall be coordinated with the requirements of the pumping unit. The pump manufacturer shall be responsible for furnishing the adjustable frequency drive, for matching the motor and the drive, and for coordinating the collection of data and the design effort to limit harmonics to the levels specified. Refer to Section 16269 VARIABLE FREQUENCY CONTROLLERS for complete specifications and requirements.

2.07 SHOP TESTS
A. Each pump shall be tested at the factory for capacity, power requirements, and efficiency at specified rated head, evaluated head, shutoff head, operating head extremes, and at as many other points as necessary for accurate performance curve plotting. All tests and test reports shall be made in conformity with the requirements and recommendations of the Hydraulic Institute Standards.

B. A certified test report shall be prepared. Five certified copies of a report covering each test shall be prepared by the pump manufacturer and delivered to Engineer not less than 10 days prior to the shipment of the equipment from the factory. The report shall include data and test information as stipulated in the Hydraulic Institute Standards, copies of the test log originals, test reading to curve conversion equations, and certified performance curves. The curves shall include head, pump input power, pump efficiency, rpm, and shop test NPSH available, plotted against capacity. The curves shall be easily read and plotted to scales consistent with performance requirements, with all test points clearly shown. When the pump is not tested at the rated speed, performance charts shall include both the test speed and the calculated speed curves.

PART 3.0 - EXECUTION

3.01 INSTALLATION

A. Each pump will be installed in accordance with Equipment Installation section.

3.02 FIELD QUALITY CONTROL

3.02.1 Installation Check:

A. An experienced, competent, and authorized representative of the manufacturer shall visit the site of the Work and inspect, check, adjust if necessary, and approve the equipment installation. The representative shall be present when the equipment is placed in operation in accordance with Start-up Requirements section, and shall revisit the job site as often as necessary until all trouble is corrected and the equipment installation and operation are satisfactory in the opinion of Engineer.

B. The manufacturer's representative shall furnish a written report certifying that the equipment has been properly installed and lubricated; is in accurate alignment; is free from any undue stress imposed by connecting piping or anchor bolts; and has been operated under full load conditions and that it operated satisfactorily.

C. All costs for these services shall be included in the contract price.

3.02.2 Installation Supervision

A. Installation supervision by the manufacturer is not required.

END OF SECTION
SECTION 11625

POSITIVE DISPLACEMENT BLOWERS

PART 1 - GENERAL

1.01 SCOPE

A. This section covers the furnishing of electric motor driven, rotary, positive displacement blower packages to be installed as indicated on the drawings and as required.

B. Each blower package shall be a factory or shop fabricated skid and shall include blower, motor, inlet filter, inlet silencer, discharge silencer, belts, sheaves, belt guard, flexible connections, safety valve, discharge check valve, instrumentation, controls, and vibration isolators. Each blower package shall be complete with all spare parts, accessories and appurtenances indicated on the drawings, specified herein, or otherwise needed for proper operation.

| Number of blowers. | 2 |
| Blower tag numbers. | ARW-BL-001, ARW-BL-002 |
| Blower location. | Filter Building |

C. Piping, pipe supports, valves, and accessories that are not an integral part of the equipment or specified herein are covered in other sections.

1.02 GENERAL

1.02.1 Coordination:

A. Equipment furnished under this section shall be fabricated and assembled in full conformity with drawings, specifications, engineering data, instructions, and recommendations furnished by the equipment manufacturer unless exceptions are noted by ENGINEER.

B. Where two or more units of the same class of equipment are required, they shall be the product of a single manufacturer; however, all the component parts of the system need not be the products of one manufacturer.

C. The blower unit shall be a current standard product of the blower manufacturer and shall be a fully shop assembled package by one of the blower packagers specified in the data sheet. All accessory items shall be furnished by the blower packager.

For general construction contracts and aeration applications, CONTRACTOR shall be responsible for coordinating the blowers with the equipment specified in the diffused aeration equipment section. CONTRACTOR shall be responsible for any changes required in the blower design resulting from changes in the diffused aeration equipment design, including pressure losses through the submerged piping system and diffusers.
D. Unless exceptions are noted by ENGINEER, the equipment arrangement and piping may be modified in accordance with the recommendations of the equipment manufacturer to suit the equipment furnished. All needed modifications shall be reviewed by ENGINEER and shall be performed by CONTRACTOR at no additional cost to AUTHORITY.

1.02.2 General Equipment Stipulations:

A. The General Equipment Stipulations shall apply to all equipment furnished under this section. If requirements in this specification differ from those in the General Equipment Stipulations, the requirements specified herein shall take precedence.

1.02.3 Governing Standards

A. Except as modified or supplemented herein, all work covered by this section shall be performed in accordance with all applicable municipal codes and ordinances, laws, and regulations which pertain to such work. In case of a conflict between these specifications and any state law or local ordinance, the latter shall govern.

B. All work shall comply with Underwriters’ Laboratories (UL) safety requirements.

1.02.4 Power Supply:

A. Unless otherwise indicated, power supply to the equipment shall be 480 volts, 60 Hz, 3 phase.

1.02.5 Tagging:

A. Each item of equipment and each part shipped separately shall be tagged and identified with indelible markings for the intended service. Tag number shall be clearly marked on all shipping labels and on the outside of all containers.

1.02.6 Nameplates

A. Each blower and accessory component having a tag number as indicated on the drawings or specified herein, shall be provided with a permanent number plate. The location of number plates and the method of fastening shall be acceptable to ENGINEER. Numerals shall be at least 1 inch high and shall be black baked enamel on anodized aluminum plate.

1.02.7 Lubrication:

A. Equipment shall be adequately lubricated by systems which require attention no more frequently than weekly during continuous operation. Lubrication systems shall not require attention during startup or shutdown and shall not waste lubricants.

B. Lubricants shall be provided in sufficient quantities to fill all lubricant reservoirs and to replace all consumption during testing, startup, and operation prior to acceptance of equipment. Lubricant type shall be as recommended by the equipment supplier.
1.02.8 Abbreviations:

A. Reference to standards and organizations in the Specifications shall be by the following designations:

- AFBMA Antifriction Bearing Manufacturers Association
- AGMA American Gear Manufacturers Association
- AISC American Institute of Steel Construction
- AISI American Iron and Steel Institute
- ANSI American National Standards Institute
- ASME American Society of Mechanical Engineers
- ASTM American Society for Testing and Materials
- AWS American Welding Society
- Fed Spec Federal Specification
- IEEE Institute of Electrical and Electronics Engineers
- MIL Military Specification
- NEC National Electrical Code
- NEMA National Electrical Manufacturers Association
- NPT National Pipe Thread
- OSHA Occupational Safety and Health Administration
- UL Underwriters' Laboratories

1.03 SUBMITTALS

1.03.1 Drawings and Data:

A. Complete assembly and installation drawings, wiring and schematic diagrams, together with detailed specifications and data covering materials used, parts, devices and other accessories forming a part of the equipment furnished, shall be submitted in accordance with the submittals section. Device tag numbers indicated on the contract drawings shall be referenced on the wiring and schematic diagrams where applicable. The data and specifications for each unit shall include, but not be limited to the following:
Package

Letter from the blower manufacturer confirming blower package is fully shop assembled and will meet the performance requirements specified herein.

Dimensional drawings showing overall package dimensions, connection locations and sizes.

Package weight.

For general construction contracts and water filter backwash applications, statement from Contractor verifying that the maximum air pressure drop through the filter and underdrain manufacturer's equipment is as specified in the Filter Equipment and Media section; that the design capacity is an acceptable air flow for low water level; and that the other specified capacity is acceptable for the high water level.

Blowers

Name of manufacturer.

Type and model.

Full rotative speed at rated condition.

Blower design maximum rotative speed.

Critical speed of the rotor.

Type of bearings, AFBMA L10 life rating, and lubrication.

Connection sizes.

Maximum air temperature at discharge flange.

Maximum allowable forces and moments on blower inlet and discharge flanges.

Net weight of blower.

Net weight of heaviest single component requiring removal for maintenance.

Overall dimensions.

Complete performance curves or tables showing discharge pressure versus capacity and speed, blower and overall efficiency, and bhp at minimum and maximum ambient air temperatures and at standard conditions.

Shop painting data.

Anchor bolt location details.

Spring vibration isolators and their sizing information

Maximum free field noise level at 3 feet

Motors
As specified in the General Purpose Induction Motors section.

**Controls**
- Blower control panel layout including interior and exterior views.
- Accessory device data including catalog cut sheets on all control components.
- Wiring diagram.

**Accessories**
- Name of manufacturer.
- Equipment data indicating overall dimensions, connection sizes, weights and materials of construction, pressure losses, efficiencies, and noise attenuation as applicable.
- Drawing showing internal silencer baffling and construction.
- Sound attenuation at each octave band for each silencer.
- Drawing showing internal construction of each silencer.

**Certified Shop Test Reports**
- Test data and results.
- Sample calculations.

1.03.2 **Operation and Maintenance Manuals**:

A. Adequate operation and maintenance information shall be supplied as required in the Submittals section. Operation and maintenance manuals shall be submitted in accordance with the Submittals section. The operation and maintenance manuals shall be in addition to any instructions or parts lists packed with or attached to the equipment when delivered.

1.04 **DELIVERY, STORAGE, AND HANDLING**

A. Shipping shall be in accordance with the Shipping section. Handling and storage shall be in accordance with the Handling and Storage section.

1.05 **SPARE PARTS**

A. The following spare parts and accessories shall be furnished in substantial wooden boxes with identifying labels and delivered to the vicinity of the project site or the AUTHORITY as directed:

<table>
<thead>
<tr>
<th>Quantity</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>Quantity of intake filter elements sets per filter.</td>
</tr>
<tr>
<td>1</td>
<td>Quantity of bearing and seal sets per blower.</td>
</tr>
</tbody>
</table>

**PART 2 - PRODUCTS**

B Street Water Treatment Plant &
North Water Treatment Plant Improvements
City of Meridian

POSITIVE DESPLACEMENT BLOWERS
DWSIRLF Project No. DWI-L380005-01

11625-5
BKI Project No. TU.17.019
2.01 SERVICE CONDITIONS

A. Two blowers shall provide air for filter backwash.

B. The blowers shall be suitable for the following service conditions:

<table>
<thead>
<tr>
<th>Seismic zone.</th>
<th>Gulf Margin Normal Fault Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Barometric pressure</td>
<td>14.4 psia</td>
</tr>
<tr>
<td>Design maximum inlet air temperature.</td>
<td>110 °F</td>
</tr>
<tr>
<td>Design minimum inlet air temperature.</td>
<td>5 °F</td>
</tr>
<tr>
<td>Design relative humidity at maximum design temperature.</td>
<td>85 %</td>
</tr>
<tr>
<td>Design relative humidity at minimum design temperature.</td>
<td>10 %</td>
</tr>
<tr>
<td>Site elevation.</td>
<td>325 ft</td>
</tr>
</tbody>
</table>

Parts shall be interchangeable between units of similar size and capacity to extent practical.

All equipment furnished shall be designed to meet all specified conditions and to operate satisfactorily at this elevation.

2-2. PERFORMANCE AND DESIGN REQUIREMENTS. Blower units shall be designed for the operating conditions as follows:

**Blowers**

<table>
<thead>
<tr>
<th>Blower tag numbers.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operation.</td>
</tr>
<tr>
<td>Discharge pipe connection.</td>
</tr>
<tr>
<td>Inlet pressure at package suction flange.</td>
</tr>
<tr>
<td>Rated discharge pressure at package outlet flange.</td>
</tr>
<tr>
<td>Minimum capacity at rated package discharge pressure, maximum inlet air temperature and relative humidity and rated operating speed</td>
</tr>
<tr>
<td>Alternate discharge pressure at constant speed</td>
</tr>
<tr>
<td>Ratio of maximum rated blower operating speed at normal motor speed to</td>
</tr>
</tbody>
</table>
POSITIVE DESPLACEMENT BLOWERS
DWSIRLF Project No. DWI-L380005-01

B Street Water Treatment Plant &
North Water Treatment Plant Improvements
City of Meridian

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum allowable blower speed.</td>
<td></td>
</tr>
<tr>
<td>Ratio of rated discharge pressure at blower outlet flange to maximum allowable blower discharge pressure.</td>
<td>90 %</td>
</tr>
<tr>
<td>Maximum rated speed of motor.</td>
<td>3600 rpm</td>
</tr>
<tr>
<td>Maximum power required at rated discharge pressure, minimum inlet temperature and relative humidity, and rated operating speed.</td>
<td>75 bhp</td>
</tr>
<tr>
<td>Drive motor rating</td>
<td>40 hp</td>
</tr>
</tbody>
</table>

**Intake Filter**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Equipment tag numbers.</td>
<td>N/A</td>
</tr>
<tr>
<td>Maximum initial pressure drop.</td>
<td>2 in wc</td>
</tr>
<tr>
<td>Maximum face velocity at housing entrance.</td>
<td>400 ft/min</td>
</tr>
<tr>
<td>Filter configuration</td>
<td>Bottom Outlet</td>
</tr>
<tr>
<td>Filter element type.</td>
<td>Polyester felt</td>
</tr>
<tr>
<td>Particle arrestance (removal percentage/size).</td>
<td>98% for 10 micron and larger particles</td>
</tr>
</tbody>
</table>

| Minimum inlet and discharge silencer sound attenuation for two lobe blowers. |
|-----------------------------|-----------------------------|
| Octave band 63.             | 21 dB                       |
| Octave band 125.            | 26 dB                       |
| Octave band 250.            | 30 dB                       |
| Octave band 500.            | 32 dB                       |
| Octave band 1000.           | 32 dB                       |
| Octave band 2000.           | 30 dB                       |
| Octave band 4000.           | 27 dB                       |
| Octave band 8000.           | 21 dB                       |
| Maximum silencer operating temperature.                                 | 300 °F         |
B Street Water Treatment Plant &  
North Water Treatment Plant Improvements  
City of Meridian 

Maximum free field noise level  
with piped inlet and discharge  
connections at rated operating 
speed, measured 3 feet from  
any surface of acoustic 
enclosure.  

91                     dBA

Maximum overall vibration velocity  
of blower at any point on the 
blower skid at rated operating  
speed.  

0.45                    in/sec

Maximum length.  
5'-3"

Maximum width (between 
anchor bolts)  
4'-11"

Maximum height.  
5'-3"

Discharge Flexible Connection  

Discharge configuration   Side

Number of arches.  
3

Lateral movement capability.  
3 in.

Axial movement capability.  
2.25 in.

Lateral spring rates.  
411 lb/in.

Axial spring rates.  
597 lb/in.

Maximum face-to-face length.  
20 in.

Temperature rating.  
300 °F

2.03 ACCEPTABLE MANUFACTURERS  

A. Blowers shall be as manufactured by Roots Dresser, Gardner Denver or Aerzen without exception. Blowers shall be packaged by Universal Blower PAC, Unimac, Excelsior, Fluid-Technology LLC of Lakewood, CO or Aerzen without exception.

2.04 MATERIALS  

Casing and Impellers  
Cast iron or ductile iron.

Shafts  
High carbon steel or ductile iron; turned, 
ground and polished.

Timing Gears  
Alloy steel.
B Street Water Treatment Plant &
North Water Treatment Plant Improvements
City of Meridian

Bearsings
Antifriction, oil lubricated, AFBMA rated
L_{10} for 80,000 hours continuous
operation.

Base
Fabricated steel.

2.05  CONSTRUCTION

2.05.1  Casings:

A. Casings shall be designed to withstand at least twice the specified discharge pressure
and shall be reinforced with integrally cast ribs. Each casing shall be provided with
tapped and plugged openings for casing and bearing drains and fittings for properly
adding bearing and gear lubricant.

2.05.2  Impellers:

A. Impellers shall be reinforced by internal ribs and shall have all outside surfaces
machined. Each impeller shall be statically and dynamically balanced. Impellers shall
be arranged for vertical air flow through the units unless otherwise indicated. Impellers
shall be two lobe with the exception of Aerzen, which shall be three lobe.

2.05.3  Shafts:

A. Shafts shall be cast integrally with the impeller or shall pass completely through the
impeller. Stub shafts will not be acceptable. Impellers shall be securely attached to
through shafts.

2.05.4  Timing Gears:

A. Timing gears shall be enclosed in oil-tight housings and shall be splash oil lubricated.

2.05.5  Belts and Sheaves:

A. All belts and blower and motor sheaves required for the blower shall be furnished. Belts
and sheaves shall be of the heavy-duty "V" type with a horsepower rating of at least 1.4
times the motor nameplate horsepower. Belts shall be matched sets.

2.05.6  Base Frame:

A. A full length, common base shall be provided for each blower package. The base
frames shall be constructed of cast iron or heavy steel plate and structural members and
shall be designed for no measurable deflection with the equipment mounted thereon and
the base frame supported from the floor. Each base shall be designed so that all
equipment bolted to it can be removed without access to the underside, and for ease of
cleaning. Structural stiffeners shall be located under the equipment at the equipment
anchor points. A drip lip will not be required. The base shall be suitable for direct
attachment to the foundation. Complete support of the inlet and discharge silencers
shall be from the base frame. The blower supplier shall provide and install silencer
supports for each blower package. The intake silencer shall be supported horizontally above the blower and the discharge silencer shall be supported horizontally below the blower. The inlet filter shall be attached to the inlet silencer.

2.05.7 Silencers:

A. Each blower shall be furnished with a silencer in the suction and discharge piping. Silencers shall be multi-chambered reactive type or combination multi-chambered reactive/absorptive type as required by the blower operating speed. Silencers shall be equipped with ported tubes and air passageways to reduce blower pulsations and system air noise from the blower. There shall be no “line of sight” passages within the silencer design. Each silencer shall be of all-welded steel construction with painted exterior surfaces and flanged connections with diameter and drilling conforming to ASME B16.1, Class 125.

B. If the specified 3-lobe blower vendor does not offer the type of silencers specified in their package, the following paragraph shall apply.

C. If resonance in the piping occurs, an independent consultant shall be contracted to analyze the noise. If the resonance is the result of pulsations emanating from the blower package, then the blower packager will be liable for the charges relating to the acoustical analysis and correction of the problem. Correction of the problem will likely involve installation of additional silencers. Additional silencers shall be installed as close to the blower package as possible to prevent resonant piping lengths. The blower shall be initially sized with sufficient additional pressure capability to compensate for the losses through additional silencers in case they are required. Additional silencers shall be as specified herein with low frequency sound attenuation capability.

2.05.8 Acoustical Enclosure:

A. Provide sealed enclosure with inlet and outlet openings lined with soundproofing material to minimize sound and suitable for outside installation.

B. The acoustic enclosure shall be a self-supporting structure housing at least the blower, motor and drive mounted on the package skid base. There shall not be pipe extensions on the skid made to accommodate the sound enclosure. The enclosure shall be provided with removable panels or hinged sections to allow routine blower and V-belt maintenance.

C. The enclosure shall be designed to withstand the specified wind velocity without damage. All bracing and reinforcing members shall be integral to the enclosure. Blower oil drain piping shall be piped to outside of enclosure and terminated with a threaded pipe cap. Air piping shall be piped to outside of the enclosure and terminate with a pipe flange. The flanges shall be ASME B16.1, Class 125 diameter and drilling and shall extend not less than 4 inches outside of the enclosure for flange bolt removal.

D. An internal ventilating system shall be provided for the enclosure. The ventilation system shall utilize a 120 volt ac rated electric motor driven ventilating fan to draw ambient air into the enclosure for cooling the enclosed equipment prior to exhausting the
Air inlet and exhaust openings shall have noise abatement features that meet the maximum noise level specified when the ventilating system and blower are operating simultaneously. The ventilating fan shall be powered and controlled through the blower control panel. A timer shall be provided to allow the fan to continue to operate for an adjustable time-period after the blower shuts down. When installed outdoors, the ventilation inlet and exhaust openings shall be designed to prevent rain/snow penetration during operation at the maximum wind speeds specified.

2.05.9 Anchor Bolts:

A. Anchor bolts and nuts shall be furnished as required for each item of equipment. Anchor bolts, together with templates or setting drawings, shall be delivered sufficiently early to permit setting the anchor bolts when the structural concrete is placed.

B. The bolts shall be at least 1/2 inch in diameter.

C. Anchor bolts shall be accurately located and centered in pipe sleeves having an inside diameter approximately 2-1/2 times the bolt diameter and a length approximately 8 times the bolt diameter. A square anchor plate with thickness of approximately 1/2 the bolt diameter and side dimensions 4 times the bolt diameter shall be welded to the bottom of each sleeve, with the anchor bolt extended through the plate and welded thereto. Two nuts and a washer shall be furnished with each anchor bolt.

chor Bolts and Nuts.

- SI Type 304, 305, 384, 304L Stainless Steel
- Nuts ASTM F593, Alloy Group 1
- Washers SI B18.22.1; of the same material as the bolts and nuts.

D. Anchor bolts shall be long enough to accommodate at least 1-1/2 inches of space beneath the baseplate and to provide adequate anchorage into structural concrete.

E. Anti-seize compound will be applied to the threads of all stainless steel bolts before assembly.
2.06 ACCESSORIES

2.06.1 Intake Filter:

A. Each blower shall be provided with an intake filter installed in the suction piping. Each filter shall be of all-welded steel construction with prime painted exterior, replaceable dry polyester or cloth filter element, and flanged outlet connection with diameter and drilling conforming to ANSI B16.1, Class 125. Filter shall be cartridge type.

2.06.2 Blowoff Silencers:

A. Each blower shall be provided with a blowoff silencers shall be provided for installation in the piping as indicated on the drawings. When silencers containing absorptive material are used, packing shall suitable for continuous operation at the specified temperature. Packing shall be the polyester fiber type. Hole sizes in the ported tubes within each combination silencer shall be as small as possible to reduce packing blowout. Each silencer shall be of all-welded steel construction with prime painted exterior surfaces and flanged connections with diameter and drilling conforming to ANSI B16.1, Class 125.

B. Silencers shall be sized in accordance with the silencer manufacturer's recommendations. Silencer connection sizes shall match connecting pipe sizes.

2.06.3 Vibration Isolator Base Pads:

A. Spring vibration isolators shall be supplied by the blower packager for each blower.

2.06.4 Flexible Connections:

A. An elastomeric, flanged, arched type flexible connection shall be provided in the suction and discharge piping adjacent to each blower as specified herein.

B. Each flexible connection shall be sized to allow piping movement without exceeding the blower manufacturer's force allowance at the blower flange. Minimum piping movements allowed for each discharge flexible connection shall be as specified herein. The number of arches shall be as specified herein or as needed to meet the specified spring rates and movement capabilities. The inlet connection shall be suitable for 7 psi vacuum service and the discharge connection shall be suitable for a pressure of 15 psig and a temperature rating of 300°F. Suction flexible connectors shall be single arch, Mercer “Type 450”, or equal. Discharge flexible connectors shall be Mercer “Type 450” with “Type 500” retaining rings and Kevlar reinforcement, or equal, with the number of arches, spring rate, and movement as indicated herein.

2.06.5 Valves:

2.06.5.1 Safety Valves:

A. Each blower shall be provided with a safety valve as recommended by the blower manufacturer. The safety valves shall be capable of protecting the blowers from damage due to operation with a closed discharge valve. For valves smaller than 2 inch,
valves shall be spring loaded type. For valves 2 inch and larger, the safety valves shall be weighted type, anodized aluminum, as manufactured by Pathfinder Systems, Inc. without exception. Weights shall be chrome zinc plated and provided in half pound increments for settings below 15 psig. The valves shall be suitable for temperature up to 300°F. Set points shall be at least 1 psi above the rated blower discharge pressure unless otherwise indicated.

2.06.5.2 Check Valves:

A. An air check valve shall be installed in the discharge piping from each blower downstream of the discharge silencer as part of the factory piped package. Check valves shall be provided with flanged ends or shall be suitable for installation between pipe flanges. Check valves shall be suitable for use with rotary positive displacement blowers and for operation at all temperatures between 0°F and 300°F. Pressure drop across the check valve shall not exceed 3 inch W.C. Check valves shall be Techno Corporation “Technocheck Silent Seatless Check Valves”, US valve of Englewood, NJ, or equal.

2.06.6 Pressure Gauges:

A. A pressure gauge shall be furnished and installed in the discharge piping of each blower and a vacuum gauge in the suction piping of each blower.

B. Pressure gauges shall conform to ANSI B40.1 and shall be of the indicating dial type with C-type phosphor bronze bourdon tube, stainless steel rotary geared movement, phenolic open front turret case, adjustable pointer, stainless steel or phenolic ring, and acrylic plastic or shatterproof glass window. All gauges shall be ANSI Accuracy Grade A. Gauges installed indoors shall be liquid filled.

C. The dial shall be 4-1/2 inch size with white background and black markings and shall have dual English and metric indication. The English units of measurement shall be pounds per square inch and the metric units shall be kilopascals. The range for each discharge pressure gauge shall be from 0 to 15 psig. The range for each vacuum gauge shall be from 30 inches Hg vacuum to 0. Pointer travel shall be not less than 200 degrees nor more than 270 degrees.

D. All gauges shall be provided with 1/2 inch NPT connections. Each gauge shall be provided with a threaded end ball type shutoff valve as specified in the Miscellaneous Ball Valves section installed at the blower discharge piping connection.

2.06.7 Pressure Switch:

A. A pressure switch shall be furnished and installed in the discharge piping of each blower and furnished for installation across each intake filter. Each switch in the blower discharge piping shall have an adjustable range of 0 to 15 psig and shall be set lower than the relief valve setting. Each switch across the intake filters shall have an adjustable range from 0 to 10 inches water column vacuum.
A. Each pressure switch shall be field adjustable and shall have a trip point repeatability of better than 1 percent of actual pressure. Each switch shall have one normally open and one normally closed contact rated 10 amps at 120 volt ac. Each switch shall be wired to the blower control panel and shall shut down the blower on high discharge pressure or high pressure drop across the filter. Switches shall have a weatherproof housing and shall be as manufactured by Static-O-Ring Company, Mercoid Control, Barksdale, or equal.

2.06.8 Thermometers:

A. A thermometer shall be provided for monitoring of temperature in the discharge piping. The thermometer shall be mounted on the blower control panel. The capillary routing shall not require disassembly for normal maintenance of the blower, motor or V-belts.

B. Thermometers shall be of the remote reading gas actuated dial type. Thermometers shall have a minimum dial size of 4-1/2 inches, an adjustable pointer, shall be accurate within 1 percent of full scale. Thermometers shall have both Fahrenheit and Celsius indication. Thermometers shall be furnished complete with a uniformly graduated dial indicator, armored capillary tube, bulb or temperature sensor, and thermowell. Thermometer ranges shall be such that the normal operating reading will be near the midpoint of the range. The units of measurement shall be indicated on the dial face. Spare capillary length shall be neatly coiled and tied.

2.06.9 Temperature Switches:

A. Temperature switches shall be remote bulb type with one normally open and one normally closed contact rated 10 amps at 120 volt ac. Temperature switches shall have NEMA 4 housings, stainless steel thermal well assemblies, and armored capillaries. Capillary length shall be sufficient for convenient mounting. Each temperature switch shall be wired to the blower control panel and shall shut down the corresponding blower on high discharge air temperature.

2.06.10 Vibration Detection Systems.

A. Solid state vibration detection systems shall be furnished and installed to monitor vibration on each blower housing and motor housing or in each blower bearing and motor bearing. Vibration detection systems shall include control panel mounted vibration relays and equipment mounted vibration sensors. Each vibration detection system shall include the following features: Built-in time delay that is field adjustable; No false triggering; Calibrated dial for setting limits; Solid state relays for alarm and shutdown including normally open and normally closed contacts for each condition rated 5 amps continuous at 120 volt ac; provision for self test and calibration; sensitivity of the system unaffected by rotational speed of equipment.

B. Vibration detection alarm and shutdown shall be triggered by either velocity or displacement as recommended by the equipment manufacturer.

C. Vibration relays shall be mounted in the blower control panel, and the vibration sensors shall be mounted on the driven equipment as recommended by the manufacturer. Cable
between the sensor and the switch shall be provided by the vibration detection system manufacturer.

D. The vibration detection system shall be rated for a 120 volt ac supply and shall be derived from the blower control panel. Vibration detection system shall be manufactured by PMC Beta or equal.

2.07 BALANCE

A. All rotating parts shall be accurately machined and shall be in as nearly perfect rotational balance as practicable. Excessive vibrations shall be sufficient cause for rejection of the equipment. The mass of the unit and its distribution shall be such that resonance at normal operating speeds is avoided. In any case, the maximum unfiltered vibration velocity, as measured at any point on the machine, shall be as required.

B. At any operating speed, the ratio of rotative speed to the critical speed of a unit or its components shall be less than 0.8.

2.08 DRIVE UNITS

A. Each blower shall be driven by an electric motor through a belt drive as required. Drive units shall be designed for 24 hour continuous service.

2.08.1 V-Belt Drives:

A. Each V-belt drive shall include a sliding base or other suitable tension adjustment. V-belt drives shall have a service factor of at least 1.6 times the motor nameplate horsepower of the drive motor.

2.08.2 Safety Guards:

A. All belt drives, couplings, and other moving or rotating parts shall be covered on all sides by a safety guard. Safety guards shall be fabricated from 16 USS gage or thicker galvanized or aluminum-clad sheet steel or from 1/2 inch mesh galvanized expanded metal. Each guard shall be designed for easy installation and removal. All necessary supports and accessories shall be provided for each guard. Supports and accessories, including bolts, shall be galvanized.

2.08.3 Electric Motors:

A. The maximum brake horsepower shall be less than the motor nameplate rating by 5 percent or by the amount of the anticipated belt losses, whichever is greater. Each motor terminal box shall be sized to accommodate the installation of a current transformer specified herein, and all incoming power and control cable as indicated on the drawings.

2.09 CONTROLS

2.09.1 Blower Motor Starters.
A. Motor starters will provide to the blower control panel one normally open dry motor run contact. The contact will close when the blower motor is started and will open when the blower motor is stopped.

B. The equipment manufacturer shall provide a local disconnect switch for hand/off/auto control in a separate panel exterior to the blower enclosure. Manual operation of the blower will be located in this panel and not at the MCC.

2.09.2 Blower Control Panel.

A. All blowers shall be furnished with a common blower control panel as indicated on the drawings. The blower control panel shall be furnished with all gauges, relays, pilot devices, indicators, etc., required to monitor and shutdown each blower for the following conditions: High discharge air temperature, high discharge pressure, and high differential pressure across intake filter.

B. The control panel shall be mounted separate from the blower package to prevent vibration from affecting panel mounted components. All components installed in or on the panel shall be rated for the control power supply as required. If voltages other than the specified control power supply are required, the panel supplier shall furnish the required control power transformers.

C. The control panel shall be furnished with a white control power on indicating light.

D. The control panel shall be furnished with red indicating alarm lights for high discharge air temperature, high discharge pressure, and high differential pressure across intake filter.

C. For all conditions above requiring red indicating lights control relays shall be furnished in the panel with normally open dry contacts rated 10 amps at 120 volt ac for remote annunciation of the condition. In addition, all alarm conditions shall be combined in the panel to generate a common alarm. The common alarm relay shall be furnished with one normally open and one normally closed contact each rated 10 amps at 120 volt ac. The normally open contact shall be used for remote annunciation and the normally closed contact shall be wired to the respective blower starter or controller for shutdown purposes.

D. The panel shall be furnished with a manual alarm reset pushbutton and all alarm conditions shall require a manual reset before the alarm condition and contact is cleared.

E. The panel shall be furnished with a warning and alarm light test pushbutton that illuminates all panel mounted lights when pushed.

2.09.3 Panel Fabrication Requirements.

A. The control panel furnished shall conform to the requirements of NEMA ICS-6. Panels shall be rated NEMA Type 4X and shall be constructed from stainless steel.

B. All panel wiring shall be of the type normally furnished by the manufacturer with the following exceptions. All power and control wiring for 120 volt circuits shall be stranded...
copper #12 AWG minimum. All power and control wiring shall have a 600 volt insulation rating and a nominal maximum operating temperature of 90 degrees C. All analog circuits shall be #16 AWG twisted shielded pair rated for at least 300 volts. Conductor insulation for power, control, and analog circuits shall have a moisture-resistant and flame-retardant covering.

C. All wiring shall be grouped or cabled and firmly supported inside the panel. Wiring shall be bundled in groups and bound with nylon cable ties or routed in Panduit or similar nonmetallic slotted ducts. Ducts shall be readily accessible within the panel, with removable covers, and with space equal to at least 40 percent of the depth of the duct remaining available for future use after completion of installation and field wiring. Sufficient space shall be provided between cable groups or ducts and terminal blocks for easy installation or removal of cables.

D. The power entrance to each panel shall be provided with a surge protection device. Surge protectors shall be nominal 120 volts ac with a nominal clamping voltage of 200 volts. Surge protectors shall be of nonfaulting and noninterrupting design, with a response time not to exceed 5 nanoseconds. Surge protectors shall be manufactured by Innovative Technology, Power Integrity Corporation, or Transtector.

E. Terminal blocks shall be suitable for 12 AWG wire and shall be rated 30 amperes at not less than 300 volts. Terminal blocks shall be fabricated complete with marking strips, covers, and pressure connectors. Terminals shall be labeled to agree with the identification on the System Supplier's submittal drawings. A terminal shall be provided for each conductor of external circuits, plus one ground for each shielded cable. At least 25 percent spare terminals shall be provided. Not less than 8 inches of clearance shall be provided between the terminal strips and the base of vertical panels for conduit and wiring space.

F. Nameplates shall be provided on the face of each panel and on each individual control or pilot device. Panel nameplates shall be made of laminated phenolic material with engraved letters approximately 3/16 inch high extending through the black face into the white layer, and shall be secured firmly to the panel.

G. All control and pilot devices furnished shall be NEMA 4 rated, heavy duty oiltight.

2.09.4 Factory Panel Test:

A. Before shipment, the panels shall be electrically tested by the manufacturer.

2.09.5 Sequence of Operation:

A. The blower sequence of operation shall be as indicated below:

    Startup Sequence:

    1. Energize blower motor

    Shutdown Sequence:
2. De-energize blower motor

2.10 SHOP PAINTING

A. All steel and iron surfaces shall be protected by suitable coatings applied in the shop. Surfaces that will be inaccessible after assembly shall be protected for the life of the equipment. Coatings shall be suitable for the environment where the equipment is installed. Exposed surfaces shall be finished, thoroughly cleaned, and filled as necessary to provide a smooth, uniform base for painting. Electric motors, speed reducers, starters, and other self-contained or enclosed components shall be shop primed or finished with an oil-resistant enamel or universal type primer suitable for top coating in the field with a universal primer and aliphatic polyurethane system.

B. Machined, polished, and nonferrous surfaces shall be coated with rust-preventive compound.

2.11 SHOP TESTS

2.11.1 Operational Test:

A. Each blower shall be shop tested by the manufacturer for vibration and pressure developed and shall be checked for leaks, faulty components and controls.

2.11.2 Slip Test:

A. A slip test shall be performed on each blower. The test shall consist of an ASME PTC-9 slip test, with calculations correcting the results to field conditions, to ensure compliance with specifications. The test shall be in accordance to the paragraph, 4.52 of ASME PTC-9 slip test.

2.11.3 Vibration Test:

A. A vibration test shall be performed on each blower. When the vibration test indicates an overall vibration velocity greater than 0.45 inches per second, the manufacturer shall be responsible for performing and reviewing a frequency analysis. The manufacturer shall make corrections as necessary, and confirm that the vibration velocity will not be detrimental to the equipment. An overall vibration velocity greater than 1.0 inch per second shall be sufficient cause for rejection of the equipment.

B. Defective equipment and controls disclosed by the tests shall be replaced and each unit placed in satisfactory operating condition before shipping.

C. Six certified copies of the test report complete with performance curves, data, and all calculations shall be submitted in accordance with the submittals section.

PART 3 - EXECUTION

3.01 INSTALLATION
A. Each blower unit will be installed in accordance with Equipment Installation section.

B. Unless otherwise indicated or specified, the blower unit will be installed on concrete bases at least 6 inches high. Vibration isolation pads will be installed between the blower unit baseplate and the concrete base.

3.02 FIELD QUALITY CONTROL

3.02.1 Installation Check:

A. An experienced, competent, and authorized representative of the manufacturer shall visit the site of the Work and inspect, check, adjust if necessary, and approve the equipment installation. The representative shall be present when the equipment is placed in operation in accordance with Startup Requirements section, and shall revisit the job site as often as necessary until all trouble is corrected and the equipment installation and operation are satisfactory in the opinion of ENGINEER.

B. The manufacturer's representative shall furnish a written report certifying that the equipment has been properly installed and lubricated; is in accurate alignment; is free from any undue stress imposed by connecting piping or anchor bolts; and has been operated under full load conditions and that it operated satisfactorily.

C. The manufacturer’s representative shall verify:

1. Each blower discharge isolation valve is fully open.
2. Each check valve is properly installed.
3. Piping is installed such that excessive force is not being exerted on the blower flanges.
4. No resonance vibration conditions are occurring within the blower package or air piping.

D. All costs for these services shall be included in the contract price.

3.03 FIELD RUN TESTING

A. Each blower shall be mechanically checked for proper operation. Each alarm and safety shutdown shall be checked by artificially simulating an alarm condition. Defective equipment and controls disclosed by the tests shall be replaced or corrected, and the packages placed in satisfactory operating condition. The following items shall be measured, recorded, and submitted in a field test report:

1. Discharge pressure, each blower.
2. Discharge temperature, each blower.
3. Differential pressure across each intake filter unit.
4. Pressure and temperature at downstream end of piping system at any measurement taps provided.
5. Outdoor ambient temperature.
6. Indoor ambient temperature.

B. Test reports shall verify that the specified tests have been performed and shall state results.

3.04 TRAINING

A. The manufacturer’s representative shall provide training for Owner in proper operation and maintenance of the equipment. Such services shall be included in the contract price.

END OF SECTION
SECTION 13220
FILTERS

PART 1 - GENERAL

1.01 SCOPE

A. This section covers the design, furnishing, and installation of underdrains and media for the filters, including all items within each filter cell for collecting filtered water and uniformly distributing backwash air and water including all appurtenances and controls.

B. Equipment provided under the manufacturer’s scope listed below is not all specified within this section. It shall be the manufacturer’s and Contractor’s responsibility to ensure that the equipment provided meets the requirements of the specification listed below and any other associated specification. The equipment manufacturer shall provide the equipment and all appurtenances described in this section and as listed below:

- Air scour blower package - Specification Section 11625
- Filter underdrain system - Specification Section 13220
- Backwash collection system - Specification Section 13220
- Backwash troughs - Specification Section 13220
- Level instruments in filters - Specification Section 13563
- Flow meters for filters - Specification Section 13562
- Filter control valves - Specification Section 15101
- Backwash rate control valves - Specification Section 15101

C. This specification has been prepared on the basis of the specific requirements for this application. These specifications require modification of manufacturer’s standard equipment design. It will be mandatory that all equipment manufacturers meet all requirements of this specification. Equipment manufacturer shall modify their standard designs and recommended operational parameters to meet all requirements of this specification. Any claims to the contrary, whether specific or implied, indicating that the equipment may not meet the specifications, will be considered grounds for rejection of the bid.

D. Plans do not show all of the information required for installation. Contractor is to obtain, during the bid phase, such information and drawings from approved manufacturers as required to evaluate the scope of installation.

1.02 GENERAL

A. Each filter shall be constructed and equipped as indicated on the Drawings, as specified, and as required to provide a properly operating filter installation acceptable to the Engineer. All reinforcing steel, anchors, concrete fill, concrete supports, and grout required for installation of the filter underdrains shall be furnished and installed.
1.02.1 Coordination:

A. Installation of the underdrains, air supply equipment, and media shall be coordinated with the installation of related items of filter equipment and materials covered in other sections including air and water piping, valves, and air blowers. Contractor shall obtain installation details and recommendations from the underdrain manufacturer to install the filter underdrain system, including but not limited to requirements for grouting keys and pockets, dowels, support ledges and piers, plastic forms, and anchorage. Complete installation details are not depicted on the Drawings and Contractor shall coordinate installation of the underdrains with the supplier. Filter underdrains shall not be installed until testing of the filter cells for water tightness, repair of leaks, and concrete dampproofing inside the filter cells have been completed.

1.02.2 Manufacturer's Experience:

A. The underdrain manufacturer and the media supplier shall have furnished underdrains and media of the types specified which have been in successful operation for not less than 5 years.

1.02.3 Installation Supervision:

A. Installation of underdrains shall be under the direct supervision and control of a competent and experienced field representative of the underdrain manufacturer and acceptable to the Engineer. The field representative shall remain on-site for the duration of the underdrain and air distribution manifold installation and testing, and shall certify in writing that the installation is correct.

B. The installation of filter media shall be under the direct supervision and control of a competent and experienced field representative employed by the media supplier and acceptable to the Engineer.

C. The qualifications and experience record of these field representatives shall be submitted to the Engineer for review along with the initial drawing submittals.

1.03 SUBMITTALS

A. Complete descriptive data for filter underdrains and filter materials shall be submitted for review prior to shipment, in accordance with the Submittals section. Information shall include, but shall not be limited to, the following:

Filter/Backwash System
- Name of manufacturer.
- Complete specifications and dimensional drawings for all components listed in Part 1, paragraph 1 including but not limited to air scour blowers, control valves, and backwash collection system.
- Installation drawings.
- Complete test reports and design calculations showing conformity with design flow requirements.
Complete specifications for instrumentation and control devices including but not limited to flow measuring devices and control panel information.

**Underdrains**
- Name of manufacturer.
- Complete specifications and dimensional drawings
- Installation drawings
- Certification that the distribution manifold support design has been performed in accordance with criteria specified in the General Equipment Stipulations section or indicated on the structural Drawings.
- Complete test reports and design calculations showing conformity with design flow requirements.
- Pressure drop for air and air/water backwash equipment, through each component of the filter equipment including air header, J-riser, underdrain, orifice, and media.
- Certification of compliance with underdrain loading requirements. Certification shall be sealed and signed by a licensed professional engineer.
- Test procedures.
- Installation procedures.
- Qualifications and experience record of the field representative.

**Filter Media Materials**
- Name of supplier.
- Specific gravity.
- Sieve analyses for fine sand and anthracite.
- Effective size and uniformity coefficient for fine sand and anthracite.
- Mohs’ hardness for anthracite.
- Acid solubility for anthracite.
- Caustic solubility for anthracite.
- Loss on ignition for filter sands.
- Qualifications and experience record of the field representative.

### 1.04 DELIVERY, STORAGE, AND HANDLING

A. Shipping shall be in accordance with the Shipping section. Handling and storage shall be in accordance with the Handling and Storage section and as specified herein.

B. Filter underdrain components shall be handled carefully to prevent damage and shall be stored on platforms clear of the ground. Only sound, undamaged units shall be used in the Work. Any items damaged before final completion of the Work shall be removed and replaced with undamaged units by and at the expense of the Contractor.

C. Containers for shipping filter media shall be new and unused.

**PART 2 - PRODUCTS**

2.01 UNDERDRAINS

2.01.1 Acceptable Manufacturers:
A. The underdrain system shall be Leopold Universal Type XA underdrain with media retainer filter arrangement or equal. Drawings have been based around the design of this manufacturer. Contractor shall be responsible for all changes required to the structures, piping and design fees if another manufacturer is selected.

2.01.2 Performance and Design Requirements:

A. The entire floor area of each filter shall be equipped with an underdrain. The underdrain system shall be manufactured from corrosion resistant, high density polyethylene for installation in four (4) filters, two (2) cells per filter for a total of eight filter cells. Each filter cell measures 15'-0" wide by 22'-6" long for a total area per filter cell of 337.50 square feet and a total overall filter area of 2,700 square feet.

B. The filter underdrain system in each filter bay shall consist of pre-formed filter blocks with air diffuser piping capable of withstanding maximum hydraulic, static and dynamic conditions for which the underdrain will be exposed. Underdrains shall be designed to support the filter media as specified herein, and shall be designed for entry and exit of water into a manifold as indicated on the Drawings.

C. The blocks shall be arranged end-to-end and mechanically joined with an O-ring to form continuous underdrain laterals approximately equivalent to the length of the filter cell. The joints shall be gasketed, bell and spigot type with internal alignment tabs for proper alignment, and be air and water tight. Joints shall be snap-lock type so the blocks are joined with integral interlocking snap lugs and lug receptors for ease of assembly and installation of the laterals, and supplied with carbon steel "L" anchor rods.

D. The equipment supplier is to provide 2,700 square feet of media retainer plates. The molded thermoplastic media retainer plates shall be factory installed onto the proposed underdrain blocks prior to shipment.

E. Three (3) backwash troughs shall be installed in each filter cell. The troughs shall be designed to accept a water backwash flow at specified flow rates while backwash water overflows the trough for duration greater than 10 minute without loss of media and without inhibiting the removal of suspended solids. The maximum horizontal travel to the centerline of the trough shall be three (3) feet. Each width of each trough, from weir to weir shall be 1'-6". The collection troughs shall have adjustable weir edges along the entire length of trough to allow for equal distribution and collection of water.

F. There will be a total of twenty four (24) reinforced fiberglass troughs measuring 18" side x 19" deep x 22'-6" long with round bottom construction. Troughs will be supported from existing beams spanning the width of each filter cell. Support hardware shall be Type 304 stainless steel hangers with threaded connections doweled a minimum of 8" into the bottom of each concrete beam.

G. The equipment supplier shall furnish eight air header assemblies, one for each filter cell. The air header assemblies shall be manufactured from Schd. 5, Type 304 stainless steel pipe. The air headers shall measure 6" in diameter and will run the full 15'-0" width of each of the eight filter cells. The air header shall commence with a flange approximately 3" inside the filter cell. Mating flange and hardware will supplied by the Contractor. The
air header pipe shall have J-riser pipes to provide air to each of the individual filter laterals. Included with the air header pipe shall be the required Type 304 stainless steel support and all fasteners and hardware necessary to install a complete and functional air distribution system.

H. The filter underdrain system, backwash troughs, and air diffuser system shall be designed to uniformly collect filtered water and uniformly distribute backwash air and water under the following conditions:

- Downflow of filtered water at 4.0 gpm/ft².
- Upflow of backwash air at 4.0 scfm/ft².
- Low rate upflow of backwash water at 5 gpm/ft².
- High rate upflow of backwash water at 20 gpm/ft².

I. There shall be no mounding, lateral displacement or other disturbances to the filter bed caused by non-uniform flows. The average maldistribution of air and water flow during backwash across the filter shall not exceed ±10% and ±5% respectively of the average flow per unit of filter surface area at all specified flow conditions. Backwash collection system shall guarantee media loss of one inch per year or less.

2.01.3 Air Distribution Manifold:

A. The airwash distribution manifold shall be designed to uniformly discharge air beneath the underdrain to provide a uniform air blanket. The airwash piping shall be installed beneath the underdrain prior to installation of the underdrain forms. The air distribution manifold from the connection point inside the filter wall, including air header, riser pipes, flanges, hangers and supports, and all accessories, shall be furnished by the filter underdrain manufacturer, ready for field installation with no cutting or alterations required. The quantity and location of supports provided shall be as required by the manufacturer’s design, except that the maximum space between supports shall not exceed the spacing specified in the Pipe Support section. The manifold, support system, and accessories shall be constructed of Type 304L or 316L stainless steel.

B. The maximum allowable air pressure loss, at the design conditions above, through the air piping provided by the filter equipment manufacturer, the underdrains, and the media, but excluding water head, shall not exceed 5 psi. Manufacturer shall be responsible for providing a triple arch expansion joint at each of the blower discharge connections. The expansion joints shall be the elastomeric, arched type and shall be Mercer “Type 450” with “Type 500” retaining rings and Kevlar reinforcement, or equal.

2.01.4 Anchorage and Grout:

A. All anchorage shall be 304 or 316 stainless steel. Grout shall be in accordance with the underdrain manufacturer’s recommendation. Concrete shall be in accordance with Type A1 concrete as described in the Concrete section.

2.01.5 Stainless Steel:
A. All stainless steel shall be passivated in accordance with ASTM A967 and AMS 2700 at the mill before being shipped. Passivation shall remove embedded iron and heat tint. After fabrication, passivated surfaces shall be subjected to a free iron test for a ferroxyl test to detect the presence of residual embedded iron in accordance with testing procedures in ASTM A967. All passivated surfaces contaminated or damaged during fabrication including welded areas shall be repassivated as needed to remove all traces of iron contamination and heat tint. All stainless steel surfaces shall be adequately protected during fabrication, shipping, handling, and installation to prevent contamination from iron or carbon steel objects or surfaces. Stellar Solutions - CitriSurf 2210 or approved equal shall be used for passivation.

2.01.6 **Field Passivation:**

A. All non-submerged stainless steel components, and all stainless steel components installed within 3 inches below the minimum water surface elevation shall be field passivated. Preparation and passivation of the stainless steel welds shall be passivated with BOW 15154 UTP CF PICKLING PASTE. The entire exterior surface shall be washed with Stellar Solutions - CitriSurf 2310 after the paste is applied and set.

2.02 **FILTER MEDIA**

A. Filter media materials shall comply with AWWA B100, except as modified herein. Gradation sizes shall be based on square hole sieves conforming to ASTM E11.

**Filter Sand**

- Loss on Ignition: ASTM C25; 4 percent maximum.

**Anthracite**

- Specific Gravity: 1.5 minimum.
- Acid Solubility: 5 percent maximum.
- Hardness, Mohs' Scale: 2.7 or greater.
- Caustic Solubility: 2 percent maximum in 1 percent sodium hydroxide solution at 190°F.

2.02.1 **Media Suppliers:**

A. All filter media shall be supplied by one supplier who shall assume responsibility for the quality and compatibility of the media. Media shall be supplied by filter equipment manufacturer.

2.02.2 **Filter Media:**

A. Filter media shall be furnished in two sizes and installed in layers.

1. **Bottom Layer.** The bottom layer of silica sand shall be 16 inches thick and shall be placed directly over the filter underdrain cover plates.
2. **Top Layer.** The top layer of anthracite shall be 20 inches thick and shall be placed directly over the 16 inch thick layer of silcia sand.

B. Fine sand shall have the following characteristics:

<table>
<thead>
<tr>
<th>Effective Size</th>
<th>Uniformity Coefficient</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.45 to 0.55 mm</td>
<td>1.65 maximum</td>
</tr>
</tbody>
</table>

C. Anthracite filter media shall be furnished in a single size range and installed in a single layer 20 inches thick directly over the fine sand. Anthracite shall have the following characteristics:

<table>
<thead>
<tr>
<th>Effective Size</th>
<th>Uniformity Coefficient</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.95 to 1.05 mm</td>
<td>1.50 maximum</td>
</tr>
</tbody>
</table>

Anthracite shall be of deep pit mine origin and shall not contain dredged or bank material. Anthracite shall be free of extraneous material.

2.03 **FILTER CONTROL SYSTEM**

A. The filter control system shall be furnished, programmed and started-up by the filter equipment supplier. The system shall include a programmable logic controller system, and field instrument devices as indicated on the drawings, and as specified in Section 13500.

2.03.1 **Programmable Logic Controller:**

A. The programmable logic controller system is existing Allen Bradly System. Contractor shall add compatible I/O modules as necessary re-program to the sequence of operations in Section 13500.

2.03.2 **Filter Instrumentation:**

A. The filter instrumentation devices shall be provided as indicated on the Instrument Device Schedule in Section 13500. The instrument devices shall meet the requirements as specified in Section 13500 and associated subsections.

**PART 3 - EXECUTION**

3.01 **INSTALLATION**

3.01.1 **Filter Underdrains:**

A. Each underdrain system shall be installed so that a uniform backwash is obtained over the entire surface of the filter. Underdrains shall be securely anchored to withstand forces under all operating conditions. Installations shall be in accordance with the recommendations of the underdrain manufacturer, and as specified herein.
B. Contractor shall thoroughly clean the filter cell and piping connected to the underdrain system. Backwash water and air pipe shall be flushed with water and air respectively, and all dirt and debris within the filter cell shall be removed prior to installation of the underdrain system.

C. Underdrain nozzles shall be bedded in the monolithic concrete pour and carefully leveled. The underdrain system shall be leveled to position the air metering orifices in a level plane. Leveling of the underdrain system shall be to the tolerance recommended by the underdrain manufacturer. Contractor shall flood the underdrain with water to determine if the leveling requirement has been met. Sections that are not within the specified tolerance shall be removed and replaced with new sections to within level tolerance.

D. The underdrain support piers will consist of 6" Sch. 40 PVC pipes, cut to length and slotted at one end to accept and securely hold the underdrain forms. The pier forms will be placed on 2'-0" centers throughout the underdrain, placed directly over vertical reinforcing rods which have been anchored in the filter floor with epoxy anchors. Epoxy anchors shall be supplied by filter underdrain manufacturer.

E. The underdrain forms shall be nominally 24" square and constructed of ABS plastic. The underdrain forms shall be designed to be supported at each corner by a pier form in such a way that when the underdrain form is installed, the entire assembly locks in place. The underdrain forms shall also be designed such that when installed a minimum 4" concentric opening is present at each pier form to permit installation of concrete in each pier form.

F. The underdrain form shall be of a honeycomb design with inherent strength and rigidity. Within each form, a total of nine (9) openings shall be provided to accept the snap mount insert assemblies. The openings shall be located in the underdrain form such that after the inserts and diffuser nozzles have been installed, the nozzles are on 8" centers.

G. The underdrain forms shall be designed specifically such that no air can be trapped beneath the underdrain in the underdrain form. Vents shall be provided that will direct entrapped air to the diffuser nozzles allowing escape.

H. Plastic inserts will be provided for installation in the underdrain forms. The inserts are of the snap mount design where the inserts will snap in place when pushed down through the receiving opening in the underdrain. The inserts will be of sufficient length to provide a minimum 6" depth of concrete above the highest elevation of the form. The inserts shall be provided with thread protection caps to protect the threads that receive the underdrain diffuser nozzles and to prevent concrete from getting into the plenum area. When the concrete is leveled, it should be screeded smooth and level to the bottom of the thread protector caps.

I. The underdrain diffuser nozzles shall be media retaining type nozzles of the fine slotted design. The nozzles shall be equipped with threaded connections and installed in the underdrain inserts after the concrete has set and the thread protection caps have been removed. The nozzles shall be provided with an O-ring mounted over the threads so that when the diffuser nozzles is threaded into the insert and tightened down, the bottom
of the diffuser nozzle compresses the O-ring against the concrete floor and insert providing a watertight seal. Nozzles shall be supplied with a metered orifice tailpipe for proper distribution of air and water during backwash procedures.

3.01.2 **Air Distribution Manifold:**

A. The air distribution manifold shall be installed in accordance with the manufacturer’s recommendation.

3.01.3 **Filter Media:**

A. Filter media placement shall comply with AWWA B100, except as modified herein. Media which becomes dirty or contaminated shall be removed and replaced with clean media.

B. The bottom layer shall be carefully placed to avoid damage to the filter underdrain system. Each layer shall be completed before starting the layer above. For materials less than 1/2 inch in size, workers shall not stand or walk directly on the media, but on boards which will sustain their weight without displacing the media.

C. Each layer of filter material shall be deposited to a uniform thickness, with the top surface screeded or otherwise brought to a true level plane. Care shall be taken in depositing each layer not to disturb the level surface of the layer beneath. The correct thickness of each layer shall be determined by screeding each layer to a continuous level line on the side of the filter cell. The layer shall then be leveled, with the water surface maintained at the appropriate elevation mark.

D. Placement of filter material shall be performed so as to avoid staining or damaging surfaces of the filter walls. Surfaces that are stained or damaged shall be repaired to the satisfaction of the Engineer.

3.01.3.1 **Washing, Scraping, and Skimming:**

A. Material in the sand passing a No. 50 sieve shall be removed by scraping the surface after washing, before the anthracite is installed. Flat particles shall be removed from the anthracite by skimming.

B. Washing and scraping shall comply with the governing standard, except the initial scraping of anthracite shall be a layer approximately 3/8 inches thick.

3.01.3.2 **Field Control Tests:**

A. Field control tests for filter media materials will be performed in accordance with the procedures and requirements of AWWA B100, by an independent testing laboratory at the expense of the Owner. Media not passing field control testing shall be replaced.

1. **Fine Sand.** At least one sieve analysis will be made representing each carload or truckload. In addition, a sample for determination of the portion passing a No. 50 sieve will be taken from each 100 cubic feet of sand placed in a filter. A composite
sample will be prepared for each filter and at least three sieve analyses will be made on the composite sample. The average of the sieve analyses will be used to determine the amount of fine material to be removed from the filter by scraping.

2. **Anthracite.** At least one sieve analysis will be made for each carload or truckload.

### 3.02 FILTER DISTRIBUTION TESTING

- **A.** Contractor shall conduct testing and furnish all materials, instrumentation, and personnel, for testing as specified herein. All testing and rectification work for systems failing testing shall be at the Contractor’s expense.

- **B.** Contractor shall verify that all equipment is properly installed and that the filter, backwash system, and backwash air system is complete prior to performing any tests. A manufacturer’s representative shall inspect the underdrain systems prior to testing and supervise all testing.

- **C.** Contractor shall provide Engineer two weeks notice of testing.

- **D.** Testing shall be performed on installed underdrain systems with the process blowers supplied under this Contract. Contractor shall correct deficiencies revealed during testing, and shall retest as required to demonstrate deficiencies have been rectified.

- **E.** All test set-ups, procedures, and instrumentation shall provide data accuracy of \( \pm 2 \) percent.

- **F.** Contractor shall submit 3 copies of complete test reports for all tests, describing the units tested; the type of test; test set-ups, procedures, and instrumentation; and test flow rates, pressures, levels, and all other data and results as required to demonstrate that all items tested meet specified requirements.

- **G.** Flow rates for testing shall be as specified in the Performance and Design Requirements paragraph.

#### 3.02.1 Visual Distribution Tests:

- **A.** The filter underdrain system in each filter shall be given a visual distribution test to verify flow uniformity. This test shall be performed before filter media bed is placed.

- **B.** For the water distribution test, filter cells shall be flooded with clean water to the top of the underdrain. After all residual air is released, the water flow rate shall be slowly increased to the specified low rate water flow, and sustained for approximately 2 minutes while visual observations are made. The test shall be repeated for the high rate water flow.

- **C.** For the air distribution test, the filter cell shall be flooded to approximately 3 to 6 inches above the top of the underdrain prior to the installation of media. The air flow rate shall be slowly increased to the specified air only rate, and sustained for approximately 2 minutes while visual observations are made.
D. When observation for the air only distribution test is complete, the air and water flow rates shall be adjusted to the specified flow rates for simultaneous air and water backwash. The air and water flow shall be sustained for approximately 10 minutes while visual observations are made.

E. During each test, the water surface shall present a uniformly turbulent appearance, without dead spots or boils. Tests shall be repeated if, in the Engineer's judgment, additional testing is needed to make observations.

3.02.2 Metered Distribution Tests:

A. A metered distribution test shall be performed on a filter where the Contractor is unable to rectify deficiencies demonstrated by the visual distribution testing. Testing shall be performed in accordance with the underdrain manufacturer's metered distribution testing protocol.

B. The Contractor shall install piezometer tubes at 6 points on the underdrain for water distribution testing, and manometer tubes at 6 points for air distribution testing. The locations shall be as directed by the filter underdrain manufacturer's field representative.

C. The high rate water only test and the air only test shall be performed in a manner similar to that described in the Visual Distribution Tests paragraph above. Air and water flow rates shall be held constant at the specified rates for a minimum of 4 minutes while the piezometer and manometer tube readings are recorded. Each test shall be repeated 3 times and the results of the tests shall be averaged.

D. Holes in the underdrain for connection of test instruments shall be plugged with pipe plugs.

E. Average maldistribution of air and water shall be in accordance with the tolerances specified herein, and calculated as follows using the highest (H) and lowest (L) average readings recorded at the test points.

\[
\text{Average maldistribution} = (1 - \frac{L}{H})^{1/2} \times 0.5 \times 100\%
\]

F. The Contractor shall perform metered testing on two other filters of the Engineer's selection if the underdrain system first tested failed to perform within the specified tolerances during the initial test run. Subsequent metered testing of all filters will be required if either of the additional two filters fail testing.

3.02.3 Final Distribution Tests:

A. At least two filters shall be tested for acceptable flow uniformity following placement and washing and skimming of the filter material. The filter cells to be tested shall be selected by the Engineer.

B. Final distribution tests shall consist of a backwash cycle as follows:

1. Start with initial water surface 6 inches below the backwash trough weir.
2. Run air scour at a rate of 4 scfm/ft² for 3-5 minutes.

3. Run water backwash at the specified 20 gpm for 8-12 minutes or until all air has been removed from the underdrain system and restratification has occurred.

C. All flows and durations shall be adjusted during the test if directed by the Engineer.

D. At the conclusion of the final distribution test, the water level shall be lowered to the top of the filter media. The top of the media shall be inspected, and shall have no areas deviating more than 2 inches from the average level plane.

E. If either filter that is tested fails to pass the test, all filter cells shall be tested.

3.03 FACTORY SERVICES AND START-UP

3.03.1 Installation Supervision:

A. The contractor shall coordinate with the treatment equipment manufacturer to provide factory supervision (as outlined on the Equipment Schedule) or direction during critical phases of installation. Critical phases will include setting of equipment, installation of internals, installation of controls, wiring instrumentation and other components critical to the successful operation of the system.

3.03.2 Media Installation:

A. Installation of support gravels and filter media shall be under the direct supervision of an employee of the filter manufacturer experienced in this procedure, in accordance with the Equipment Schedule.

3.03.3 System Start-Up and Training:

A. Notification: The contractor will verify in writing that the project is ready for manufacturers field services. Copies of written verification shall be given to the manufacturer, engineer and owner prior to scheduling field services.

B. Factory Representative. The contractor shall provide the services of a factory representative during start-up of the treatment equipment. The contractor shall provide the number of days on site for start-up supervision as outlined in the Equipment Schedule. At a minimum, the equipment manufacturer’s technician shall perform the following start-up functions:

1. Inspect the final installation to assure proper installation, connection and wiring of all equipment of the manufacturer’s supply.

2. Start-up of the equipment in the presence of the Contractor and Owner’s operating personnel.

3. Training of Owner’s operating personnel in proper operation and maintenance procedures, start-up/shutdown procedures, response to emergency conditions, and
troubleshooting. The responsibility of the Contractor and the factory service representative with regard to start-up shall be fulfilled when the start-up is complete, the equipment is functioning properly, operating personnel have been trained and the equipment has been accepted by the Owner.

3.03.4 **SCADA System Interface:**

A. Provide services of representative to evaluate and resolve in the field SCADA system interface compatibility. Contractor to coordinate services of equipment manufacturer and SCADA contractor, after installation of all components and prior to initial start-up.

3.05 **WARRANTY AND BONDS**

3.05.1 **Backwash Process Verification:**

A. For filter optimization, the backwash process shall incorporate collapse pulse action during the backwash process as described in the AWWA Research Report by Professor Amirtharajah. These specifications incorporate these researched flow rates. The process of sustained simultaneous air and water backwash system minimizes the wastewater production while maximizing cleaning of the filter bed.

B. Manufacturers shall provide certification following start-up that the unit will be run within accepted collapse-pulse ranges during backwash. These ranges are identified in Section 2.9.C.5 of the specification. A representative of the Owner will witness and verify in writing that the system is operating according to specified collapse-pulse rates at the time start-up is completed and are trained in this operation. A copy of the start-up report containing this owner verification shall be provided to the engineer and shall be required before final payment to the contractor can be made.

3.05.2 **Backwash Waste Production Warranty:**

A. The Owner considers water conservation an intrinsic part of this project. As such, all Contractors shall provide with their bid a wastewater generation calculation using the form listed on the Equipment Schedule. Failure to use this form will result in the bid being declared as non-responsive and will be rejected.

B. This plant is designed on Tonka Equipment Company’s maximum backwash volume guarantee. If a Bidder supplies a system which produces more wastewater than Tonka Equipment Company, he shall be held responsible for all costs associated with this increased wastewater production, including but not limited to: expanding the wash water holding tank/lagoon system; revising decant pumps; revising all plans including engineers review time, or other wastewater disposal costs.

3.05.3 **Effluent Performance Warranty:**

A. During start-up, the equipment manufacturer’s representative shall perform raw water and filtered effluent field tests to confirm performance of the equipment. Analytical methods employed for field testing shall be performed by a digital colorimeter. Color comparators are unacceptable.
B. The equipment shall be warranted for a period of one year from the date of placing it online. The treatment water effluent during this period of time shall be as detailed in this specification.

C. Sampling for conformance shall be taken during the middle of a filter run. All adjustments necessary to comply with this guarantee shall be made at the Contractor's expense.

3.05.4 Backwash Waste Production Warranty:

A. The filter equipment manufacturer shall warranty the filter performance based on the following criteria:

- **Filter draindown**: 954 gallons
- **Water only wash (air purge) @ 5 gpm/sq. ft. (473 sq. ft./cell x 2 min continuous)**: 4,730 gallons
- **Water only wash (restratification) @ 15 gpm/sq. ft. (473 sq. ft./cell x 3 min continuous)**: 21,285 gallons
- **Total water usage per cell**: 50,619 gallons
- **Proposed total backwash water total backwash cycle waste water (50,619 gallons/cell x 6 cells)**: 303,714 gallons

B. Calculations shall be based on Ten State Standards durations.

3.05.5 Effluent Performance Warranty:

A. The filter equipment manufacturer shall warranty the filter effluent is less than 0.3 ntu.

END OF SECTION
SECTION 13500

INSTRUMENTATION AND CONTROL SYSTEM

PART 1 – GENERAL

1.01 SCOPE

A. This section covers the furnishing and installation of an instrumentation and control system designated as the Plant Control System

B. The system shall be furnished as specified, complete with all software, human machine interface (HMI) hardware, operator interface terminal (OIT) input/output hardware, instrumentation, and all devices, accessories, appurtenances, testing, and training necessary for proper operation.

1.01.1 Associated Sections:

A. This section also includes the equipment and services specified in the following sections.

   Section 13530       REMOTE I/O (RIO)
   Section 13561       PANEL MOUNTED INSTRUMENTS
   Section 13562       FLOW INSTRUMENTS
   Section 13562       PRESSURE AND LEVEL INSTRUMENTS
   Division 16         ELECTRICAL SPECIFICATIONS

B. The drawings and specifications are complementary. Reference the drawings for further information regarding equipment and requirements of the system. Contractor shall provide a complete and functional system.

1.01.2 Process Equipment:

A. The process equipment including the backwash pump, blowers, valves and associated instrumentation and other devices will be supplied as specified in other sections. All of the plant equipment shall be integrated into an overall control system to be supplied by the manufacturer of the filter backwash system equipment to form one seamlessly operating system.

1.01.3 Sequence of Operation - Backwash

A. The following details the planned filter backwash sequence to be used as the basis for design of the modifications to the four sand filters (2 cells per filter) at the B Street WTP. For this example, the valves for Filter No. 2 will be referenced. Filters 1, 3, 4 shall use the
same sequence. A valve matrix is included at the end of this section. The filter wash sequence will be as follows:

1. Before beginning the filter wash sequence the 16” filter influent valve FLT-VBF-02A and the two 10” filter effluent valves PW-VBF-02A and PW-VBF-02B are open, all other valves connected to this filter are closed.

2. At the start of the filter wash sequence, the 16” filter influent valve FLT-VBF-02A and the 10” filter effluent valves for Filter 2, Cells A and B will be closed.

3. The 16” filter to waste valve WW-VBF-02A will then be opened which to allow Filter 2, Cells A and B to drain to the top of the trough edge in both filters at elevation 329.93.

4. The 6” re-wash valve WWW-VBF-2A will be opened to lower the water surface elevation in Filter 2, Cell A to elevation 328.10. When the water surface has reached elevation 328.10 in Filter 2, Cell A, the 6” re-wash valve will be closed.

5. A command will be sent to the blower to start. After the blower has started, the 6” air supply valve AIR-VBF-02A will be opened and the media bed will be aerated to separate the accumulated sediment from the media. The aeration period of the filter bed will be approximately 5-8 minutes. The aeration period can be adjusted based on the operating conditions.

6. At the end of the aeration period the 6” air supply valve will be closed and the blower will be turned off.

7. Next, the backwash supply pump will be turned on at low speed and the 16” backwash supply valve BW-VBF-02A be opened. The backwash supply valve shall be interlocked with the backwash supply pump such that the valve may not be opened unless the pump is running. The speed of the backwash pump will be increased to provide a flow of 5,400 gpm or 15.0 gpm/sq.ft. to expand and fluidize the media bed to aid in cleaning and re-stratification of the media at the end of the backwash period. The water level in Filter 2, Cell A will rise to elevation 330.18, approximately 3 inches higher than the top edge of the wash water trough. The backwash water will flow through the media thereby expanding the media bed and removing the accumulated sediment, into the three filter cell troughs, to a common channel and through to the 16” filter to waste pipe. The backwash period will be approximately 10 minutes. The backwash period can be adjusted based on the operating conditions. The backwash rate during media cleaning will be approximately 5 gpm/sq.ft. which will be achieved through modulation of pump speed and modulation of the 16” backwash supply valve to achieve the desired flow rate.

8. At this time steps 4 through 7 will be repeated for Filter 2, Cell B.

9. When both cells of Filter 2 have been washed, the 16” filter to waste valve WW-VBF-02A will be closed and the 16” filter influent valve FLT-VBF-02A and the 6” re-wash valves WWW-VBF-02A and WWW-VBF-02B will be opened and the filters will operate
normally for a period of time to re-establish the filter performance, approximately 3-5 minutes.

10. Finally, the 6” re-wash valves will be closed and the 10” filter effluent valves PW-VBF-02A and PW-VBF-02B will be opened and the filter will return to service. The 10” filter effluent valves will be modulated to not exceed the discharge rate of 4 gpm/sq.ft. as measured by the flow meters on the filter effluent piping.

B. All of the time periods described above can be modified by the plant operators based on actual conditions and observation of the cells during the backwash sequence. Please see drawings for reference to valve locations and water surface elevations described in the sequence above.

1.01.4 Sequence of Operation – Filter Control Panels

A. Reference drawings for panel layouts, P&ID, and equipment interconnections. The Filter Control Panels for B Street WTP shall be as shown and described on the drawings and specifications. There are four panels, one for each filter, CP-1 through CP-4, all have the same logic functions, CP-1 has additional controls for the blowers and backwash pump. The description below applies to all Filter Control Panels unless specifically designated as being for CP-1

1. Each Filter Control Panel shall have indicators that shall report OPEN/CLOSED/FAULT conditions for each valve. These indicators shall report valve status regardless of whether the system is in AUTO or MANUAL mode. If an ALARM/FAULT light appears, the user will need to go to the respective valve or SCADA panel for details.

2. Each Filter Control Panel shall have switches to manually operate valves when the respective panel is in the MANUAL mode, these switches shall have no function in the AUTOMATIC mode.
   a. Air and rewash valves shall utilize a center return momentary switch, valve shall stroke fully to either the open of closed position in response to the switch, turn and release.
   b. Backwash and Effluent valves shall have push button switches for open and close, valves shall travel only while respective switch is depressed in response each push button switch, allowing partial opening and closing of valve. A digital position readout calibrated 0-100% shall indicate the position of valve via analog signal from valve.

3. Each Filter Control Panel shall have a switch to select MANUAL or AUTOMATIC mode. The respective panel shall control its respective Filter when in MANUAL mode, allowing manual control of the valves for that filter. When any panel is in MANUAL mode, control of the blowers and backwash pump shall also go to manual mode and be controlled at CP-1, CP-1 is not required to be in MANUAL mode to control blowers.
and backwash pump if any other panel is in MANUAL mode. The PLC shall control all functions when in the AUTOMATIC mode.

4. Filter Control Panel CP-1 shall have additional switches, controls, and indicators for the Blowers as follows:

   a. Indicators for RUN/STOP/FAULT shall mirror status of each blower as shown on the Blower Control Panel at all times.

   b. Blower control RUN/STOP switch shall call and start an available blower as determined by the Blower Control panel logic, when any of the Filter Control Panels are in MANUAL mode and shall have no control when all Filter Control Panels are in AUTOMATIC mode.

5. Filter Control Panel CP-1 shall have additional switches, controls, and indicators for the Backwash Pump as follows:

   a. Indicators for RUN/STOP/FAULT shall indicate the status of the Backwash Pump transmitted from the pump VFD. Status shall be indicated at all times, MANUAL or AUTOMATIC.

   b. Backwash Pump RUN/STOP switch shall start or stop the pump when any of the Filter Control Panels are in MANUAL mode and shall have no control when all Filter Control Panels are in AUTOMATIC mode. Automatic control of the Backwash Pump shall be by the PLC via Ethernet/IP network.

   c. A Backwash Pump speed control shall control the speed of the pump via a potentiometer and 4-20ma signal to the VFD, calibrated as 0-100%. This control shall only function when any of the Filter Control Panels are in MANUAL mode and shall have no control when all Filter Control Panels are in AUTOMATIC mode. Automatic control of the Backwash Pump speed shall be by the PLC via Ethernet/IP network.

   d. A digital readout calibrated 0-100% shall indicate backwash pump speed via analog signal from the pump VFD, this indicator shall function at all times.

   e. The Backwash Pump manual control shall provide a permissive signal when it is reporting a RUN for the pump. This signal will allow the Backwash Valve to open when commanded. This shall be a hardwired interlock for MANUAL mode and software interlock for AUTOMATIC mode.

B. The controls supplier shall provide all necessary items in the panels as required to accomplish the sequence of operation described. This includes, but not limited to, switches, pilot lights, panel readouts, relays, power supplies, alternating relays, terminal strips, rails, enclosures, etc.
1.01.5 Sequence of Operation – Blowers

A. Reference drawings for panel layouts, P&ID, and equipment interconnections. The Blower Control Panel for B Street WTP shall be a duplex control panel that will cycle (alternate) between each of two blowers that are available when a run request is made at the Filter Control Panel CP-1, and roll over to an available blower in the event one is off-line or faults during operation.

1. Each blower shall be provided with an on-board operator interface control panel. The Blower Control panel shall interface with these control panels and follow the logic described. Automation interface between the blowers and PLC shall be via Ethernet/IP networking. When in AUTO mode control of blowers shall be via the network, when in MANUAL mode the network and PLC shall monitor only and report to the SCADA system.

2. The Blower Control Panel shall report RUN/STOP/FAULT conditions for each blower. These indicators shall report blower status regardless of whether the system is in AUTO or MANUAL mode. If an ALARM/FAULT light appears, the user will need to go to the respective on-board blower control panel for details.

3. The Blower Control panel shall have an IN SERVICE/OUT OF SERVICE selector switch for each blower. These will allow the operator to place either blower out of service (off) for maintenance or if the respective blower is inoperable for any other reason. These switches shall interrupt the control circuit to prevent the motor controller in the MCC from being energized. These switches shall also provide a contact closure to RIO-1, communicating to the automation system that the respective blower is out of service and should not be called on by the automation system via the network.

4. The Blower Control panel shall have a Run Time hour meter for each blower to record the cumulative run time on each blower.

5. Further blower control is on the Filter Control Panel CP-1. When the Filter Control Panel is in AUTOMATIC mode, the plant automation PLC shall control the blowers directly via network and bypass the Blower Control panel.

6. When the Filter Control Panel is in the MANUAL control mode, the Blower Control panel and Filter Control Panel shall control the blowers, and other equipment, bypassing the plant automation PLC completely. The PLC shall monitor only in this mode.

7. The Filter Control Panel shall have a RUN/STOP switch to remotely control the Blower Control panel and call for a blower to run, the Blower Control panel logic shall alternate the blowers and decide which blower is started.
8. The Filter Control Panel also shall have RUN/STOP/FAULT indicators for each blower. These will report the status of the blowers at all times regardless of whether the system is in AUTO or LOCAL/MANUAL mode.

9. When the Filter Control Panel is placed in the AUTOMATIC CONTROL mode, all manual controls at the Filter Control Panel and Blower Control Panel shall be bypassed with the exception of the IN SERVICE/OUT OF SERVICE switches at the Blower Control Panel, all indicators and panel displays on both the Blower Control Panel and Filter Control Panel shall continue to monitor and display system status. In the AUTOMATIC CONTROL mode, the plant automation PLC shall bypass the Blower Control Panel and send a signal directly to the MCC for blower operation.

10. The plant automation PLC shall monitor the status of the Filter Control Panel, Blower Control Panel, and blowers at all times whether the system is in AUTO or MANUAL mode. The plant automation PLC shall only operate the system when it is placed in the AUTOMATIC mode.

11. The Filter Control Panel also shall have additional controls as shown on the drawings. The same logic applies, if the panel is in the AUTOMATIC CONTROL mode, the panel controls are bypassed, and the plant automation PLC shall control all devices. When in the MANUAL CONTROL mode, the controls shown on the panel shall control their respective devices such as valves, backwash supply pump, and blowers, bypassing the PLC. All indicators and panel displays shall monitor system status regardless of mode of operation.

B. The controls supplier shall provide all necessary items in the panels as required to accomplish the sequence of operation described. This includes, but not limited to, switches, pilot lights, panel readouts, relays, power supplies, alternating relays, terminal strips, rails, enclosures, etc.

1.01.6 Sequence of Operation – North Plant Filter Backwash

A. Reference drawings for panel layouts, P&ID, and equipment interconnections. The North Plant sequence of operations shall remain the same as it is currently with the exception of the Effluent valves (the 18” Effluent valves function as Backwash valves during the Backwash cycle. These are not to be confused with the Backwash Siphon vacuum valves.) These valves have been replaced with modulating valves to allow adjusting the Backwash flow rate. The logic is the similar for AUTOMATIC (PLC) and MANUAL (LOCAL) operation.

B. AUTOMATIC (PLC) MODE

1. The AUTOMATIC sequence is unchanged for the Service, Fast Drain, Air Scour, and Filter to Drain cycles of the sequence. Contractor shall ensure programming and SCADA screens allow for adjusting all variables, such as duration of cycles, valve percentage opening, dwell times, and rate of valve opening.
2. Before beginning the filter wash sequence the filter Influent Siphon vacuum valve and the 18" filter Effluent valve are open, all other valves connected to the filter are closed.

3. At the start of the filter wash sequence, the filter Influent Siphon vacuum valve and the 18" filter Effluent valves will be closed.

4. The Backwash Siphon vacuum valve will then be opened and remain open.

5. The 6" Air Inlet valve will then be opened during the Air Scour phase and closed at the end of Air Scour.

6. The Backwash cycle of the sequence will incorporate a modulating valve. When the Backwash cycle is initiated, the 18" Effluent valve shall open partially to a predetermined percentage of approximately 25%. Exact percentage shall be determined in the field with operators.

7. The 18” Effluent valve shall remain in this position until the flow has stabilized, dwell time to be determined.

8. Once stabilized, the 18” Effluent valve shall continue to open to FULL OPEN slowly, duration to be determined.

9. Once backwash cycle has completed, the 18” Effluent valve shall close during Filter to Drain cycle.

10. The 8” Filter to Waste valve and Inlet Siphon vacuum valve shall open for duration of Drain cycle.

11. When the filter is placed back in Service, the 18” Effluent valve shall go to full open, and the Influent Siphon vacuum valve shall remain open. The Backwash Siphon vacuum valve shall close, all other valves connected to the filter shall remain closed (6” Air Inlet, 8” Filter to Waste).

C. MANUAL (LOCAL) MODE

1. The MANUAL sequence is unchanged for the Service, Fast Drain, Air Scour, and Filter to Drain cycles of the sequence. The sequence is determined and controlled when PCP-4 Control panel is placed into the LOCAL mode for a particular Filter. Contractor shall modify PCP-4 to operate with the changes to the Effluent/Backwash valve and logic described below. Duration of cycles and dwell times is manually determined by the operator during the Backwash sequence when in the MANUAL (LOCAL) mode. This description only covers the 18” Effluent valve, all other parts of the sequence are the same.

2. The Backwash cycle of the sequence will incorporate a modulating valve. When the Backwash cycle is initiated by placing the control switch in the “Backwash” position, the 18” Effluent valve will be controlled by a momentary contact pushbutton switch to
“bump” the valve partially. Operator will determine opening of valve. Exact percentage shall be determined in the field with operators.

3. The 18” Effluent valve shall remain in this position until the flow has stabilized, dwell time to be determined by operator.

4. Once stabilized, the 18” Effluent valve shall continue to be opened to FULL OPEN slowly, by “bumping” using the pushbutton switch, duration to be determined by the operator.

5. Once backwash cycle is completed, valve should close during Filter to Drain cycle, as determined by the selector switch.

6. The 18” Effluent valve shall go to full open when filter is placed back in Service with the selector switch.

D. The controls supplier shall provide all necessary items in the panels as required to accomplish the sequence of operation described. This includes, but not limited to, switches, pilot lights, panel readouts, relays, power supplies, alternating relays, latching relays, terminal strips, rails, enclosures, etc.

1.01.7 Interface and Use of Existing Equipment and Systems

A. The installation and operation of the controls system incorporates some existing equipment, including instrumentation and control circuits, PLC, RIO cabinets, and a variety of these items without replacement (except for where specifically allowed or directed) and as described below.

B. System Supplier shall provide any and all programming necessary for the existing plant automation system to incorporate the controls specified herein, and on the drawings, including, but not limited to, software and software upgrades, firmware upgrades, programming and reprogramming, and documentation of the system and any modifications made to the software and firmware. Fully licensed copies of any software upgrades or additional software shall be provided to the OWNER.

C. Instrumentation and Control Circuits: The instrumentation and control circuits that are to be directly connected to the existing plant automation system will be connected by the System Supplier, and shall be compatible with the existing system. The System Supplier shall be responsible for providing all interpose relays, isolators, convertors, etc. That are required to make this existing equipment compatible with the controls system delineated in the drawings and specifications. System Supplier shall also provide any additional input cards/modules that may be needed to accommodate the new controls into the existing system. Any such hardware shall be of the same manufacturer as the existing hardware, and fully compatible with same. Connections between new or existing station control panels and the RIO panels shall be performed by the System Supplier. The contractor shall not be responsible for the condition, calibration, or performance of this existing equipment, other than to the extent of reprogramming and calibrating the system.
However, the System Supplier shall make notes of all such conditions, etc. during the check out and startup phases of this contract. System Supplier is responsible for the proper operation of the controls system and shall coordinate with the OWNER any discrepancies requiring correction with the OWNER’s equipment.

D. Control elements shall be furnished at locations as delineated on the drawings.

E. Miscellaneous items such as cables, connections, etc. are not necessarily shown or specified. All such items needed to provide a complete and operable system shall be furnished under the requirements of this contract.

F. Power Supplies: All equipment shall be designed to operate on 115 VAC utility power. The power will be provided by the existing facility as shown on the drawings. All power supplies, converters, isolators, etc. necessary for the proper operation of this equipment shall be furnished by the System Supplier with the equipment.

G. Racks, Cabinets and Furniture: All equipment shall be mounted in or on appropriate racks, enclosures. System Supplier shall furnish required racks and cabinets for equipment.

1.02 GENERAL

A. Equipment furnished and installed under this section shall be fabricated, assembled, erected, and placed in proper operating condition in full conformity with the drawings, specifications, engineering data, instructions, and recommendations of the equipment manufacturer, unless exceptions are noted by Engineer.

1.02.1 General Equipment Stipulations

A. The General Equipment Stipulations shall apply to all equipment and materials furnished under this section. If requirements in this specification differ from those in the General Equipment Stipulations, the requirements specified herein shall take precedence.

1.02.2 Drawings:

A. The drawings indicate locations and arrangements of equipment and may include installation details and block and one-line diagrams showing connections and interfaces with other equipment. The input/output locations are indicated on the drawings.

B. Principal components of the instrumentation systems shall be as indicated on the &ID drawings.

C. Control panel layouts are included in the drawings and are intended to convey the general layout and labelling of the control elements including switches, pilot lights, readouts, etc. for controlling plant devices and equipment. They do not show or indicate any required logic necessary to accomplish functions described in the Sequence of Operation, such as relays, etc.
1.02.3 Codes, Permits and Agency Approvals:

A. All work performed and all materials used shall be in accordance with the National Electrical Code, and with applicable local regulations and ordinances. Where mandated by codes, panels, assemblies, materials, and equipment shall be listed by Underwriters' Laboratories. Contractor shall, as part of their work, arrange for and obtain all necessary permits, inspections, and approvals by the authorities having local jurisdiction of such work. This shall include any third-party inspections and testing of panels and equipment.

1.02.4 Supplier’s Qualifications:

A. Equipment and software furnished under this section and under other related subsections listed in the Scope paragraph above shall be designed, coordinated, and supplied by a single manufacturer or supplier, hereinafter referred to as the System Supplier. The System Supplier shall be regularly engaged in the business of supplying computer-based monitoring, control, and data acquisition systems. The Contractor shall utilize the services of the System Supplier to coordinate all control system related items, to check-out and calibrate instruments, and to perform all testing, training, and startup activities specified to be provided.

B. The System Supplier shall have the following minimum qualifications:

1. The supplier shall maintain a design office staffed with qualified technical design personnel.

2. The supplier shall maintain competent and experienced service personnel to service the hardware and software furnished for this project.

3. System Supplier shall be Control Systems, Inc. (CSI), Jackson, MS as existing system is under Warranty with CSI.

1.02.5 Coordination:

A. Systems supplied under this section shall be designed and coordinated by System Supplier for proper operation with related equipment and materials furnished by other suppliers under other sections of these specifications, under other contracts, and, where applicable, with related existing equipment. All equipment shall be designed and installed in full conformity with the drawings, specifications, engineering data, instructions, and recommendations of the manufacturer, and the manufacturer of the related equipment.

1.02.6 Related Equipment and Materials:

A. Related equipment and materials may include, but will not be limited to, instrumentation, motor controllers, valve actuators, chemical feeders, analytical measuring devices, conduit, cable, and piping as described in other sections.

1.02.7 Device Tag Numbering System:
A. All devices shall be provided with permanent identification tags. The tag numbers shall agree with System Supplier’s equipment drawings and shall be as close as practical to the tag numbers used on the project drawings and device schedules. All field-mounted transmitters and devices shall have stamped stainless steel identification tags. Panel, subpanel, and rack-mounted devices shall have laminated phenolic identification tags securely fastened to the device. Hand-lettered or tape labels will not be acceptable.

1.03 GENERAL REQUIREMENTS

A. The drawings and specifications indicate the extent and general arrangement of the systems. If any departures from the drawings or specifications are deemed necessary by System Supplier, details of such departures and the reasons shall be submitted to Engineer for review with or before the first stage submittal. No departures shall be made without prior written acceptance.

B. The specifications describe the minimum requirements for hardware and software. Where System Supplier’s standard configuration includes additional items of equipment or software features not specifically described herein, such equipment or features shall be furnished as a part of the system and shall be warranted as specified herein.

1.03.1 Governing Standards:

A. Equipment furnished under this section shall be designed, constructed, and tested in accordance with IEEE 519, ANSI C37.90, FCC Part 15 - Class A, and NEMA ICS-1-109.60.

1.03.2 Dimensional Restrictions:

A. Layout dimensions will vary between manufacturers and the layout area indicated on the drawings is based on typical values. The System Supplier shall review the contract drawings, the manufacturer's layout drawings and installation requirements, and make any modifications requisite for proper installation subject to acceptance by Engineer. At least three feet of clear access space shall be provided in front of all instrumentation and control system components.

1.03.3 Workmanship and Materials:

A. System Supplier shall guarantee all equipment against faulty or inadequate design, improper assembly or erection, defective workmanship or materials, and leakage, breakage, or other failure. Materials shall be suitable for service conditions.

B. All equipment shall be designed, fabricated, and assembled in accordance with recognized and acceptable engineering and shop practice. Individual parts shall be manufactured to standard sizes and thicknesses so that repair parts, furnished at any time, can be installed in the field. Like parts of duplicate units shall be interchangeable. Equipment shall not have been in service at any time prior to delivery, except for testing.
1.03.4 Corrosive Fluids:

A. All parts, which are exposed to corrosive conditions, shall be made from corrosion resistant materials. System Supplier shall submit certification that the instrument manufacturer approves the selection of materials of primary elements that are in contact with the specified process fluid to be inert to the effects of the process fluid.

1.03.5 Appurtenances:

A. Signal converters, signal boosters, amplifiers, special power supplies, special cable, special grounding, and isolation devices shall be furnished as needed for proper performance of the equipment.

1.03.6 Programming Devices:

A. A programming or system-configuring device shall be provided for systems that contain any equipment that requires such a device for routine calibration, maintenance, and troubleshooting. The programming device shall be complete, newly purchased for this project, and shall be in like-new condition when turned over to Owner at completion of start-up.

1.04 SUBMITTALS

A. Complete dimensional, assembly, and installation drawings, wiring and schematic diagrams; and details, specifications, and data covering the materials used and the parts, devices and accessories forming a part of the system furnished, shall be submitted in accordance with the submittals section. Submittal data shall be grouped and submitted in three separate stages. The submittal for each stage shall be substantially complete. Individual drawings and data sheets submitted at random intervals will not be accepted for review. Equipment tag numbers or identifications used on the drawings shall be referenced where applicable.

1.04.1 First Stage Submittal:

A. The first stage submittal shall include the following items.

1. A detailed list of any exceptions, functional difference, or discrepancies between the system proposed by System Supplier and this specification.

2. Product catalog cut sheets on all hardware and software items, clearly marked to show the model number, optional features, and intended service of each device.

3. A brief, concise description of the proposed system, including major hardware and software components and personnel training.

4. A block diagram or schematic drawing showing the principal items of equipment furnished, including model numbers, and their interrelationships.
5. Drawings showing floor space or desktop area requirements for all equipment items, including allowances for door swings and maintenance access.

6. Environmental and power requirements, including heat release information for each equipment item.

7. Standard field termination drawings for all process input/output equipment, showing typical terminations for each type of point available in the system.

8. A copy of the proposed software licenses for all software associated with the system.

9. Outline for training classes.

1.04.2 Second Stage Submittal:

A. Before any equipment is released for shipment to the site and before factory testing is scheduled, the following data shall be submitted.

B. At System Supplier’s option, the first and second stage submittals may be combined.

1. Detailed functional descriptions of all software modules specified and furnished as part of System Supplier’s standard system. The descriptions shall be identified with the applicable specifications paragraph.

2. Complete panel fabrication drawings and details of panel wiring, piping, and painting. Panel and subpanel drawings shall be to scale and shall include overall dimensions, metal thickness, door swing, mounting details, weight, and front of panel arrangement to show general appearance, with spacing and mounting height of instruments and control devices.

3. Wiring and installation drawings for all interconnecting wiring between components of the system and between related equipment and the equipment furnished under this section. Wiring diagrams shall show complete circuits and indicate all connections. If panel terminal designations, inter-device connections, device features and options, or other features are modified during the fabrication or factory testing, revised drawings shall be submitted before shipment of the equipment to the site.

4. Review of drawings submitted prior to the final determination of related equipment shall not relieve System Supplier from supplying systems in full compliance with the specific requirements of the related equipment.

5. Input/output listings showing point named, numbers, and addresses. Input/output identification numbers from the contract documents shall be cross-referenced in this submittal.

6. Proposed lesson plans or outlines for all training courses specified herein, including schedule, instructor’s qualifications and experience, and recommended prerequisites.
7. Standard system engineering and user manuals describing the use of the system and application programming techniques for creating reports, graphics, database, historical records, and adding new process I/O nodes to the system.

8. Additional requirements identified in other Division 13 sections.

1.04.3 Third Stage Submittal:

A. Complete system documentation, in the form of Operation and Maintenance Manuals, shall be submitted before the commencement of field acceptance testing. Operation and Maintenance Manuals shall include complete instruction books for each item of equipment and software furnished. Where instruction booklets cover more than one specific model or range of device, product data sheets shall be included which indicate the device model number and other special features. A complete set of "as-built" wiring, fabrication, and interconnection drawings shall be included with the manuals. If field-wiring modifications are made after these drawings are submitted, the affected drawings shall be revised and resubmitted. Additional requirements are identified in other Division 13 specification sections.

1.05 PREPARATION FOR SHIPMENT

A. All electronic equipment and instruments shall be suitably packaged to facilitate handling and to protect against damage during transit and storage. All equipment shall be boxed, crated, or otherwise completely enclosed and protected during shipment, handling, and storage. All equipment shall be protected from exposure to the elements, shall be kept dry at all times, and shall not be exposed to adverse ambient conditions.

B. Painted surfaces shall be protected against impact, abrasion, discoloration, and other damage. Painted surfaces that are damaged prior to acceptance of equipment shall be repainted to the satisfaction of Engineer.

C. Each shipment shall include an appropriate shipping list that indicates the contents of the package, including the specific instrument tags. The shipping list shall be accessible without exposing the instruments to the atmosphere. The shipping list shall also contain any cautionary notes regarding storage of the instruments, including requirements to protect the instrument from static discharge, desensitizing chemicals (solvents, paints, etc.), or ambient atmospheric conditions.

D. Individual instruments shall be appropriately tagged or labeled to positively identify the device. All identification shall be visible without the need to unpack the instrument from its protective packaging.

E. Instrument shipment and storage requirements shall be coordinated with Engineer or Owner prior to shipment. System Supplier shall provide adequate storage and be ready to accept the shipment before shipping any equipment to the site. Additional shipping and storage requirements shall be as detailed in the individual instrument specifications.
F. Components which are shipped loose due to transportation limitations shall be assembled and disassembled by the manufacturer prior to shipment to assure that all components fit together and are adequately supported.

1.06 DELIVERY, STORAGE, AND SHIPPING

A. Shipping shall be in accordance with the shipping section. Handling and storage shall be in accordance with the handling and storage section.

1.07 SPARE PARTS

A. In addition to spare parts and consumable items specified in other sections, the following spares and consumable items shall be provided:

<table>
<thead>
<tr>
<th>Spare Parts</th>
<th>Quantity</th>
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<tbody>
<tr>
<td>Lamps for annunciators</td>
<td>1 full set</td>
</tr>
<tr>
<td>Lamps for indicating lights</td>
<td>1 full set</td>
</tr>
</tbody>
</table>

1.07.1 Packaging:

A. All spare parts shall be delivered to Owner before final acceptance of the system. Packaging of spare parts shall provide protection against dust and moisture and shall be suitable for storage. Circuit boards and other electronic parts shall be enclosed in anti-static material. All packages shall be clearly marked with the manufacturer's name, part number or other identification, date of manufacture, and approximate shelf life.

1.07.2 Replacement:

A. System Supplier may utilize spare parts and supplies during system installation, de-bugging, startup, or training, but shall restore all such materials and supplies to the specified quantities before final acceptance of the systems.

PART 2 - PRODUCTS

2.01 GENERAL REQUIREMENTS

A. All equipment furnished under each section referenced in SCOPE is a part of this section and shall be selected by System Supplier for its superior quality and intended performance. Equipment and materials used shall be subject to review.

2.01.1 Standard Products:

A. The systems furnished shall be standard products. Where two or more units of the same type of equipment are supplied, they shall be the products of the same manufacturer; however, all components of the systems furnished hereunder need not be the products of one manufacturer unless specified herein.
B. To the extent possible, instruments used for similar types of functions and services shall be of the same brand and model line. Similar components of different instruments shall be the products of the same manufacturer to facilitate maintenance and stocking of repair parts. Whenever possible, identical units shall be furnished.

2.02 PERFORMANCE AND DESIGN REQUIREMENTS

A. The design of the systems furnished hereunder shall utilize concepts, techniques and features that provide maximum reliability and ease of maintenance and repair. The systems shall include board-level devices such as light emitting diodes or other indicators to facilitate quick diagnosis and repair. Diagnostic software shall be furnished to facilitate system-level troubleshooting.

B. Where redundant hardware is provided, the system shall be capable of performing all specified functions, without reconfiguring hardware or software, with only one device of each category in service.

2.02.1 Factory Assembly:

A. Equipment shall be shipped completely factory assembled, except where its physical size, arrangement, configuration, or shipping and handling limitations make the shipment of completely assembled units impracticable.

2.03 POWER SUPPLY AND INSTRUMENT SIGNAL

A. Power supply to all control system equipment will be 120 volts, 60 Hz, single phase. System Supplier shall be responsible for distribution of power among enclosures, consoles, peripherals, and other components of the system from the power supply receptacles and junction boxes indicated on the drawings. Power distribution hardware shall include cables and branch circuit overcurrent protection installed in accordance with the electrical section.

B. Unless otherwise indicated or specified, power supply to the instrumentation will be unregulated 120 volts ac. Unless otherwise indicated, all transmitted electronic analog instrument signals shall be 4-20 mA dc and shall be linear with the measured variable.

2.03.1 Facility Distribution System:

A. Equipment not indicated to be powered from an uninterruptible power source shall be suitable for being supplied from the facility distribution system and shall be capable of withstanding voltage variations of ±10 percent and harmonics up to the limits of IEEE 519 without affecting operation. System Supplier shall provide voltage conditioning or filtering equipment if necessary, to meet the requirements specified.

2.03.2 Power Supplies:
A. Power supplies for voltages other than those listed above shall be an integral part of the equipment furnished. Internal power supplies shall be regulated, current limiting, and self-protected.

2.03.3 Surge Withstand:

A. All equipment shall meet all surge withstand capability tests as defined in ANSI C37.90 without damage to the equipment.

2.04 SERVICE CONDITIONS AND ENVIRONMENTAL REQUIREMENTS

A. The equipment provided for the instrumentation and control system shall be suitable for the service conditions specified in the attached equipment sections.

B. All equipment shall be designed and selected to operate without degradation in performance throughout the environmental extremes specified. Equipment shall be designed to prevent the generation of electromagnetic and radio frequency interference and shall be in compliance with FCC Rules and Regulations, Part 15, for Class A computing devices.

2.04.1 Ambient Temperature and Elevation:

A. All system equipment located in air conditioned rooms shall be suitable for operation in ambient temperatures from 10°C to 35°C and a relative humidity of 10 to 90 percent, noncondensing. All equipment located in non air conditioned indoor areas shall be suitable for an ambient temperature range of 0°C to 50°C and a relative humidity of 10 to 98 percent, noncondensing. All equipment located outdoors shall be suitable for operation in an ambient temperature range 0°C to 60°C and a relative humidity of 10 to 100 percent. Heaters and air conditioning/cooling equipment shall be provided where essential to maintain equipment within its manufacturer-recommended operating ranges.

B. All equipment and instruments shall be designed to operate at the site elevation of 0 to 30 ft.

2.04.2 Deleterious Effects:

A. All system equipment will be installed in areas without anti-static floor construction and without any provisions for control of particulates or corrosive gases other than ordinary office-type HVAC filtering. System Supplier shall furnish any additional air cleaning equipment, anti-static chair pads, or other protective measures necessary for proper operation of the system.

B. All input/output hardware shall meet or exceed, without false operation, all requirements of NEMA ICS-1-109.60, Electrical Noise Tests.
2.04.3 **Noise Level:**

A. The equivalent "A" weighted sound level for any system equipment located in the control room, except printers, shall not exceed 35 dBA. The sound level for printers shall not exceed 65 dBA. Sound reduction enclosures shall be provided where necessary to comply with these limits.

2.04.4 **Lightning Protection:**

A. In addition to other environmental protection specified herein, the entire system shall be provided with lightning protection. Lightning protection measures shall include the following.

2.04.4.1 **Grounding:**

A. All major components of the system shall have a low resistance ground connection. Grounding system provisions indicated on the drawings and described in Division 16 specifications, shall be modified as recommended by System Supplier.

2.05 **SOFTWARE DOCUMENTATION**

A. System Supplier shall furnish complete documentation on all software supplied with the systems specified herein. Operating systems, compilers, assemblers, and utility and diagnostic programs that are standard commercial products of third parties need not be included in the optical media backup. Software documentation shall consist of the following principal items.

1. One backup set of any integrated circuit or solid-state memory-based plug-in firmware used.

2. Two complete backup copies of system and supplication software in executable format on optical media compatible with the system furnished.

3. Three sets of user reference manuals for all standard system and application software.

4. One set of user reference manuals for all operating system software.

5. Three sets of printed as-built reference documentation for any special software provided specifically for this contract.

6. For each licensed software product. All documentation provided by the project manufacturer shall be provided. This includes all reference manuals and any other documents that were provided by the manufacturer. One set of this documentation shall be supplied for each and every piece of equipment provided. Multiple pieces of similar equipment or software require multiple copies of this documentation.
2.06 **SOFTWARE LICENSE**

A. All software programs supplied as a standard part of System Supplier’s products for this project shall be licensed to Owner for use on the system specified herein. Such license shall not restrict Owner from using the software on the system provided hereunder or its replacement. Owner shall have the right to make copies of the software for use on the system provided. Specific requirements of System Supplier’s software license are subject to review and approval by Owner and Engineer.

2.07 **INSTALLATION TEST EQUIPMENT**

A. All necessary testing equipment for calibration and checking of system components shall be provided by System Supplier. System Supplier shall also furnish calibration and maintenance records for all testing and calibration equipment used on the site if requested by Engineer.

**PART 3 – EXECUTION**

3.01 **INSTALLATION REQUIREMENTS**

A. The installation of equipment furnished hereunder shall be by the Contractor or their assigned Subcontractors.

3.01.1 **Field Wiring:**

A. Field wiring materials and installation shall be in accordance with the electrical section.

3.01.2 **Instrument Installation:**

A. Instruments shall be mounted so that they can be easily read and serviced and so that all appurtenant devices can be easily operated. Installation details for some instruments are indicated on the drawings.

B. Outdoor instrumentation shall be protected from direct sun exposure. Instruments shall be placed in locations to limit south and west sun exposure. Sunshades shall be provided on instruments that are subject to the direct sun exposure. Sunshades shall be located so the opening faces north or east where possible. Sunshades shall be provided as shown on the drawings.

3.01.3 **Salvage of Existing Equipment:**

A. Existing equipment and materials removed or replaced under this contract shall be delivered to Owner at a location designated by Owner, or shall be properly disposed of at Owner’s discretion. Care shall be taken to avoid damage to equipment delivered to Owner.
B. Any mounting brackets, enclosures, stilling wells, piping, conduits, wiring, or openings that remain after removal of equipment and support hardware shall be removed or repaired in a manner acceptable to Owner and Engineer. Transmitters or switches containing mercury shall be removed and disposed of by personnel trained in the handling of hazardous materials and using approved procedures.

3.02 SYSTEM SOFTWARE CONFIGURATION

A. System software (SCADA/HMI/PLC) shall be configured by the System Supplier. Configuration services shall consist of the creation of the system database, report formats, operator interface graphic and tabular display screen formats, password and security implementation, and programming of control units to provide a fully functioning system. The System Supplier shall fully configure the system using data provided herein or supplied by the Engineer and/or the Owner after award of the contract.

B. System supplier shall modify and/or create SCADA HMI screens as required to control and display the process at the B Street WTP, North WTP, and other locations within the system as described herein or shown on the drawings. Programming shall be provided as required by those screens.

C. Screens shall allow for operator input and modification of system or device variables such as levels, flows, pump speeds, valve opening percentages, timing, etc. as shown on the drawings, described in sequence of operations, specifications, or as requested by the Owner.

D. The system that is delivered to the field for installation, checkout, and startup shall have all files, or databases, that are configurable in size, sized in a manner in which there will be 50% space available for future work after the completion of this project. This sizing should include the addition of memory modules, disk drives, or any other device to insure the 50% spare space availability. All "tuning" of software that is dependent on space requirements shall be done prior to the completion of this project.

E. Tuning of software programs shall be accomplished in such a manner that the program operates at its highest performance level. These programs include, but are not limited to Microsoft SQL Server, all PLC ladder logic, and others.

3.02.1 Control System Database:

A. The control system database shall be modified, developed, and configured by the System Supplier. The System Supplier shall enter information obtainable from the Contract Documents into the database prior to soliciting input from the Engineer and the Owner. The System Supplier shall determine the need for any "pseudo" database points and shall ascertain and enter all information needed to define these points. The System Supplier is responsible for entering all information associated with each point. This includes but is not limited to, descriptions, engineering units, associated displays, areas, security, etc. All fields associated with each database point must be completely filled out accurately.

3.03 SYSTEMS CHECK
A. System Supplier shall provide the services of a trained and experienced field supervisor to assist the installation Contractor during installation, and to calibrate, test, and advise others of the procedures for installation, adjustment, and operation.

3.03.1 Field Calibration of Instruments:
A. After each instrument has been installed, a technical representative of System Supplier shall calibrate each instrument and shall provide a written calibration report for each instrument, indicating the results and final settings. The adjustments of calibrated instruments shall be sealed or marked, insofar as possible, to discourage tampering. Instrument calibration shall be done before checkout of the system operation. A typical instrument calibration report is attached to the end of this section.

3.03.2 Training for Installation Personnel:
A. The field supervisor shall train the installation personnel in reading and understanding submittal drawings, and in the correct installation and wiring procedures for the equipment. At least one full day of on-site time shall be included for this training.

3.03.3 Field Inspection Prior to Start Up:
A. After installation and wiring connections are complete, the field supervisor, with additional System Supplier’s personnel shall verify that each external connection to the system is correctly wired and field process components and devices are functioning as intended. A minimum of three (3) working days shall be included for this task, but System Supplier shall be responsible for completing the following scope of work.

3.03.3.1 Analog Signals:
A. Analog input signals shall be simulated at the transmitting source and verified to be received at the proper register address in the control system. Analog outputs shall be generated at the control system, and verified to be received with the correct polarity, at the respective receiving device.

3.03.3.2 Discrete Signals:
A. Discrete input and output signals shall be simulated and verified that they are received at the respective receiving device, and at the proper voltage.

3.03.3.3 Devices by Other Suppliers:
A. If interrelated devices furnished by other suppliers, under other contracts, or by Owner, such as valve actuators, motor controls, chemical feeders, and instruments, do not perform properly at the time of system checkout, the field supervisor shall use suitable test equipment to introduce simulated signals to and/or measure signals from these devices to locate the sources of trouble or malfunction.
3.03.3.4 System Check Out Report:

A. The System Supplier shall submit a written report on the results of such tests to Engineer. Additional documentation shall be furnished as requested by Engineer to establish responsibility for corrective measures. System Supplier shall verify, in writing, to Engineer or Owner that System Supplier has successfully completed the external connection check before beginning system startup or field acceptance testing.

3.04 TESTING

A. The system shall be acceptance tested at the factory. The location of the factory testing site(s) shall be coordinated between the Contractor, Suppliers, Engineer, and Owner.

B. System Supplier shall prepare a testing procedure to be approved by Owner and Engineer that shall demonstrate that the system conforms to the specifications. The testing procedure shall be submitted at least 30 days in advance of testing. The testing shall be conducted by System Supplier and witnessed by Owner and/or Engineer.

C. System Supplier shall notify Engineer and Owner in writing at least 14 days before the proposed testing date. If the factory acceptance test is concluded unsuccessfully, the test shall be repeated. System Supplier shall reimburse Owner and Engineer for all expenses incurred in connection with attending repeated factory or site testing necessitated by system failure or inadequate preparation.

3.04.1 Factory Acceptance Testing:

A. After system assembly and debugging at System Supplier’s facility, the system shall be tested before the system is shipped to the site. The factory test shall be conducted on complete system, including all field PLC panels and I/O cards, communications and network equipment, and peripherals. The filter control system PLC and the overall plant control system need not be tested at the same location at the same time, but the suppliers shall develop a simulated test procedure to demonstrate that the systems will intercommunicate correctly when connected in the field.

B. The system, including all peripherals and associated software, shall be factory tested under simulated operating conditions. Both normal operating sequences and fault conditions shall be simulated. The results shall be noted on the CRT displays and the logging printer for hard copy. The testing procedures for hardware and software are described below.

C. All basic functions shall be demonstrated, including I/O processing, communications, alarm handling, HMI display functions, alarm logging, report generation, and historical data storage, as well as the specific functions listed herein. The system shall operate continuously for at least 72 hours without faults. This operational test may run concurrently with the demonstration of hardware and software functions. The test procedure shall also include at a least four-hour period for discretionary tests to be conducted by Engineer or Owner.
3.04.1.1 **Hardware Test:**

A. Processors, processor modules, and peripheral devices associated with the system shall be assembled together as they will be installed in the field and shall be tested. The test shall demonstrate proper operation of each hardware device and communications among devices and shall include verification of selected analog and discrete inputs and outputs.

3.04.1.2 **Software Test:**

A. All system software modules specified herein shall be demonstrated. Software tests shall include running all diagnostics, debugging routines, and system test routines. The operating system, advanced process control language compiler, and all associated drivers shall be fully tested and operable for the system test. Software "patches" or changes to bypass failed or flawed modules during the test will not be acceptable.

3.04.1.3 **Site Acceptance Testing:**

A. After installation and checkout by System Supplier's personnel, the system shall be subjected to an acceptance test.

B. Site acceptance testing shall be scheduled after receipt of the System Check Out Report and System Supplier shall verify that all field signal changes are reflected in the proper address locations in the system database.

C. The site acceptance testing shall follow the same procedure as the factory testing and shall operate without loss of basic functions. The number of working days of continuous operation for the test shall be five (5) days. The operational demonstration shall confirm that the status, alarm, and process variable signals are valid and are being updated appropriately, and that the discrete and analog output signals from the control system are being correctly transmitted and implemented. Any errors or abnormal occurrences shall be recorded by System Supplier's field representative. System Supplier's field representative need not be continuously present during the site acceptance testing but shall be available to respond to the site within one hour of notification. The representative shall inspect the system for faults at least once every 24 hours and shall log or record any noted problems. The log shall include a description of the problem, its apparent cause, and any corrective action taken.

3.04.2.1 **Failure of Redundant Equipment:**

A. Failure of redundant equipment shall not be considered downtime provided that automatic failover occurs as specified and, in the opinion of Engineer, the failure was not caused by deficiency in design or installation. In the event of repeated failure of any hardware component or software module, the acceptance test shall be terminated and re-started.
3.04.2.2 Completion of Test:

A. Successful completion of the site acceptance test, including the operational demonstration, is prerequisite to Substantial Completion.

3.05 TRAINING

A. System Supplier shall conduct training courses for personnel selected by Owner. Eight categories of training, instrument, control system maintenance, operator (pre-installation), operator (post-installation), programmer (HMI software), programmer (PLC software), networking, and supplemental shall be provided. Training shall be conducted by experienced instructors who are familiar with the specific system supplied. The filtration system supplier (specified in another section) shall participate in the training activities.

3.05.1 General Training Requirements:

A. In general, System Supplier’s standard training courses may be used to meet the training objectives specified. Where standard courses do not meet these objectives, additional coursework shall be developed. Clock hour requirements for each level of training are shall be as listed. A "clock hour" is defined as one hour of instruction or supervised training exercise. Training hour requirements are the number of hours of training to be provided for each student. Additional training time shall be provided if considered necessary to meet the training objectives.

3.05.1.1 Training Costs:

A. All costs associated with the training program; excluding travel, lodging, and per diem expenses for Owner’s and Engineer’s personnel to attend off-site training programs; shall be the responsibility of System Supplier and shall be included in the contract price.

3.05.1.2 Lessons:

A. Training lesson plans and other information for the second stage submittal as defined herein shall be submitted at least 30 days prior to the start of training.
## B STREET FILTER BACKWASH MATRIX

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END OF SECTION
## B Street Water Treatment Plant & North Water Treatment Plant Improvements
City of Meridian

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SECTION 13530

REMOTE I/O (RIO) 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.

B. Equipment and Services provided under this section shall be subject to the Instrumentation and Control System, Section 13500. This section shall be used and referenced only in conjunction with the Section 13500 and other documents referenced by Section 13500.

1.2  SUMMARY

A. This Section includes requirements for the Remote I/O (RIO) panel.

B. The new remote I/O (RIO) panel for filter control at the B Street water plant will house the local input/output modules, Ethernet network adapters, and device control network scanner modules. There will be ControlLogix PLC hardware consisting of an I/O chassis with power supply, Ethernet/IP communication module and two Profibus DP master communication modules. There will also be AB Flex I/O modules for the required local inputs and outputs. Ethernet communications will be facilitated by inclusion of an AB Stratix 5700 10-port switch. On the door of the panel will be an AB PanelView Plus 7 HMI graphic terminal for viewing and interacting with the filter process equipment. The use of AB Flex I/O modules follows the design approach employed elsewhere in the water plant SCADA/control systems at both B Street and North plants.

C. The RIO panel will have digital, analog, Profibus, and Ethernet/IP inputs and outputs that will connect to the Filter Control Panels CP-1 through CP-4, Blower Control Panel, as well as to valves, flow meters, level transmitters, blowers, and backwash pump VFD. It will communicate with these devices and with the plant PLC and SCADA system to control and monitor the process and equipment.

1.3  GENERAL

A. Supplementing this Section, the drawings indicate the number and location of RIOs, and provide diagrams that illustrate connections to other PLCs and other systems.

1.4  RIO I/O Layout

A. Refer to Section 13500 and drawings for layout.
PART 2 PRODUCTS

2.1 PLC PROCESSORS

A. The plant PLC is a 1756-L61 ControlLogix controller, located in the SCADA room of the water plant. The Profibus masters and Flex I/O modules will be controlled by the existing plant PLC. An Ethernet LAN cable will be run between the switch in the plant PLC panel and the switch in the RIO panel.

2.2 HARDWARE

A. Major items to be included in the RIO panel shall consist of the following:

1. 1794-AENT Flex I/O Ethernet/IP Adapter
2. 1794-PS13 1.3A POWER SUPPLY
3. 1794-IV16 16 PT DC INPUT
4. 1794-OW8 8 PT RELAY OUTPUT
5. 1794-IF8IH 8-CHAN ANALOG INPUT, Isolated with Hart
6. MVI56-PDPMV1 Profibus DP-V1 Master Comm Module for CLX
7. 1756-A4 4-SLOT ControlLogix I/O Chassis
8. 1756-PA72 ControlLogix Power Supply 120VAC
9. 1756-EN2T ControlLogix Ethernet/IP Adapter Module
10. 1783-BMS10CA Stratix 5700 10-port switch
11. 1783-BMS10CA Stratix 5700 10-port switch
12. 2711P-T12W22D9P PanelView Plus 7 12" Wide Screen OIT, Performance version

B. Contractor shall be responsible for determining final module types and quantities and other appurtenances according to the drawings.

C. The RIO shall be enclosed in a NEMA 4X stainless steel enclosure with hinged front door(s) and back panel sized to accommodate all items without crowding and providing sufficient wiring space.

D. PVC wire ducts with covers, sized to accommodate all wiring, shall be used to route all internal wiring. Panduit Panduct or equivalent.

E. Contractor shall provide all terminal blocks, mounting hardware, and accessories as required for a complete and functional RIO system.

F. Contractor shall provide Empty Slot Fillers for all slots in the Chassis that are not used.

G. Contractor shall provide, terminate, and install all required converters.

H. Contractor shall interconnect the RIO to the plant PLC and instrumentation devices, control
2.5 **OPERATOR INTERFACE (OIT)**

A. Operator Interface shall be mounted on the outside panel door of the enclosure.

B. Contractor shall provide all software and programming to provide a complete system including modification or additions to the existing SCADA system and for the Operator Interface Terminal (OIT).

C. Contractor shall provide all terminal blocks, mounting hardware, and accessories as required for a complete and functional system.

2.4 **SALVAGED COMPONENTS**

A. All existing components not reused shall remain the property of the Owner.

B. Contractor shall give the Owner an opportunity to salvage all other equipment before that equipment is disposed of.

**PART 3 EXECUTION**

3.1 **I/O MODULE WIRING**

A. PLC I/O wiring shall conform to current standards for the facility including labeling, wire type, and wire gauge. Contractor shall coordinate with Division 16 to ensure all necessary wiring and cabling is installed for a complete and functional system.

END OF SECTION
B Street Water Treatment Plant &
North Water Treatment Plant Improvements
City of Meridian

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SECTION 13561

PANEL MOUNTED INSTRUMENTS

PART 1 - GENERAL

1.01 SCOPE

A. The Panel Mounted Instruments section covers the furnishing of panel mounted instruments and accessories required for the Instrumentation and Control System as specified herein or as indicated on the Drawings.

B. Equipment and services provided under this section shall be subject to the Instrumentation and Control System section. This section shall be used and referenced only in conjunction with the Instrumentation and Control System section. Supplementing the Instrumentation and Control System section, instrument data, special requirements, and options are indicated on the drawings or the Instrument Device Schedule.

C. When multiple instruments of a particular type are specified, and each requires different features, the required features are described on the drawings or the Instrument Device Schedule.

1.02 DESIGN CRITERIA

A. The instruments shall be installed to measure, monitor, or display the specified process at the ranges and service conditions indicated on the drawings. The instruments shall be installed at the locations indicated on the drawings.

B. Where possible, each instrument shall be factory calibrated to the calibration ranges indicated on the drawings. Transmitters or similar measurement instruments shall be calibrated using National Institute of Standards and Technology (NIST) approved bench calibration procedures, when such procedures exist for the instrument type. For "smart" devices, calibration data shall be stored digitally in each device, including the instrument tag designation indicated on the drawings.

1.03 SUBMITTALS

A. Submittals shall be as specified in the Instrumentation and Control System section.

PART 2 - PRODUCTS

2.01 GENERAL

A. The following paragraphs describe minimum device stipulations. The drawings shall be used to determine any additional instrument options, requirements, or service conditions.

2.01.1 Programming Device:
A. For systems that require a dedicated programming device for calibration, maintenance, or troubleshooting, one such programming device shall be provided for each Owner facility. The programming device shall include appropriate operation manuals and shall be included in the training stipulations. For systems that allow the programming device functions to be implemented in software, running on a laptop computer, the software shall be provided instead of the programming device.

2.01.2 Configuration Software/Serial Interface

A. Devices indicated as requiring a serial interface shall be provided with all accessories to properly communicate over the serial link. An appropriate cable shall be provided to allow the transmitter serial interface to be connected to a personal computer. One licensed copy of the diagnostic/interface software shall be provided for each Owner facility (quantity required shall be as indicated in the Instrumentation and Control System section). Software shall be capable of running under the latest version of the Windows operating system available at the time of project start. If the software furnished performs the same functions as the programming device, specified elsewhere, then the programming device shall not be furnished.

2.02 PANEL FRONT MOUNTED DEVICES

2.02.1 Digital Panel Indicators

A. Digital indicators shall be designed for semi-flush mounting in a panel. The indicator shall be a minimum 3-1/2 digit LED, LCD, with digits at least 0.5 inch high. The indicator shall be easily read at a distance of 10 feet in varying control room lighting environments. The indicator input shall be 4-20 mA dc. The indicator shall have an isolated 4-20 mA dc output signal duplicating the input. Power shall be 24VDC. Operating temperature range shall be 32°F to 140°F. Accuracy shall be ±0.1 percent. The indicator shall be scaled in units corresponding to application, GPM, Feet, Percent, etc. with the units engraved on the display face or on the associated nameplate. The indicator shall have a selectable decimal point and shall provide over-range indication. NEMA 4X/IP 65 rated. Digital panel indicators shall be manufactured by Precision Digital Corporation, or approved equivalent.

2.02.2 Electronic Bar Graph Indicators

A. Indicators shall be of the single vertical bar graph type, with all solid-state electronic circuitry and no moving parts. The bar graph shall consist of a dot matrix, gas-discharge, or LED bar type display in combination with a digital display. Average display life shall be at least 10 years. Display length shall be 4 inches. The indicator shall have an electrical zero adjustment. Accuracy shall be ±1 percent of span. Scales shall be as indicated on the drawings or the Instrument Device Schedule. The use of a dual display indicator for displaying two related signals will be considered. However, Engineer reserves the right to require individual indicators where determined to be appropriate. Indicators shall have isolated, non-grounded inputs. If input is grounded, a signal isolator shall be provided between the meter and the rest of the signal. NEMA 4X/IP 65 rated. Bar graph indicators shall be Ametek/Dixson, Weschler Instruments, or equal.
B. The indicators shall have an absolute alarm for each displayed point. Each alarm shall have an adjustable set point and deadband, and shall have a single-pole, double-throw output contact rated not less than 50 mA dc at 30VDC. An auxiliary output relay shall be provided if required for interface to external devices.

2.02.3 Switches, Lights, Push Buttons, Potentiometers:

2.02.3.1 Selector Switches:

A. Selector switches shall be 22-mm, heavy-duty, oil-tight, NEMA 4X/IP 66 type with gloved-hand or wing lever operators. Position legends shall be engraved on the switch faceplate. Switches for electric circuits shall have silver butting or sliding contacts, rated 10 amperes continuous at 120 V ac. Contact configuration shall be as indicated on the drawings or for the application. Switches used in electronic signal circuits shall have contacts suitable for that duty. Switches shall be Eaton/Cutler-Hammer "RMQ-M22", Square D “XB5”, Allen Bradley “800F”, or equivalent.

2.02.3.2 Indicating Lights:

A. Indicating lights shall be 22-mm, heavy-duty, oil-tight, NEMA 4X/IP 66 type, with full voltage LED lamps. Legends shall be engraved on the lens or on a legend faceplate. Lights shall be push-to-test type. Indicating lights shall be Eaton/Cutler-Hammer "RMQ-M22", Square D “XB”, Allen Bradley “800F”, or equivalent.

2.02.3.3 Push Buttons:

A. Push buttons shall be 22-mm, heavy-duty, oil-tight, NEMA 4X/IP 66 type. Legends shall be engraved on the push-button faceplate. Contacts shall be rated 10 amperes continuous at 120 V ac. Push buttons shall be Eaton/Cutler-Hammer "RMQ-M22", Square D “XB”, Allen Bradley “800F”, or equivalent.

2.02.3.4 Potentiometers:

A. Potentiometer shall be single turn with knob and scale for panel mounting. Value of potentiometer shall be as required by signal conditioner/converter. Potentiometer shall be connected to a signal conditioner/converter with a 4-20ma output proportional to the resistance. Potentiometer and signal conditioner/converter shall be Allen Bradley or approved equivalent.
2.02.3.4 Alarm Horns:
   A. Alarm horns shall be heavy duty, weatherproof, vibrating type horns. Audible alarm horns shall be provided in a NEMA Type 4X enclosure, suitable for mounting on the face of an outdoor panel. Alarm horns shall produce a minimum of 100 dB at 10 feet. Alarm horns shall be ac-powered from a 120 Vac source. Alarm horns shall be an Edwards 876 Series AdaptaHorn Grille Type AC Weatherproof Vibrating Horn, Federal Signal Vibratone Model 350TR, or equal.

2.03 PANEL INTERIOR MOUNTED DEVICES

2.03.1 Power Supplies
   A. Regulated dc power supplies for instrument loops shall be designed and arranged so that loss of one supply does not affect more than one instrument loop or system. Power supplies shall be suitable for an input voltage variation of ±10 percent, and the supply output shall be fused or short circuit protected. Output voltage regulation shall be by the instrumentation equipment supplied. Multiloop or multisystem power supplies will be acceptable if backup power supply units are provided which will automatically supply the load upon failure of the primary supply. The backup supply systems shall be designed so either the primary or the backup supply can be removed, repaired, and returned to service without disrupting the instrument system operation. Multiloop power supply connections shall be individually fused so a fault in one instrument loop will be isolated from the other loops being fed from the same supply. Fuses shall be clearly labeled and shall be located for easy access. Multiloop supply systems shall be oversized for an additional 10 percent future load. Failure of a multiloop supply shall be indicated on the respective instrument panel or enclosure.

   B. Filter control systems may be designed so one power supply feeds all instrument loops common to one individual filter.

2.03.2 Relays:
   A. Relays to be provided in panels, enclosures, or systems furnished under this section shall DIN rail mounted, plug-in socket base type with dustproof plastic enclosures unless noted otherwise. Relays shall be UL recognized and shall have not less than double-pole, double-throw contacts. Control circuit relays shall have silver cadmium oxide contacts rated 10 amperes at 120 V ac. Electronic switching-duty relays shall have gold-plated or gold alloy contacts suitable for use with low-level signals. Relays used for computer input, alarm input, or indicating light service shall have contacts rated at least 3 amperes. Time delay relays shall have dials or switch settings engraved in seconds and shall have timing repeatability of ±2 percent of setting. Latching and special purpose relays shall be for the specific application. Unless otherwise indicated, all relays shall have an integral pilot light that illuminates to indicate an energized condition. Relays shall be IDEC "Series RR"; Potter & Brumfield "Series KRP, CB", Allen Bradley, or approved equivalent

2.03.3 Intrinsically Safe Relays
A. Relays shall be solid-state electronic type in which the energy level of the sensing or actuation circuit is low enough to allow safe use in hazardous areas. Relays shall be located in non-hazardous areas. Relays shall be manufactured by Potter & Brumfield or approved equivalent.

2.03.4 Electronic Signal Booster/Isolators:

A. Electronic signal boosters and isolators shall have all solid-state circuitry and complete electrical isolation between the power supply and the input and output signals. Accuracy shall be ±0.15 percent of span. Isolators shall be manufactured by Allen Bradley, Acromag, Phoenix Contact or approved equivalent.

PART 3 – EXECUTION

3.01 FIELD SERVICES

A. Manufacturer's field services shall be provided for installation, field calibration, startup, and training as specified in the Instrumentation and Control System section. Instruments shall not be shipped to the Work Site until two weeks prior to the scheduled installation. System Supplier shall be responsible for coordinating the installation schedule with the Installation Contractor. Each shipment shall contain a listing of protective measures required to maintain sensor operation, including a listing of any common construction or cleaning chemicals that may affect instrument operation.

END OF SECTION
SECTION 13562

FLOW INSTRUMENTS

PART 1 - GENERAL

1.01 SCOPE

A. The Flow Instrument Section covers the furnishing of flow instruments and accessories required for the Instrumentation and Control System as specified herein or as indicated on the drawings.

B. Equipment and services provided under this section shall be subject to the Instrumentation and Control System section. This section shall be used and referenced only in conjunction with the Instrumentation and Control System section. Supplementing the Instrumentation and Control System section, instrument data, special requirements, and options are indicated on the drawings or the Instrument Device Schedule.

C. When multiple instruments of a particular type are specified, and each requires different features, the required features are described on the drawings or the Instrument Device Schedule.

1.02 DESIGN CRITERIA

A. Each device shall be a pre-assembled, packaged unit. Upon delivery to the work site, each device or system shall be ready for installation with only minor piping and electrical connections required by Contractor.

B. Primary elements shall derive any required power from the transmitter, unless otherwise indicated.

C. The instruments shall be installed to measure, monitor, or display the specified process at the ranges and service conditions indicated on the drawings or as indicated in the Instrument Device Schedule. The instruments shall be installed at the locations indicated on the drawings or in the Instrument Device Schedule.

D. Where possible, each instrument shall be factory wet flow calibrated to the full scale flow range of the sensors or calibration ranges indicated on the drawings or in the Instrument Device Schedule. Transmitters or similar measurement instruments shall be calibrated using National Institute of Standards and Technology (NIST) approved bench calibration procedures, when such procedures exist for the instrument type. Calibration and configuration data shall be stored digitally in each device, including the instrument tag designation indicated on the drawings or Instrument Device Schedule.

1.03 SUBMITTALS

A. Submittals shall be made as specified in the Instrumentation and Control System section.
1.04 SHIPMENT, PROTECTION, AND STORAGE

A. Equipment provided under this section shall be shipped, protected, and stored as specified in the Instrumentation and Control System section. Identification of packaging shall be as specified in the Instrumentation and Control System section.

PART 2 - PRODUCTS

2.01 GENERAL

A. The following paragraphs provide minimum device requirements. The drawings or Instrument Device Schedule shall be used to determine any additional instrument options, requirements, or service conditions.

2.01.1 Interconnecting Cable:

A. For instruments where the primary element and transmitter are physically separated, interconnecting cable from the element to the transmitter shall be provided. The cable shall be the type approved by the instrument manufacturer for the intended purpose of interfacing the element to the transmitter. Length of cable shall be a minimum of three meters or as indicated on the drawings or in the Instrument Device Schedule. The interconnecting cable shall be provided in the length necessary for installation. Splices shall not be allowed in the installed cable.

2.01.2 Programming Device:

A. For instruments that require a dedicated programming device for calibration, maintenance, or troubleshooting, one such programming device shall be provided for each Owner facility (quantity required shall be as indicated in the Instrumentation and Control System section). The programming device shall include appropriate operation manuals and shall be included in the training requirements. For systems that allow the programming device functions to be implemented in software, running on a laptop computer, the software shall be provided instead of the programming device.

2.01.3 Configuration Software/Serial Interface:

A. Devices indicated as requiring a serial interface shall be provided with all accessories required to properly communicate over the serial link. As a minimum, an appropriate cable shall be provided to allow the transmitter serial interface to be connected to a personal computer. One licensed copy of the diagnostic/interface software shall be provided for each Owner facility (quantity required shall be as indicated in the Instrumentation and Control System section). Software shall be capable of running under the Windows XP operating system. If the software furnished performs the same functions as the programming device, specified elsewhere, then the programming device shall not be furnished.

2.02 FLOW INSTRUMENTATION
2.02.1 Magnetic Flowmeter:

A. The magnetic flowmeter shall be a completely obstructionless, in-line flowmeter with no constrictions in the flow of fluid through the meter. The meter shall consist of a metallic tube with flanged ends and with grounding rings or grounding electrodes as required by the application. Flange diameter and bolt drilling pattern shall comply with ANSI/ASME B16.5 for line sizes from one-half inch to 24 inches or AWWA C207 for line sizes larger than 24 inches. Flange class ratings and meter maximum pressure ratings shall be compatible with the adjoining piping. Flangeless wafer insert style meters may be used for pipe sizes up to 6 inches, where compatible with adjacent piping flanges. Self-cleaning electrodes shall be provided for all meters used for sludge metering. Electrode and liner materials shall be fully compatible with the process fluid as approved by the Engineer and shall comply with the requirements specified in the instrument device schedules. Each meter shall be factory wet flow calibrated to the sensors full flow capacity, at a facility, which is traceable to NIST or other standard acceptable to Engineer, and a copy of the calibration, report shall be submitted as part of the operation and maintenance manual submittal.

B. The meter shall be capable of standing empty for extended periods of time without damage to any components.

C. The meter housing shall be rated for continuous submergence, IP68.

D. Cable shall be factory installed and ordered to length.

E. Flow meter shall be capable of 0x DIA Upstream and 0x DIA downstream with accuracy +/- 1%.

F. Meters shall be ABB Watermaster reduced-bore meters (FER) or engineer approved equal.

2.02.2.2 Magnetic Flowmeter Signal Converters:

A. Separately mounted, or mounted on flow tube, microprocessor-based signal converters shall be provided for the magnetic flowmeters. The signal converters shall include output damping, self-testing, built-in calibration capability, and an "empty pipe zero" contact input or integral empty pipe detection and low flow cut off. The overall accuracy of the magnetic flowmeter transmitter and signal converter shall be ±0.5 percent of actual flow rate for full-scale settings of 3 to 30 fps [0.91 to 9.14 m/s]. The meter manufacturer shall furnish the signal cable between the converter and the magnetic flowmeter. Signal cable shall be continuous and not spliced between the meter and the signal converter. The signal converter shall be housed in a corrosion-resistant, weatherproof NEMA Type 4X housing and shall be suitable for operation over an ambient temperature range of -30 to +140°F [-34 to +60°C], and relative humidity of 10 to 100 percent. The converter shall have an analog output of 4-20 mA dc. Where indicated on the drawings or in the Instrument Device Schedule, the converter shall have a pulse output designed to operate a remote seven-digit totalizer and scaled so that the totalizer will operate for 60 days at 100 percent flow without repeating. Scaling factors shall be field adjustable and shall be selected to
provide a totalizer multiplier of a power of 10. Transmitters tagged on the drawings or specified to be of the indicating type shall contain a local indicator with a minimum four digit LCD type display, scaled to read in engineering units of flow.

B. Flowmeter shall be 24V DC powered from power supply located in the control console.

C. Magnetic flowmeter systems shall provide zero flow stability by means of automatic zero adjustment of a DC excited metering circuit. Converters shall be capable of bi-directional flow measurement. Signal converters and transmitters shall be of the same brand as the magnetic flowmeters.

D. Where indicated on the drawings or in the Instrument Device Schedule, the signal converter shall have totalizer on the face of the enclosure.

E. The signal converter shall have built in calibration verification software. Manufacturer shall supply software and cable to allow connection to a customer supplied laptop with an infrared port that will allow access without physically removing transmitter wiring or access cover.

PART 3 - EXECUTION

3.01 FIELD SERVICES

A. Manufacturer's field services shall be provided for installation, field calibration, startup, and training as specified in the Instrumentation and Control System section.

B. Instruments shall not be shipped to the Work Site until two weeks prior to the scheduled installation. The System Supplier shall be responsible for coordinating the installation schedule with the Installation Contractor. Each shipment shall contain a listing of protective measures required to maintain sensor operation, including a listing of any common construction or cleaning chemicals that may affect instrument operation.

END OF SECTION
SECTION 13563

PRESSURE AND LEVEL INSTRUMENTS

PART 1 - GENERAL

1.01.0 SCOPE

A. The Pressure and Level Instruments section covers the furnishing of pressure and level instruments and accessories required for the Instrumentation and Control System as specified herein or as indicated on the drawings.

B. Equipment and services provided under this section shall be subject to the Instrumentation and Control System section. This section shall be used and referenced only in conjunction with the Instrumentation and Control System section. Supplementing the Instrumentation and Control System section, instrument data, special requirements, and options are indicated on the drawings or the Instrument Device Schedule.

C. When multiple instruments of a particular type are specified, and each requires different features, the required features are described on the drawings or the Instrument Device Schedule.

1.02 DESIGN CRITERIA

A. Each device shall be a pre-assembled, packaged unit. Upon delivery to the work site, each device or system shall be ready for installation with only minor piping and electrical connections required by Contractor.

B. Primary elements shall derive any required power from the transmitter, unless otherwise indicated.

C. The instruments shall be installed to measure, monitor, or display the specified process at the ranges and service conditions indicated on the drawings or as indicated in the Instrument Device Schedule. The instruments shall be installed at the locations indicated on the drawings or in the Instrument Device Schedule.

D. Where possible, each instrument shall be factory calibrated to the calibration ranges indicated in the drawings or in the Instrument Device Schedule. Transmitters or similar measurement instruments shall be calibrated using National Institute of Standards and Technology (NIST) approved bench calibration procedures, when such procedures exist for the instrument type. Calibration data shall be stored digitally in each device, including the instrument tag designation indicated on the drawings and/or Instrument Device Schedule.
1.03 **SUBMITTALS**

A. Submittals shall be made as specified in the Instrumentation and Control System section.

1.04 **SHIPMENT, PROTECTION, AND STORAGE**

A. Equipment provided under this section shall be shipped, protected, and stored in accordance with the requirements of the Instrumentation and Control System section. Identification of packaging shall be as described in the Instrumentation and Control System section.

PART 2 - **PRODUCTS**

2.01 **GENERAL**

A. The following paragraphs provide minimum device stipulations. The drawings or Instrument Device Schedule shall be used to determine any additional instrument options, requirements, or service conditions.

2.01.1 **Interconnecting Cable**:

A. For systems where the primary element and transmitter are physically separated, interconnecting cable from the element to the transmitter shall be provided. The cable shall be the type approved by the instrument manufacturer for the intended purpose of interfacing the element to the transmitter. Length of cable shall be a minimum of twenty (20) feet. Coordinate with Division 16 for actual length required by conduit routing.

2.01.2 **Programming Device**:

A. For systems that require a dedicated programming device for calibration, maintenance, or troubleshooting, one such programming device shall be provided for each Owner facility (quantity required shall be as indicated in the Instrumentation and Control System section.) The programming device shall include appropriate operation manuals and shall be included in the training requirements. For systems that allow the programming device functions to be implemented in software, running on a laptop computer, the software shall be provided instead of the programming device.

2.01.3 **Configuration Software/Serial Interface**:

A. Devices indicated as requiring a serial interface shall be provided with all accessories required to properly communicate over the serial link. An appropriate cable shall be provided to allow the transmitter serial interface to be connected to a personal computer. One licensed copy of the diagnostic/interface software shall be provided for each Owner facility (quantity required shall be as indicated in the
Instrumentation and Control System section). Software shall be capable of running under Microsoft’s Windows operating system. If the software furnished performs the same functions as the programming device, specified elsewhere, then the programming device shall not be furnished.

2.02 PRESSURE AND LEVEL INSTRUMENTATION

2.02.1 Ultrasonic Level Transmitters:

A. Each ultrasonic level transmitter shall be a microprocessor-based electronic unit consisting of a sensor assembly, a signal converter/transmitter, and an interconnecting cable. The sensor shall be encapsulated in a chemical and corrosion-resistant material such as Kynar or CPVC, and shall be suitable for operation over a temperature range of -20°F [-28°C] and a relative humidity of 10 to 100 percent. The sensor shall be compatible with the process media being measured. Where indicated on the drawings or in the Instrument Device Schedule, the sensor shall be an explosion-proof or intrinsically safe design suitable for use in all hazardous areas. Sensors mounted in areas subject to freezing shall be provided with special transducers or protected against icing by heaters. Sensors mounted in direct sunlight shall be provided with sunshades.

B. The supplier shall coordinate the sensor mounting requirements and furnish drawings complete with dimensions and elevations. General installation requirements are indicated on the drawings.

C. The ultrasonic level transmitter shall have automatic compensation for changes in air temperature at the sensor location. If separate temperature sensing probes are provided, they shall be mounted with or adjacent to the ultrasonic sensor, as recommended by the manufacturer. The transmitter shall have a four-digit LCD display scaled to read in engineering units. Digit height shall be approximately 1/2 inch [12 mm]. The transmitter shall be designed to ignore momentary level spikes, false targets, or momentary loss-of-echo. A loss-of-echo condition shall be indicated on the transmitter unit and shall be available as an alarm contact output. The transmitter output shall be an isolated 4-20 mA dc signal linearly proportional to the measured level range, or where indicated on the drawings or in the Instrument Device Schedule, shall be characterized to be proportional to the tank volume. Calibration parameters shall be entered through a keypad on the unit and shall be stored in nonvolatile EEPROM memory. Accuracy of the transmitted signal shall be ±0.5 percent of the level range.

D. Where indicated on the drawings or in the Instrument Device Schedule, the transmitter shall contain four independently adjustable level alarm contact outputs. Contacts shall be single-pole, single-throw, or double pole where indicated in the device schedule, rated not less than 5 amperes at 120 V ac.

E. A sufficient length of sensor-to-transmitter signal cable shall be furnished with the instrument to locate the sensor 25 to 200 feet from the signal converter.
F. The signal converter/transmitter electronics shall be housed in a weatherproof, corrosion-resistant NEMA Type 4X enclosure suitable for mounting in a control console (panel/fascia mount) and for operating temperatures of -5° to +122°F and a relative humidity of 10 to 100 percent. A thermostatically controlled strip heater shall be provided in the signal converter enclosure.

G. The signal converter shall be of the ac-powered type. The ultrasonic level transmitter shall be Pulsar “Ultra 3” without exception.

2.02.2 Field-Mount Pressure Gauges:

A. Pressure gauges shall be of the indicating dial type, with C-type phosphor bronze Bourdon tube; stainless steel rotary geared movement; phenolic or polypropylene open front turret case; adjustable pointer; stainless steel, phenolic, or polypropylene ring; and acrylic plastic or shatterproof glass window.

B. Gauge dial shall be 4-1/2 inch size, with white background and black markings. The units of measurement shall be indicated on the dial face. Subdivisions of the scale shall conform to the requirements of the governing standard. Pointer travel shall be not less than 200 degrees or more than 270 degrees of arc.

C. Surface-mounted gauges shall be provided with 1/4 inch NPT connections. All stem-mounted gauges shall be provided with 1/2 inch NPT connections. Where indicated in the drawings or on the Instrument Device Schedule, stem mounted gauges shall have an adjustable viewing angle to allow the gauge to be positioned for optimum viewing.

D. All pressure gauges shall measure in psi and all vacuum gauges in inches water. All gauges shall have a suitable range to give mid-scale readings under normal conditions. Gauge accuracy shall be 0.5 percent of scale range.

E. Each gauge shall be provided with a threaded end, ball-type gauge valve. Gauge valve materials shall be compatible with the measured process. Where the process is not defined, gauge valves shall have AISI Type 316 stainless steel wetted parts and Teflon seals. Multi-port gauge valves shall have all unused ports plugged. Gauge valve construction shall be as detailed in Section 13565.

F. Where indicated on the drawings or the Instrument Device Schedule, the pressure gauge shall be provided with a pressure snubber. Each snubber shall be of a size and pressure range compatible with the gauge served. Snubbers shall be Ashcroft "Pulsation Dampers", or approved equal.

G. Where indicated on the drawings or in the Instrument Device Schedule, a diaphragm seal shall be provided for the respective gauge. Diaphragm seals shall be thread-attached type with removable AISI Type 316 stainless steel diaphragm, zinc or cadmium plated carbon steel upper housing, and stainless steel lower
housing. The upper housing shall be contoured to fit and provide a seat and seal for the diaphragm and shall be designed to permit removal of the gauge with the system under pressure. The lower housing shall be provided with a tapped and plugged 1/4 inch [6 mm] NPT flushing connection. Each diaphragm seal and the gauge served shall be factory assembled, filled with a suitable fluid, and calibrated as a unit.

H. Gauges shall be installed at the locations indicated on the drawings, with installation conforming to the installation details. All gauges, snubbers, and diaphragm seals shall be installed in the vertical, upright position. Thread sealer, suitable for use with the associated process, shall be used in the assembly of threaded connections. All connections shall be free from leaks. Lines shall be purged of trapped air at gauge locations prior to installation of the gauge or diaphragm seal.

I. Each gauge shall be provided with all required mounting hardware to securely mount the unit according to the mounting requirements indicated in the drawings or the Instrument Device Schedule.

J. Unless otherwise indicated, mounting and installation hardware shall be Type 316L stainless steel.

K. Pressure gauges shall be Ashcroft "1279 Duragauge", or equal.

PART 3 - EXECUTION

3.01 FIELD SERVICES

A. Manufacturer's field services shall be provided for installation, field calibration, startup, and training as specified in the Instrumentation and Control System section.

B. Instruments shall not be shipped to the Work Site until two weeks prior to the scheduled installation. System Supplier shall be responsible for coordinating the installation schedule with the Installation Contractor. Each shipment shall contain a listing of protective measures required to maintain sensor operation, including a listing of any common construction or cleaning chemicals that may affect instrument operation.

END OF SECTION
SECTION 15010

VALVE INSTALLATION

PART 1 - GENERAL

1.01 SCOPE

A. This section covers the installation of new valves and actuators purchased by Contractor as part of this Work or purchased by others under the valve specifications. The equipment to be furnished by others for installation by Contractor is identified in the applicable valve schedules.

B. Cleaning, disinfection, pressure and leakage testing, insulation, and pipe supports are covered in other sections.

C. The following specification sections are applicable to valves to be installed:

<table>
<thead>
<tr>
<th>Title</th>
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<tbody>
<tr>
<td>Check Valves</td>
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<tr>
<td>Miscellaneous Valves</td>
</tr>
<tr>
<td>AWWA Butterfly Valves</td>
</tr>
</tbody>
</table>

1.02 GENERAL

A. Equipment installed under this section shall be erected and placed in proper operating condition in full conformity with Drawings, Specifications, engineering data, instructions, and recommendations of the equipment manufacturer, unless exceptions are noted by Engineer.

1.02.1 Coordination:

A. When manufacturer's field services or installation check services are provided by the valve manufacturer, Contractor shall coordinate the services with the valve manufacturer. Contractor shall give Engineer written notice at least 30 days prior to the need for manufacturer's field services.

B. Flanged, push-on, and grooved connections to valves including the bolts, nuts, and gaskets are covered in the appropriate pipe specification section. Valve ends shall match piping.

PART 2 - PRODUCTS

Not Applicable.

PART 3 - EXECUTION

3.01 INSPECTION
A. All valves and accessories shall be inspected for damage and cleanliness before being installed. Any material damaged or contaminated in handling on the job shall not be used unless it is repaired and re-cleaned to the original requirements by Contractor. Such material shall be segregated from the clean material and shall be inspected and approved by Owner or his representative before its use.

3.02 INSTALLATION

3.02.1 General:
   A. Valves shall be installed with sufficient clearance for proper operation of any external mechanisms, and with sufficient clearance to dismantle the valve for in-place maintenance. Installation shall be in accordance with the valve manufacturer’s recommendations.
   
   B. Unless otherwise indicated on the Drawings or specified, all valves installed in horizontal runs of pipe having centerline elevations 4 feet 6 inches or less above the finish floor shall be installed with their operating stems vertical. Valves installed in horizontal runs of piping having centerline elevations between 4 feet 6 inches and 6 feet 9 inches above the finish floor shall be installed with their operating stems horizontal. If adjacent piping prohibits this, the stems and operating handwheel shall be installed above the valve horizontal centerline as close to horizontal as possible. Valves installed in vertical runs of pipe shall have their operating stems oriented to facilitate the most practicable operation, as reviewed by Engineer.

3.02.2 Installation Checks:
   A. When specified in the valve sections, the valve manufacturer will provide installation checks. For installation checks, the manufacturer’s field representative will inspect the valve installation immediately following installation by Contractor. The manufacturer’s representatives will revisit the site as often as necessary to ensure installation satisfactory to Owner.

3.02.3 AWWA Butterfly Valves:
   A. Butterfly valves shall be installed with the shaft vertical unless otherwise necessary for proper operation or as acceptable to Engineer.
   
   B. Whenever an actuator must be removed to permit installation of a valve, the actuator shall be promptly reinstalled and shall be inspected and readjusted by a representative of the valve manufacturer.

3.02.4 Check Valves:

3.02.4.1 Lift Check Valves: Not used.

3.02.4.2 Swing Check Valves: Not used.

3.02.4.3 Low Pressure Air Service Check Valves:
A. Dual disc wafer check valves installed in the discharge piping of centrifugal blowers shall be positioned with the valve hinge perpendicular to the impeller shaft of the blower.

3.02.5 Plug Valves: Not used.

3.02.6 Resilient Seated Gate Valves: Not used.

3.02.7 Air Release and Combination Air Valves:

   A. The exhaust from each valve shall be piped to a suitable point acceptable to Engineer. Air release valve exhaust piping leading to a trapped floor drain shall terminate at least 6 inches above the floor.

3-2.08 Hydrants: Not used.

3.03 VALVE ACTUATORS

   A. Valve actuators and accessories shall be factory mounted on the valve, calibrated, and tested by the valve or actuator manufacturer.

3.04 FIELD QUALITY CONTROL

3.04.1 Field Testing:

   A. After installation, all valves shall be tested in accordance with the Pipeline Pressure and Leakage Testing section.

3.04.1.1 Pressure Tests:

   A. Pressure testing shall be in accordance with the Pipeline Pressure and Leakage Testing section.

3.04.1.2 Leakage Tests:

   A. All valves shall be free from leaks. Each leak that is discovered within the correction period stipulated in the General Conditions shall be repaired by and at the expense of Contractor. This requirement applies whether pressure testing is required or not.

3.05 ADJUSTING

   A. After installation, the opening and closing time shall be adjusted as needed for each pneumatic, hydraulic and electric actuated valve.

END OF SECTION
SECTION 15020

MISCELLANEOUS PIPING AND ACCESSORIES INSTALLATION

PART 1 - GENERAL

1.01 SCOPE

A. This section covers the installation of piping and accessories as indicated on the drawings for the following piping sections:

<table>
<thead>
<tr>
<th>Section</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>15060</td>
<td>Miscellaneous Piping and Accessories</td>
</tr>
<tr>
<td>15064</td>
<td>Stainless Steel Pipe, Tubing, and Accessories</td>
</tr>
</tbody>
</table>

B. Contractor shall furnish all necessary jointing materials, coatings, and accessories that are specified herein.

C. Pipe supports and anchors shall be furnished by Contractor, and are covered in the Pipe Supports section. Pipe trenching and backfilling are covered in the Trenching and Backfilling section.

1.02 GENERAL

1.02.1 Coordination:

A. Materials installed under this section shall be installed in full conformity with drawings, specifications, engineering data, instructions, and recommendations of the manufacturer, unless exceptions are noted by Engineer.

1.03 SUBMITTALS

1.03.1 Drawings and Data:

A. Complete specifications, data, and catalog cuts or drawings shall be submitted in accordance with the Submittals section.

1.03.2 Welder Certification:

A. Prior to the start of the work, Contractor shall submit a list of the welders he proposes using and the type of welding for which each has been qualified. Copy of certification and identification stamp shall be submitted for each welder. Qualification tests may be waived if evidence of prior qualification is deemed suitable by Engineer.

1.04 QUALITY ASSURANCE

1.04.1 Welding and Brazing Qualifications
A. All welding and brazing procedures and operators shall be qualified by an independent testing laboratory in accordance with the applicable provisions of Section IX of the ASME Code. All procedure and operator qualifications shall be in written form and subject to Engineer’s review. Accurate records of operator and procedure qualifications shall be maintained by Contractor and made available to Engineer upon request.

1.04.2 Tolerances:

A. These tolerances apply to in-line items and connections for other lines.

B. The general dimension, such as face-to-face, face or end-to-end, face- or end-to-center, and center-to-center shall be 1/8 inch.

C. The inclination of flange face from true in any direction shall not exceed 3/64 inch per foot.

D. Rotation of flange bolt holes shall not exceed 1/16 inch.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Shipping shall be in accordance with the Shipping section. Handling and storage shall be in accordance with the Handling and Storage section. All materials shall be stored in a sheltered location above the ground, separated by type, and shall be supported to prevent sagging or bending.

B. Plastic pipe, tubing, and fittings shall be stored between 40°F and 90°F.

1.05.1 Coated Pipe. Handling methods and equipment used shall prevent damage to the protective coating and shall include the use of end hooks, padded calipers, and nylon or similar fabric slings with spreader bars. Bare cables, chains, or metal bars shall not be used. Coated pipe shall be stored off the ground on wide, padded skids. Plastic-coated pipe shall be covered or otherwise protected from exposure to sunlight.

PART 2 - PRODUCTS

2.01 SERVICE CONDITIONS. Pipe, tubing, and fittings covered herein shall be installed in the services indicated in the various pipe sections.

2.02 MATERIALS

Threaded Fittings

- Teflon Thread Sealer: Paste type; Hercules "Real-tuff", John Crane "JC-30", or Permatex "Thread Sealant with Teflon".
Teflon Thread Tape

Hercules "Tape Dope" or John Crane "Thread-Tape".

Solvent Welded Fittings

Solvent cement for PVC

ASTM D2564.

Solvent cement for CPVC

ASTM F493.

Sodium Hydroxide

IPS Corporation "Weld-On 724"

Primer for PVC Systems

ASTM F656.

Solder or Brazed Fittings

Solder

Solid wire, ASTM B32, ANSI/NSF 61 certified, Alloy Grade Sb5, (95-5).

Soldering Flux

Paste type, ASTM B813.

Brazing Filler Metal

AWS A5.8, BCuP-5; Engelhard "Silvaloy 15", Goldsmith "GB-15", or Handy & Harman "Sil-Fos".

Brazing Flux

Paste type, Fed Spec O-F-499, Type B.

Insulating Fittings

Threaded

Dielectric steel pipe nipple, ASTM A53, Schedule 40, polypropylene lined, zinc plated; Perfection Corp. "Clearflow Fittings".

Flanged

Epco "Dielectric Flange Unions" or Central Plastics "Insulating Flange Unions".

Pipe Insulation

See Mechanical Insulation section.

Watertight/Dusttight Pipe Sleeves

O-Z Electrical Manufacturing "Thruwall" and "Floor Seals", or Thunderline "Link-Seals"; with modular rubber sealing elements, nonmetallic pressure plates, and galvanized bolts.

Pipe Sleeve Sealant

Polysulfide or urethane, as specified in the Caulking section or as indicated on the drawings.

Protective Coatings
Tape Wrap | ANSI/AWWA C209, except single ply tape thickness shall not be less than 30 mils; Protecto Wrap "200" or Tapecoat "CT".

Primer | As recommended by the tape manufacturer.

Coal Tar Epoxy | High-build coal tar epoxy; Ameron "Amercoat 78HB Coal Tar Epoxy", Carboline "Bitumastic 300 M", Tnemec "46H-413 Hi-Build Tneme-Tar", or Sherwin-Williams "Hi-Mil Sher-Tar Epoxy".

Epoxy for process air piping | Shop or field applied high solids epoxy; suitable for protection at continuous pipe wall temperatures up to 300 F. Coating shall be abrasion resistant. The finished coating shall have a minimum total film thickness of 10 mils. The surface shall be prepared in accordance with SSPC-SP7 as a minimum unless otherwise recommended by the coating manufacturer. The coating shall be Carboline "Thermaline 450", Ameron "Amerlock 400 with Amercoat 880 Additive", or approved equal.

PART 3 - EXECUTION

3.01 INSPECTION

A. All piping components shall be inspected for damage and cleanliness before being installed. Any material damaged or contaminated in handling on the job shall not be used unless it is repaired and recleaned to the original requirements by Contractor. Such material shall be segregated from the clean material and shall be inspected and approved by Owner or his representative before its use.

3.02 PREPARATION

3.02.1 Field Measurement:

A. Pipe shall be cut to measurements taken at the site, not from the drawings. All necessary provisions shall be made in laying out piping to allow for expansion and contraction. Piping shall not obstruct openings or passageways. Pipes shall be held free of contact with building construction to avoid transmission of noise resulting from expansion.

3.03 INSTALLATION

3.03.1 General:
A. All instruments and specialty items shall be installed according to the manufacturer's instructions and with sufficient clearance and access for ease of operation and maintenance.

B. Flat faced wrenches and vises shall be used for copper tubing systems. Pipe wrenches and vises with toothed jaws will damage copper materials and shall not be used. Bends in soft temper tubing shall be shaped with bending tools.

3.03.2 Pipe Sleeves.

A. Piping passing through concrete or masonry shall be installed through sleeves that have been installed before the concrete is placed or when masonry is laid. Pipe sleeves installed through floors with a special finish, such as ceramic or vinyl composition tile, shall be flush with the finished floor surface and shall be provided with nickel or chromium plated floor plates. Unless otherwise indicated on the drawings, in all other locations where pipes pass through floors, pipe sleeves shall project not less than 1 inch nor more than 2 inches above the floor surface, with the projections uniform within each area. In the case of insulated pipes, the insulation shall extend through pipe sleeves. Where the drawings indicate future installation of pipe, sleeves fitted with suitable plastic caps or plugs shall be provided.

B. Holes drilled with a suitable rotary drill will be considered instead of sleeves for piping which passes through interior walls and through floors with a special finish.

C. Unless otherwise indicated on the drawings, all pipes passing through walls or slabs which have one side in contact with earth or exposed to the weather shall be sealed watertight with special rubber-gasketed sleeve and joint assemblies, or with sleeves and modular rubber sealing elements.

D. Piping shall be made dust-tight and gastight with special rubber-gasketed sleeve and joint assemblies; with sleeves sealed with modular rubber sealing elements; or by caulking with oakum and polysulfide or urethane sealant, when passing through the following locations:

   Chlorine Tank Storage Room – Not Used
   Ammonia Tank Storage Room – Not Used

3.03.3 Pipe Joints:

A. Pipe joints shall be carefully and neatly made in accordance with the indicated requirements.

3.03.3.1 Threaded:

A. Pipe threads shall conform to ANSI/ASME B1.20.1, NPT, and shall be fully and cleanly cut with sharp dies. Not more than three threads at each pipe connection shall remain exposed after installation. Ends of pipe shall be reamed after threading and before
assembly to remove all burrs. Unless otherwise indicated, threaded joints shall be made up with teflon thread tape, thread sealer, or a suitable joint compound.

B. Threaded joints in plastic piping shall be made up with teflon thread tape applied to all male threads. Threaded joints in stainless steel piping shall be made up with teflon thread sealer and teflon thread tape applied to all male threads. Threaded joints in steel piping for chlorine service shall be made up with teflon thread tape or litharge and glycerine paste applied to all male threads.

3.03.3.2 Compression:

A. Ends of tubing shall be cut square and all burrs shall be removed. The tubing end shall be fully inserted into the compression fitting and the nut shall be tightened not less than 1-1/4 turns and not more than 1-1/2 turns past fingertight, or as recommended by the fitting manufacturer, to produce a leaktight, torque-free connection.

3.03.3.3 Flared:

A. Ends of annealed copper tubing shall be cut square, and all burrs shall be removed prior to flaring. Ends shall be uniformly flared without scratches or grooves. Fittings shall be tightened as needed to produce leaktight connections.

3.03.3.4 Soldered and Brazed:

A. Where solder fittings are specified for lines smaller than 2 inches, joints may be soldered or brazed at the option of Contractor. Joints in 2 inch and larger copper tubing shall be brazed. Brazing alloy shall contain no tin. Joints in copper chlorine tubing and refrigerant piping shall be brazed; solder will not be acceptable.

B. Surfaces to be joined shall be thoroughly cleaned with flint paper and coated with a thin film of flux. At each joint, tubing shall enter to the full depth of the fitting socket.

C. Care shall be taken to avoid overheating the metal or flux. Each joint shall be uniformly heated to the extent that filler metal will melt on contact. While the joint is still hot, surplus filler metal and flux shall be removed with a rag or brush.

3.03.3.5 Solvent Welded:

A. Solvent welded connections shall only be used for PVC or CPVC pipe. All joint preparation, cutting, and jointing procedures shall comply with the pipe manufacturer's recommendations and ASTM D2855. Pipe ends shall be beveled or chamfered to the dimensions recommended by the manufacturer. Newly assembled joints shall be suitably blocked or restrained to prevent movement during the setting time recommended by the manufacturer. Pressure testing of solvent welded piping systems shall not be performed until the applicable curing time, as set forth in Table X2.1 of ASTM D2855, has elapsed. Solvent welding shall be performed by bonding operators who have met the requirements of ASME B31.3 and A328.

3.03.3.6 Epoxy and Adhesive Bonded. Not Used.
3.03.3.7 Heat Fusion Bonded:

A. Heat fusion bonded joints shall be used for polyethylene pipe with socket and butt fusion fittings. All joint preparation, cutting, jointing equipment, and jointing procedures shall comply with the pipe manufacturer's recommendations. The heating time, temperature, pressure applied to the joint during bonding, and cooling time shall consistently produce leaktight joints as strong as the pipe being joined.

3.03.3.8 Flanged:

A. Flange bolts shall be tightened sufficiently to slightly compress the gasket and effect a seal, but shall not be torqued less than the minimum value required by the gasket manufacturer. Flange bolts shall not be so tight as to fracture or distort the flanges. A plain washer shall be installed under the head and nut of bolts connecting plastic pipe flanges. Anti-seize thread lubricant shall be applied to the threaded portion of all stainless steel bolts during assembly.

B. Flange bolt holes shall be oriented as follows, unless otherwise indicated on the spool drawings:

   Vertical flange face: Bolt holes to straddle the vertical centerlines.

   Horizontal flange face: Bolt holes to straddle plant north-south centerlines.

C. Pipe sealants, thread compounds, or other coatings shall not be applied to flange gaskets unless recommended by the gasket manufacturer for the specified service and approved by Engineer.

D. Welds at orifice flanges shall have internal surfaces ground smooth to the pipe wall.

E. Slip-on flanges shall be welded inside and outside. There shall be a distance of approximately 1/16 to 1/8 inch [1.5 to 3 mm] between the edge of the fillet weld and the face of the flange. The seal weld shall be applied so that the flange face shall be free of weld spatter and does not require refacing.

F. Flat-faced flanges shall be used when mating to Class 125 flanges. Full-face gaskets shall be used with flat-faced flanges and ring gaskets shall be used with raised faced flanges.

G. Weld neck flanges shall be used with butt-weld fittings. The bore of weld neck flanges shall match the pipe wall thickness.

H. Insulating joints connecting submerged (buried) piping to exposed piping shall be installed above the maximum water surface elevation and before the first pipe support not having coated anchor bolts or adhesive-bonded concrete anchors. All submerged (buried) metallic piping shall be isolated from the concrete reinforcement. Insulating flanges shall be tested for electrical isolation after installation and bolt-up but prior to introduction of conducting fluid.
3.03.3.9 Welded:

A. Welding shall conform to the specifications and recommendations contained in the "Code for Pressure Piping", ANSI B31.1.

B. Weld cross-sections shall be equal to or greater than the pipe wall thickness. Welds shall be smooth and continuous and shall have interior projections no greater than 1/16 inch. Backing strips or rings shall not be used except with specific prior review by Engineer as to use, material, and design. Root gap inserts that are completely melted and consumed in the weld bead are acceptable only when reviewed in advance by Engineer.

C. Stainless steel welding shall be inert gas tungsten arc (TIG) or the direct current, straight polarity, inert gas metal arc process (MIG).

D. Carbon steel welding shall be made by the shielded metal arc process.

3.03.3.10 Grooved Couplings:

A. Grooves for grooved couplings shall be cut with a specially designed grooving tool. Grooves cut in steel pipe shall conform to flexible grooving dimensions, as set forth in AWWA C606, and shall be clean and sharp without burrs or check marks.

3.03.3.11 Push-on:

A. Gasket installation and other jointing procedures shall be in accordance with the recommendations of the manufacturer. Each spigot end shall be suitably beveled to facilitate assembly. All joint surfaces shall be lubricated with a heavy vegetable soap solution immediately before the joint is completed. Lubricant shall be suitable for use in potable water, shall be stored in closed containers, and shall be kept clean.

3.03.3.12 Rubber-Gasketed:

A. Rubber-gasketed joints for hub and spigot type cast iron soil pipe shall have plain spigot ends, without beads. Cut ends of all pipe shall be cut square, beveled, and all burrs shall be removed. Spigot ends shall be coated with a lubricant recommended by the gasket manufacturer and fully seated in the gasket. Clamps for hubless cast iron soil pipe shall be installed in accordance with the manufacturer's recommendations.

3.03.4 Pipe:

A. Pipe shall be installed as specified, as indicated on the drawings, or, in the absence of detail piping arrangement, in a manner acceptable to Engineer.

B. Piping shall be installed without springing or forcing the pipe in a manner which would induce stresses in the pipe, valves, or connecting equipment.

C. Piping shall be supported in conformance with the Pipe Supports section.
D. Piping shall be connected to equipment by flanges or unions as specified in the various piping sections. Piping connecting to equipment shall be supported by a pipe support and not by the equipment.

E. Water, gas, and air supply piping shall be provided with a shutoff valve and union at each fixture or unit of equipment, whether or not indicated on the drawings, to permit isolation and disconnection of each item without disturbing the remainder of the system. Air supply piping shall be provided with sectionalizing valves and valved air inlet connections as needed for isolation of portions of the system for periodic testing. Gas supply lines to buildings shall be provided with a shutoff valve and union located above grade immediately outside the building. A capped drip leg shall be provided at the bottom of the vertical riser of gas supply piping adjacent to gas-fired appliances.

F. A union shall be provided within 2 feet of each threaded-end valve unless there are other connections which will permit easy removal of the valve. Unions shall also be provided in piping adjacent to devices or equipment which may require removal in the future and where required by the drawings or the specifications.

G. Water supply piping within structures shall be arranged, and facilities provided, for complete drainage. All piping serving metering equipment shall be uniformly graded so that air traps are eliminated and complete venting is provided.

H. Taps for pressure gauge connections on the suction and discharge of pumping units shall be provided with a nipple and a ball type shutoff valve. Drilling and tapping of pipe walls for installation of pressure gauges or switches will not be permitted.

I. In all piping, insulating fittings shall be provided to prevent contact of dissimilar metals, including but not limited to, contact of copper, brass, or bronze pipe, tubing, fittings, valves, or appurtenances, or stainless steel pipe, tubing, fittings, valves, or appurtenances with iron or steel pipe, fittings, valves, or appurtenances. Insulating fittings shall also be provided to prevent contact of copper, brass, or bronze pipe, tubing, fittings, valves or appurtenances with stainless steel pipe, tubing, fittings, valves, or appurtenances.

J. Buried PVC piping shall be "snaked" in the trench and shall be kept as cool as possible during installation. PVC pipe shall be kept shaded and shall be covered with backfill immediately after installation.

K. All chemical piping shall be installed so that lines are readily accessible for cleaning. Tees shall be provided at regular intervals in all chemical piping except chlorine piping, with extra openings plugged, to facilitate cleaning. Teflon thread tape or teflon thread sealer shall be applied to the threads of the plugs so that they can be easily removed. At each point where hose or reinforced plastic tubing is connected to rigid piping, a quick-disconnect coupling shall be provided.

L. Polyethylene piping shall be installed in accordance with the manufacturer's recommendations. A continuous 12 AWG THHN insulated copper tracer wire shall be placed 6 inches above all portions of the buried pipe, but no more than 18 inches below
the ground surface. Where the pipe extends above grade, a 2 foot length of wire shall be coiled and attached to the pipe.

M. Piping adjacent to flow sensors shall be installed in accordance with the requirements of the manufacturer of the flow sensor and commonly accepted design practices of the appropriate straight pipe runs both upstream and downstream.

N. Drains required for operation are shown on the drawings. However, vents at all high points and drains at all low points in the piping that are required for complete draining for pressure test may not be shown on these drawings. Contractor shall add such items as found to be necessary during detail piping design and/or piping installation.

3.03.5 Valves:

A. Isolation valves provided with equipment and instruments shall be located in a manner which will allow ease of access and removal of the items to be isolated. Prior to soldering or brazing valves, teflon and elastomer seats and seals shall be removed to prevent damage.

3.04 PIPING ASSEMBLY

3.04.1 General:

A. Contractor shall only use labor that has been qualified by training and experience to capably perform the specified activities required to accomplish the work in a satisfactory manner.

B. Any deviations from the Specifications or piping locations shown on the drawings require prior review and approval by Engineer.


3.05 PROTECTIVE COATING

A. Standard weight steel pipe in buried locations will have exterior surfaces protected with a shop applied plastic coating.

B. Where specified in the Miscellaneous Steel Pipe, Tubing, and Accessories section, extra strong steel pipe in buried locations will have exterior surfaces protected with a shop applied plastic coating or a shop applied tape wrap. Where not specified to be shop coated or wrapped in the Miscellaneous Steel Pipe, Tubing and Accessories section, a tape wrap shall be field applied. The exterior surfaces of all fittings, couplings, specials, and other portions of buried piping not protected with plastic coating shall be tape-wrapped in the field.

C. All surfaces to be tape-wrapped shall be thoroughly cleaned and primed in accordance with the tape manufacturer’s recommendations immediately before wrapping. The tape shall be applied by two-ply (half-lap) wrapping or as needed to provide a total installed
tape thickness of at least 60 mils. Joints in plastic-coated pipe shall be cleaned, primed, and tape-wrapped after installation.

D. Joints in galvanized steel piping in underground locations shall be field painted with two coats of coal tar epoxy coating.

3.05.1 Inspection:

A. All shop-applied plastic coatings and tape wrap on pipe or fittings shall be inspected for holidays and other defects after receipt of the pipe or fitting on the job and immediately before installation. All field-applied tape wrap on pipe, joints, fittings, and valves shall be inspected for holidays and other defects following completion of wrapping. Inspection of plastic coatings after installation of the pipe or fitting in the trench shall be made where, in the opinion of Engineer, the coating may have been damaged during installation. Holidays and defects disclosed by inspection shall be repaired in accordance with the recommendations of the coating or tape wrap manufacturer, as applicable.

B. The inspection shall be made using an electrical holiday detector. The detector and inspection procedures shall conform to the requirements of Section 4.4 of ANSI/AWWA C209.

3.06 PRESSURE AND LEAKAGE TESTING

A. All specified tests shall be made by and at the expense of Contractor in the presence, and to the satisfaction of Engineer. Each piping system shall be tested for at least 1 hour with no loss of pressure. The Contractor shall coordinate this section with the Pipeline Pressure and Leakage Testing section. Piping shall be tested at the indicated pressures:

<table>
<thead>
<tr>
<th>Service</th>
<th>Test Pressure</th>
<th>Test Medium</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water supply</td>
<td>1-1/2 times working pressure</td>
<td>Water</td>
</tr>
<tr>
<td></td>
<td>but not less than 120 psi</td>
<td></td>
</tr>
<tr>
<td>Air supply and signal</td>
<td>1-1/2 times working pressure</td>
<td>Compressed air with 100 percent of all oil 0.025 micron and larger removed</td>
</tr>
<tr>
<td></td>
<td>but not less than 50 psi</td>
<td></td>
</tr>
<tr>
<td>Other piping</td>
<td>1-1/2 times working pressure</td>
<td>Suitable fluid or gas; for distilled water piping, distilled water or filtered oil-free compressed air may be used</td>
</tr>
<tr>
<td></td>
<td>but not less than 50 psi</td>
<td></td>
</tr>
</tbody>
</table>

B. Compressed air or pressurized gas shall not be used for testing plastic piping unless specifically recommended by the pipe manufacturer.

C. Leakage may be determined by loss-of-pressure, soap solution, chemical indicator, or other positive and accurate method acceptable to Engineer. All fixtures, devices, or accessories which are to be connected to the lines and which would be damaged if
subjected to the specified test pressure shall be disconnected and the ends of the branch lines plugged or capped as needed during the testing.

D. Unless otherwise required by the applicable codes, drainage and venting systems shall be air tested. For water testing, the drainage and venting system shall be filled with water to the level of the highest vent stack. For air testing, the system shall be charged with air to a minimum pressure of 5 psig. Openings shall be plugged as necessary for either type of test. To be considered free of leaks, the system shall hold the water or air for 30 minutes without any drop in the water level or air pressure.

E. All necessary testing equipment and materials, including tools, appliances and devices, shall be furnished and all tests shall be made by and at the expense of Contractor. Contractor shall give Engineer 5 working days advanced notice of scheduled testing.

F. All joints in piping shall be tight and free of leaks. All joints which are found to leak, by observation or during any specified test, shall be repaired, and the tests repeated.

3.06.1 Air Pressure Tests:

A. Pressure tests shall be performed on all air piping systems as specified herein.

B. Air piping shall be pressure tested in 3 steps. The first step shall be to pressurize the air piping to approximately 1/3 of the final test pressure and held for one hour. Then the pressure in the piping shall be increased to 2/3 of the final test pressure and held for one hour. Finally, piping shall be pressurized to the final test pressure, as specified herein, and again held for one hour. Piping shall hold pressure with minimal leakage to the satisfaction of Engineer before going to the next step.

C. Contractor shall be responsible for ensuring that all air piping is free of leaks. All joints which are found to be leaking shall be repaired and the test repeated.

3.07 CLEANING

A. The interior of all pipe, valves, and fittings shall be smooth, clean, and free of blisters, loose mill scale, sand, dirt, and other foreign matter when installed. Before being placed in service, the interior of all lines shall be thoroughly cleaned, to the satisfaction of Engineer.

3.08 ACCEPTANCE

A. Owner reserves the right to have any section of the piping system which he suspects may be faulty cut out of the system by Contractor for inspection and testing. Should the joint prove to be sound, Owner will reimburse Contractor on a time-and-material basis as specified in the Contract. Should the joint prove to be faulty, the destructive test will continue joint by joint in all directions until sound joints are found. Costs for replacement of faulty work and/or materials shall be the responsibility of Contractor.

END OF SECTION
SECTION 15061

DUCTILE IRON PIPE

PART 1 - GENERAL

1.01 SCOPE

A. This section covers the furnishing and installation of ductile iron pipe. Ductile iron pipe shall be furnished complete with all fittings, jointing materials, pipe hangers and supports, anchors, blocking, encasement, and appurtenances. Piping shall be furnished by Contractor.

B. Piping furnished hereunder shall be complete with all joint gaskets, bolts, and nuts required for installation of any valves and equipment furnished by others for installation under this contract.

C. All ductile iron pipe, fittings, and specials shall be fabricated, lined, coated, and furnished under the direction and management of one pipe supplier, (the Main Pipe Supplier). The Contractor shall designate the Main Pipe Supplier and notify them in writing of their responsibilities, which shall include, at a minimum; ensure and certify that all pipe, fittings, specials, and other materials specified herein, are being manufactured in full accordance with the contract documents; prepare and submit all submittal information and shop drawings; and make any corrections that may be required to submittal information and shop drawings.

1.02 SUBMITTALS

A. Drawings, details, specifications, and installation schedules covering all ductile iron pipe and accessories shall be submitted in accordance with the Submittals section. The method that the Contractor proposes to use for measuring deflection of pipe joints.

1.03 SHIPPING, HANDLING, AND STORAGE

A. Shipping shall be in accordance with the Shipping section. Handling and storage shall be in accordance with the Handling and Storage section, and as specified herein.

B. Pipe, fittings, and accessories shall be handled in a manner that will ensure installation in sound, undamaged condition. Equipment, tools, and methods used in handling and installing pipe and fittings shall not damage the pipe and fittings. Hooks inserted in ends of pipe shall have broad, well-padded contact surfaces. Unpadded hooks, wire brushes or other abrasive tools shall not be permitted to come into contact with polyethylene lining if such lining is specified.

C. Contractor-furnished pipe and fittings in which the lining has been damaged shall be replaced by and at the expense of Contractor. With the concurrence of Engineer, small and readily accessible damaged areas may be repaired.
D. If the lining of Owner-furnished pipe or fittings is damaged by Contractor during unloading or handling, the damaged pipe or fittings shall be replaced by and at the expense of Contractor. Where the damaged areas are small and readily accessible, Contractor may be permitted to repair the lining.

E. Contractor shall repair any damage to pipe coatings before the pipe is installed.

PART 2 – PRODUCTS

2.01 PIPE MATERIALS

Pipe
Ductile iron, ANSI/AWWA C151/A21.51

Gaskets – All Joint Types
Synthetic rubber; natural rubbers will not be acceptable. Gaskets for potable water service shall be certified as suitable at the pipe pressure and for chlorinated and chloraminated potable water; a certificate of gasket suitability shall be submitted. Gaskets shall be manufactured by the pipe manufacturer.

Gas and oil-resistant gaskets shall be made of Nitrile rubber. The name of the material shall be permanently marked or molded on the gasket. Gaskets shall be certified as suitable where soils may be contaminated with gas and oil products. A gasket of suitability shall be submitted.

Joint Lubricant
Vegetable-based lubricant recommended by the pipe manufacturer. Petroleum or animal-based lubricants will not be acceptable. Lubricants that will be in contact with treated or potable water shall be certified as being in compliance with ANSI/NSF 61.

Fittings
ANSI/AWWA C110/A21.10 (except shorter laying lengths will be acceptable for U.S. Pipe), or ANSI/AWWA C153/A21.53, minimum working pressure rating as follows, unless indicated otherwise on the drawings.

<table>
<thead>
<tr>
<th>Fitting Size</th>
<th>Material</th>
<th>Type</th>
<th>Min. Working Pressure Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>4 to 24</td>
<td>DI</td>
<td>Mechanical and Push-on Joints</td>
<td>350</td>
</tr>
</tbody>
</table>

DUCTILE IRON PIPE
DWSIRLF Project No. DWI-L380005-01
City of Meridian

BKI Project No. TU.17.019

15061-2
<table>
<thead>
<tr>
<th>Size</th>
<th>Type</th>
<th>Joint Type</th>
<th>ANSI/WWA Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>4 to 24</td>
<td>DI</td>
<td>Flanged Joints</td>
<td>250</td>
</tr>
<tr>
<td>30 to 48</td>
<td>DI</td>
<td>All joints</td>
<td>250</td>
</tr>
<tr>
<td>54 to 64</td>
<td>DI</td>
<td>All joints</td>
<td>150</td>
</tr>
</tbody>
</table>

All fittings shall be ductile iron and suitable for a factory test pressure of rated working pressure plus 100 psi or 1.5 times rated working pressure, whichever is less, without leakage or damage.

**Push-on Joints**

- **Restrained Push-on Joints**, gaskets with stainless steel gripping segments, (4 inch through 12 inch)
  - American “Fast Grip” or “Field Lok 350 Gasket” manufactured by U.S. Pipe and furnished to licenses Tyton joint manufacturer.
- **Restrained Push-on Joints**, locking wedge type, (4 inch through 24 inch)
  - EBBA Iron “Megalug” Series 1700; U.S. Pipe “TR Flex Gripper Ring; Star Pipe Products “StarGrip 3100”; or American “Field Flex Ring”, without exception.
- **Restrained Push-on Joints**, positive locking segments and/or rings, (4 inch through 64 inch)
  - American “Flex-Ring,” or Lok-Ring”; Clow “Super-Lock”; U.S. Pipe “TR Flex”; or Griffin “Snap-Lok.”

**Flange Joints**

- **Flanges**
  - **Class 250**
    - Ductile iron, flat faced, with ANSI/ASME B16.1, Class 250 diameter and drilling.
  - **All others**
    - Ductile iron, Class 125, ANSI/WWA C115/A21.15.

- **Flanges**
  - All flanges shall be suitable for test pressure of 1.5 times rated pressure without leakage or damage.

- **Bolts**
  - ASTM A307, Chamfered or rounded ends projecting ¼ to ½ inch beyond outer face of nut.

- **Nuts**
  - ASTM A563, hexagonal, ANSI/ASME B18.2.2, heavy semifinished pattern.
B Street Water Treatment Plant &
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DUCTILE IRON PIPE

Gaskets
ASTM D1330, Grade I rubber, full face type, 1/8 inch thick. Gaskets shall be furnished by the pipe manufacturer. Gaskets for potable water service shall be certified as suitable for chlorinated potable water; a certificate of gasket suitability shall be submitted.

Mechanical Joints
ANSI/AWWA C111/A21.11

Restrained Mechanical Joints (factory prepared spigot), (4 inch through 48 inch)
American “MJ coupled Joints” or Griffin “Mech-Lok”.

Restrained Mechanical Joints, (field cut spigot)
(4 inch through 24 inch)
EBAA Iron “Megalug” Series 1100, or Star Pipe Products “StarGrip 3000” without exception.

Wall Pipes or Castings
Mechanical joints with water stop and tapped holes: singles casting or fabricated ductile iron pipe; holes sized in accordance with the details on the drawings and provided with removable plugs.

Mechanical Joints with Tie Rods
As indicated on the drawings.

Tie Rods
ASTM A307

Steel Pipe
ASTM A53, Schedule 5, 10, 40 or 80 as indicated on the drawings.

Washers
ANSI/ASME B18.22.1, plain steel.

Threaded Connections
ANSI/ASME B1.20.1, NPT; with boss or tapping saddle wherever wall thickness minus the foundry tolerance at the tapped connection is less than that required for 4-thread engagement as set forth in Table A.1, Appendix A, of ANSI/AWWA C151/A21.51.

Mechanical Couplings
Dresser “Style 38”; Smith-Blair “R 411 Steel Coupling”; or Romac “Style 400” or “Style 501”; without pipe stop.
Gaskets

Oil-resistant synthetic rubber. Gaskets shall be furnished by the pipe manufacturer. Gaskets for potable water service shall be certified as suitable for chlorinated potable water; a certificate of gasket suitability shall be submitted.

Flanged Coupling Adapters

**Restrained (4 inch through 12 inch)**

Smith-Blair “Type 912” or Romac “Style FCA501”, with anchor studs.

**Dismantling Joints**

**Restrained (3 inch and larger - Dismantling Joint)**

Romac “DJ400”; Dresser “Style 131 Dismantling Joint” or Viking Johnson. For use in potable water systems, coating to be in accordance with NSF-61. Bolts, nuts, and tie rods shall be stainless steel ASTM A304 of A316.

Unless otherwise indicated on the drawings, flanged coupling adapters shall be restrained.

**Tapping Saddles**

Ductile iron, with steel straps and rubber sealing gasket, 250 psi pressure rating.

**Watertight/Dusttight Pipe Sleeves**

PSI “Thunderline Link-Seal”, Insulating type with modular rubber sealing elements, non-metallic pressure plates, and stainless steel bolts and nuts.

**Shop Coating and Lining**

**Cement Mortar Lining with Seal Coat**

ANSI/AWWA C104/A21.4.

**Universal Primer**

Manufacturer’s standard. If in contact with treated or potable water, certify as being in compliance with ANSI/NSF 61.

**Asphaltic Coating**

Manufacturer’s standard.

**Coat Tar Epoxy**

Manufacturer’s standard.

**Liquid Epoxy**

ANSI/AWWA C210, non-coal tar modified, or when in contact with treated or potable water, certify as being in compliance with ANSI/NSF 61.
Medium Consistency Coal Tar  Carboline “Bitumastic 50” or Tnemec “46-465 H.B. Tnemcol.”

Polyethylene Encasement  Seamless, ANSI/AWWA C105/A21.5; LLDPE - 8mil or HDCLPE – 4 mil.

2.02  **SHOP COATING AND LINING**

A. The interior of all pipe and fittings, unless noted otherwise, shall be cement mortar lined and seal coated. The interior of all air piping shall be unlined and uncoated.

B. The exterior surfaces of all pipe and fittings which will be exposed in interior locations shall be shop primed. Flange faces shall be coated with a suitable rust-preventive compound. Exterior surfaces of all other pipe and fittings shall be coated with asphaltic coating.

C. All piping in contact with treated or raw water shall use coating and lining materials that are in compliance with ANSI/NSF 61 requirements.

**PART 3 - EXECUTION**

3.01  **INSPECTION**

A. Pipe and fittings shall be carefully examined for cracks and other defects immediately before installation; pipe ends shall be examined with particular care. All defective pipe and fittings shall be removed from the site.

3.02  **PREPARATION**

A. The interior of all pipe and fittings shall be thoroughly cleaned of all foreign matter prior to installation. Before jointing, all joint contact surfaces shall be wire brushed if necessary, wiped clean, and kept clean until jointing is completed.

B. Precautions shall be taken to prevent foreign material from entering the pipe during installation. Debris, tools, clothing, or other objects shall not be placed in or allowed to enter the pipe.

3.03  **CUTTING PIPE**

A. Cutting shall be done in a neat manner, without damage to the pipe or the lining. Cuts shall be smooth, straight, and at right angles to the pipe axis. After cutting, the ends of the pipe shall be dressed with a file or a power grinder to remove all roughness and sharp edges. The cut ends of push-on joint pipe shall be suitably beveled.

B. All field cutting of existing gray cast iron pipe shall be done with mechanical pipe cutters, except where the use of mechanical cutters would be difficult or impracticable.

C. Contractor shall use factory prepared pipe ends unless a field cut is required for connections.
D. Ends of ductile iron pipe shall be cut with a portable guillotine saw, abrasive wheel, saw, milling cutter, or oxyacetylene torch. The use of hydraulic squeeze type cutters will not be acceptable. Field-cut holes for saddles shall be cut with mechanical cutters; oxyacetylene cutting will not be acceptable.

3.04 ALIGNMENT

A. Piping shall be laid to the lines and grades indicated on the drawings. Pipelines or runs intended to be straight shall be laid straight. Deflections from a straight line or grade shall not exceed the values stipulated in Table 3 or Table 4 of AWWA C600, unless specially designed bells and spigots are provided.

B. Either shorter pipe sections or fittings shall be installed where needed to conform to the alignment or grade indicated on the drawings.

3.05 LAYING PIPE

A. Buried pipe shall be protected from lateral displacement by placing the specified pipe embedment material installed as specified in the Trenching and Backfilling section. Under no circumstances shall pipe be laid in water, and no pipe shall be laid under unsuitable weather or trench conditions.

B. Whenever pipe laying is stopped, the open end of the pipe shall be sealed with a watertight plug, which will prevent trench water from entering the pipe.

C. Pipe shall be laid with the bell ends facing the direction of laying, except where reverse laying is specifically acceptable by Engineer.

3.06 FIELD JOINTS

A. Joints in buried and tunnel locations shall be restrained mechanical type unless otherwise indicated on the drawings or where required to connect to existing piping or to valves. Bells on wall castings and wall sleeves shall be mechanical joint type, with tapped holes for tie rods or stud bolts. All other joints shall be flanged unless otherwise indicated on the drawings.

B. Certification of joint design shall be provided in accordance with ANSI/AWWA C111/A21.11, Section 4.5, Performance Requirements, as modified herein. The joint test pressure shall be not less than 2 times the working pressure or 1-1/2 times the test pressure of the pipeline, whichever is higher. The same certification and testing shall also be provided for restrained joints. For restrained joints, the piping shall not be blocked to prevent separation and the joint shall not leak or show evidence of failure. It is not necessary that such tests be made on pipe manufactured specifically for this project. Certified reports covering tests made on other pipe of the same size and design as specified herein and manufactured from materials of equivalent type and quality may be accepted as adequate proof of design.

C. Restrained joints shall be extended after they are assembled to minimize further takeup.
D. Field closure pieces shall be located away from the bends beyond the length over which joints are to be restrained.

3.07 **MECHANICAL JOINTS**

A. Mechanical joints shall be carefully assembled in accordance with the manufacturer's recommendations. If effective sealing is not obtained, the joint shall be disassembled, thoroughly cleaned, and reassembled. Bolts shall be uniformly tightened to the torque values listed in Appendix A of ANSI/AWWA C111/A21.11. Overtightening of bolts to compensate for poor installation practice will not be acceptable.

B. The holes in mechanical joints with tie rods shall be carefully aligned to permit installation of the tie rods. In flange and mechanical joint pieces, holes in the mechanical joint bells and the flanges shall straddle the top (or side for vertical piping) centerline. The top (or side) centerline shall be marked on each flange and mechanical joint piece at the foundry.

3.08 **PUSH-ON JOINTS**

A. The pipe manufacturer's instructions and recommendations for proper jointing procedures shall be followed. All joint surfaces shall be lubricated with a soap solution provided by the pipe manufacturer immediately before the joint is completed. Lubricant shall be suitable for use in potable water, shall be stored in closed containers, and shall be kept clean. Each spigot end shall be suitably beveled to facilitate assembly.

B. Pipe ends for restrained joint pipe shall be prepared in accordance with the pipe manufacturer's recommendations.

3.09 **FLANGED JOINTS**

A. Pipe shall extend completely through screwed-on flanges. The pipe end and flange face shall be finish machined in a single operation. Flange faces shall be flat and perpendicular to the pipe centerline.

B. When bolting flanged joints, care shall be taken to avoid restraint on the opposite end of the pipe or fitting which would prevent uniform gasket compression or would cause unnecessary stress in the flanges. One flange shall be free to move in any direction while the flange bolts are being tightened. Bolts shall be tightened gradually and at a uniform rate, to ensure uniform compression of the gasket.

C. Special care shall be taken when connecting piping to any pumping equipment to ensure that piping stresses are not transmitted to the pump flanges. All connecting piping shall be permanently supported to obtain accurate matching of bolt holes and uniform contact over the entire surface of flanges before any bolts are installed in the flanges. Pump connection piping shall be free to move parallel to its longitudinal centerline while the bolts are being tightened. Each pump shall be leveled, aligned, and wedged into position which will fit the connecting piping, but shall not be grouted until the initial fitting and alignment of the pipe, so that the pump may be shifted on its foundation if necessary to properly install the connecting piping. Each pump shall, however, be grouted before final bolting.
of the connecting piping. After final alignment and bolting, the pump connections shall be tested for applied piping stresses by loosening the flange bolts which, if the piping is properly installed, should result in no movement of the piping relative to the pump or opening of the pump connection joints. If any movement is observed, the piping shall be loosened and re-aligned as needed and then the flanges bolted back together. The flange bolts shall then be loosened and the process repeated until no movement is observed.

3.10 FLANGED COUPLING ADAPTERS

A. Flanged coupling adapters shall be installed in strict accordance with the coupling manufacturer’s recommendations. After the pipe is in place and bolted tight, the proper locations of holes for the anchor studs shall be determined and the pipe shall be field-drilled. Holes for anchor studs shall be drilled completely through the pipe wall. Hole diameter shall be not more than 1/8 inch larger than the diameter of the stud projection. Unless indicated on the drawings, all flange coupling adapters shall be restrained.

B. The inner surfaces of couplings shall be prepared for coating in accordance with instructions of the coating manufacturer and shall then be coated with liquid epoxy in accordance with ANSI/AWWA C210. The remaining surfaces, except flange mating surfaces, shall be cleaned and shop primed with universal primer.

3.11 DISMANTLING JOINTS

A. Dismantling joints shall be provided for restrained coupling 14 inch and larger and where indicated on the drawings and as specified herein. Dismantling joints shall comply with AWWA C219 and shall be restrained flange by flange couplings manufactured as a single unit. Dismantling joints shall be installed in accordance with the manufacturer’s recommendations.

3.12 MECHANICAL COUPLINGS

A. Mechanical couplings shall be carefully installed in accordance with the manufacturer's recommendations. A space of at least 1/4 inch, but not more than 1 inch, shall be left between the pipe ends. Pipe and coupling surfaces in contact with gaskets shall be clean and free from dirt and other foreign matter during assembly. All assembly bolts shall be uniformly tightened so that the coupling is free from leaks, and all parts of the coupling are square and symmetrical with the pipe. Following installation of the coupling, damaged areas of shop coatings on the pipe and coupling shall be repaired to the satisfaction of Engineer.

B. The interior surfaces of the middle rings shall be prepared for coating in accordance with instructions of the coating manufacturer and shall then be coated with liquid epoxy in accordance with ANSI/AWWA C210. The remaining components shall be cleaned and shop primed with universal primer.

3.13 POLYETHYLENE ENCASEMENT

A. All buried ductile iron pipe, including all straight pipe, bends, tees, adapters, closure pieces, and other fittings or specials, and all valves, shall be provided with at least one
wrap of polyethylene encasement. Locations where ductile iron pipe shall be double
wrapped with polyethylene encasement are indicated on the drawings and/or as specified
in the provisions for Corrosion Protection section.

B. Polyethylene tube protection shall be installed in accordance with ANSI/AWWA
C105/A21.5, Method A. Preparation of the pipe shall include, but shall not be limited to,
removal of lumps of clay, mud, cinders, etc., prior to installation.

C. Where ductile iron pipe is also embedded or encased in concrete, the polyethylene tube
shall be installed over the pipe for 5 feet either side of each end of the concrete
encasement.

D. The terms "polyethylene tube protection" and "polyethylene encasement" are
interchangeable and shall have the same meaning in these Contract Documents.

3.13.01 Inspection and Testing:

A. Tests for preliminary acceptance of polyethylene encasement materials as required in the
submittal paragraph shall be made at the expense of the Contractor.

B. The Owner may obtain samples from the material supplied in the field and have test
conducted by an independent third-party laboratory, at the Owner's expense, of the
requirements specified in ANSI/AWWA C105/A21.5.

3.14 CONNECTIONS WITH EXISTING PIPING

A. Connections between new work and existing piping shall be made using fittings suitable
for the conditions encountered. Each connection with an existing pipe shall be made at a
time and under conditions which will least interfere with service to customers, and as
authorized by Owner. Facilities shall be provided for proper dewatering and for disposal
of all water removed from dewatered lines and excavations without damage to adjacent
property.

B. Special care shall be taken to prevent contamination when dewatering, cutting into, and
making connections with existing potable water piping. Trench water, mud, or other
contaminating substances shall not be permitted to enter the lines. The interior of all pipe,
fittings, and valves installed in such connections shall be thoroughly cleaned and then all
potable water pipe, fittings, and valves shall be swabbed with, or dipped in, a 200 mg/L
chlorine solution.

3.15 CONCRETE ENCASEMENT

A. Concrete encasement shall be installed where indicated on the drawings. A pipe joint
shall be provided within 12 inches of each end of the concrete encasement. Concrete and
reinforcing steel shall be as specified in the Cast-in-Place Concrete section. All pipe to be
encased shall be suitably supported and blocked in proper position, and shall be anchored
to prevent flotation.

3.16 PRESSURE AND LEAKAGE TESTS
A. Pipe and fittings shall be subjected to a pressure test and a leakage test. The Contractor shall provide all necessary pumping equipment; piping connections between the piping and the nearest available source of test water; pressure gauges; and other equipment, materials, and facilities necessary for the tests.

B. All pipe, fittings, valves, pipe joints, and other materials which are found to be defective shall be removed and replaced with new and acceptable materials, and the affected portion of the piping shall be retested by and at the expense of Contractor.

C. All joints shall be watertight and free from visible leaks. Any visible leak which is discovered within the correction period stipulated in the General Conditions shall be repaired by and at the expense of Contractor.

3.17 CLEANING

A. The interior of all pipe and fittings shall be kept clean of any foreign matter until the work has been accepted.

END OF SECTION
## Ductile Iron Pipe Schedule

**B Street Water Treatment Plant & North Water Treatment Plant Improvements**  
City of Meridian

### Schedule 15061-S01

**Ductile Iron Pipe Schedule**

<table>
<thead>
<tr>
<th>Size (in.)</th>
<th>Location and Service</th>
<th>ANSI/AWWA Class</th>
<th>Lining Material</th>
</tr>
</thead>
<tbody>
<tr>
<td>16</td>
<td>Filter Influent</td>
<td>250</td>
<td>Cement Mortar</td>
</tr>
<tr>
<td>16</td>
<td>Filter to Waste</td>
<td>250</td>
<td>Cement Mortar</td>
</tr>
<tr>
<td>16</td>
<td>Filter Backwash Influent</td>
<td>250</td>
<td>Cement Mortar</td>
</tr>
<tr>
<td>6</td>
<td>Re-Wash</td>
<td>350</td>
<td>Cement Mortar</td>
</tr>
<tr>
<td>10</td>
<td>Filter Effluent</td>
<td>350</td>
<td>Cement Mortar</td>
</tr>
</tbody>
</table>

**END OF SECTION**
B Street Water Treatment Plant &
North Water Treatment Plant Improvements
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SECTION 15064

STAINLESS STEEL PIPE, TUBING, AND ACCESSORIES

PART 1 - GENERAL

1.01 SCOPE

A. This section covers the furnishing of stainless steel pipe, tubing and accessories for the services as indicated herein. Pipe and tubing shall be furnished complete with all fittings, flanges, unions, and other accessories specified herein.

1.02 SUBMITTALS

1.02.1 Drawings and Data

A. Complete specifications, data, and catalog cuts or drawings shall be submitted in accordance with the Submittals section. Submittals are required for all piping, fittings, gaskets, sleeves, and accessories, and shall include the following data:

- Name of Manufacturer
- Type and model
- Construction materials, thickness, and finishes
- Pressure and temperature ratings

B. Contractor shall obtain and submit a written statement from the gasket material manufacturer certifying that the gasket materials are compatible with the joints specified herein and are recommended for the specified field test pressures and service conditions.

1.03 DELIVERY, STORAGE, AND HANDLING

A. Shipping shall be in accordance with the Shipping section. Handling and storage shall be in accordance with the Handling and Storage section. All materials shall be stored in a sheltered location above the ground, separated by type, and shall be supported to prevent sagging or bending.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Stainless steel pipe materials shall be as specified herein.

2.01.2 Material Classification SS-1:
SS-1 – Schedule 5 or 10 with grooved ends.  
Filter air scour piping.  
2-1/2 inch and larger.  
| Pipe | ASTM A312 seamless and welded austentistic stainless steel  
Fittings | Ductile iron ASTM A536, Grade 65-48-12. |

2.01.3 Material Classification SS-2:  

SS-2 – Schedule 5 or 10 with flanged ends.  
Filter air scour piping.  
2-1/2 inch and larger.  
| Pipe | ASTM A312 seamless and welded austentistic stainless steel  
Fittings | Flanged ASTM 182A. |

2.01.3 Material Classification SS-3:  

SS-3 – Schedule 40S with Threaded Ends.  
Gauge piping in stainless steel piping systems (to match pipe)  
2 inch and smaller.  
| Pipe | ASTM A312, TP304.  
Fittings | Threaded, material to match pipe. Fittings shall conform to ANSI/ASME B16.3, Class 150. |

2.01.4 Material Classification SS-4:  

SS-4 – Schedule 40S with Plain Ends.  
Gauge piping in stainless steel piping systems.  
2 inch and smaller with socket welded ends.  
| Pipe | ASTM A312, Grade TP304L,  
Fittings | Socket welded, ASTM A182, F304L. Fittings shall conform to ANSI/ASME B16.11, Class 3000. |

2.01.5 Accessory Materials  

A. Accessory materials for the stainless steel pipe systems shall be as indicated.
Couplings
SS-1 Couplings
Ductile iron couplings manufactured in two segments of cast iron, conforming to ASTM A536. Gaskets shall be pressure-responsive synthetic rubber, grade to suit the intended service, conforming to ASTM D2000. Mechanical coupling bolts shall be zinc plated ASTM B633 heat treated carbon street track head conforming to ASTM A449 and A813, minimum tensile strength 110,000 psi.
Size to 12”, rigid type, designed to clamp to bottom of the groove to provide an essentially rigid joint, Victaulic Series 89.
Sizes 14” through 24”, Victaulic AGS series with lead-in chamfer on housing key and wide width gasket. Rigid type, housing key shall fill the wedge shape AGS groove and provide rigidity, Victaulic Style W89.

Flanges
SS-2 Pipe Backing Flanges
Stainless steel plate, AISI Type 304 or 316 to match fittings. Provide stub ends with material and thickness to match fittings. Flanges shall conform with ANSI/ASME B16.5, Class 150 diameter and drilling; with the following thicknesses:

<table>
<thead>
<tr>
<th>Nominal Pipe Size inches</th>
<th>Flange Thickness inches</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/2-8</td>
<td>1/2</td>
</tr>
<tr>
<td>10-16</td>
<td>5/8</td>
</tr>
<tr>
<td>18-20</td>
<td>3/4</td>
</tr>
<tr>
<td>24-30</td>
<td>1</td>
</tr>
<tr>
<td>36</td>
<td>1-1/4</td>
</tr>
</tbody>
</table>

Flange Bolts
ASTM A193 Class 2, AISI Type 304, ANSI B18.2.1, heavy hex head, length such that, after installation, the bolts will project 1/8 to 3/8 inch beyond outer face of the nut.

Flange Nuts
ASTM A194, AISI Type 304, ANSI/ASME B18.2.2, heavy hex pattern.

Flange Gaskets
Process air
Raised Face Flanges
Non-asbestos inorganic fiber with EPDM binder; dimensions to suit flange contact face, 1/16 inch minimum thickness for plain finished surfaces, 3/32 inch minimum thickness for serrated surfaces, rated for 275°F service; Garlock "IFG 5507".
Flat Faced Flanges

Premium Grade, EPDM, ring type, 1/8 inch thick, rated for 275°F service; Garlock "8314".

All other services.

Flexitalic "Style CG", spiral wound, AISI Type 304 stainless steel, non-asbestos filler, 3/16 inch nominal thickness, with compression ring 1/8 inch thick to match required flange dimensions.

Protective Coatings – High Temperature Service

Epoxy for process air piping

Shop or field applied high solids epoxy; suitable for protection at continuous pipe wall temperatures up to 300 F. Coating shall be abrasion resistant. The finished coating shall have a minimum total film thickness of 10 mils. The surface shall be prepared in accordance with SSPC-SP7 as a minimum unless otherwise recommended by the coating manufacturer. The coating shall be Carboline “Thermaline 450”, Ameron “Amerlock 400 with Amercoat 880 Additive”, or approved equal.

Expansion Joints

Process air

Expansion joints shall be the elastomeric, arched type and shall be Mercer “Type 450” with “Type 500” retaining rings and Kevlar reinforcement, or equal.

The number of arches shall be as indicated on the drawings. The connection shall be suitable for a maximum pressure of 15 psig and maximum temperature of 275 F.

Insulating Fittings

Threaded

Dielectric steel pipe nipple, ASTM A53, Schedule 40, polypropylene lined, zinc plated; Perfection Corp. "Clearflow Fittings".

Flanged

Epco "Dielectric Flange Unions" or Central Plastics "Insulating Flange Unions".

2.02 WELDING OF STAINLESS STEEL

A. Filler metal for welding austenitic stainless steel, P-number 8 base materials shall be in accordance with the following:

Material Type/Grade 304 shall use Type 308 filler metal.

Material Type/Grade 304L shall use Type 308L filler metal.
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Material Type/Grade 316, shall use Type 316 filler metal.
Material Type/Grade 316L shall use Type 316L filler metal.

B. The following requirements shall apply when fabricating austenitic stainless steel components.

C. Grinding shall be by aluminum oxide, zirconium oxide, or silicon carbide grinding wheels that shall not have been used on carbon or low alloy steels. Hand or power wire brushing shall be by stainless steel brushes that shall not have been used on carbon or low alloy steels. All tools used in fabrication shall be protected to minimize contact with steel alloys or free iron. Grinding wheels and brushes shall be identified and controlled for their use on these materials only to ensure that contamination of these materials does not occur.

D. Antispatter compounds, marking fluids, marking pens, tape, temperature indicating crayons, and other tools shall have a total halogen content of less than 200 parts per million.

E. Heat input control for welding shall be specified in the applicable WPS and shall not exceed 55,000 joules per inch (22,000 joules per cm) as determined by the following formula:

\[
\text{Heat Input (J/in)} = \frac{\text{Voltage} \times \text{Amperage} \times 60}{\text{Vel Speed (in/min)}}
\]

F. Complete penetration pressure retaining welds shall be made using the GTAW process for the root and second layer as a minimum.

G. Austenitic stainless steel instrument tubing shall be welded using only the GTAW process.

H. Socket welds or butt welds in all austenitic stainless steel instrument tubing lines shall require an inert gas backing (purge) using argon during welding to avoid oxidation.

I. The application of heat to correct weld distortion and dimensional deviation without prior written approval from the Engineer is prohibited.

J. Unless otherwise approved in writing, the GTAW process shall require the addition of filler metal.

K. The maximum preheat and interpass temperature for austenitic stainless steel shall be 350°F (176°C). The minimum preheat temperature shall be 50°F (10°C).

L. Complete joint penetration welds welded from one side without backing, weld repairs welded from one side without backing, or weld repairs in which the base metal remaining after excavation is less than 0.1875 inch (5 mm) from being
STAINLESS STEEL PIPE, TUBING AND ACCESSORIES

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through wall, which are fabricated from austenitic stainless steel ASME P-number 8 base metal or unassigned metals with similar chemical compositions, shall have the root side of the weld purged with an argon backing gas prior to welding. Backing gas (purge) shall only be argon. The argon backing gas shall be classified as welding grade argon or shall meet Specification SFA-5.32, AWS Classification SG-A. The backing gas (purge) shall be maintained until a minimum of two layers of weld metal have been deposited.

2.03 SHOP CLEANING AND PICKLING OF STAINLESS STEEL PIPING AND WELDS

A. All stainless steel piping shall be thoroughly cleaned and pickled at the mill in accordance with ASTM A380.

B. Pickling shall produce a modest etch and shall remove all embedded iron and heat tint. After fabrication, pickled surfaces shall be subjected to a 24 hour water test or a ferroxyl test to detect the presence of residual embedded iron. All pickled surfaces damaged during fabrication including welded areas shall either be mechanically cleaned or repickled or passivated in accordance with ASTM A380. Materials that have been contaminated with steel alloys or free iron shall not be used until all contamination is removed. When cleaning to remove steel or iron contamination is required, it shall be performed in accordance with ASTM A380, Code D requirements. Mechanical cleaning is not an acceptable cleaning method for oxygen or ozone piping. Oxygen and ozone piping shall be repickled or passivated as specified herein. All stainless steel surfaces shall be adequately protected during fabrication, shipping, handling, and installation to prevent contamination from iron or carbon steel objects or surfaces. Particulate matter shall be removed from piping and welds. Labels shall be affixed to the piping sections to indicate shop cleaning has been performed. Welds shall be either mechanically cleaned or pickled or passivated on the exterior of the pipe.

C. For oxygen or ozone piping, welds shall be pickled or passivated on the interior and exterior of the pipe.

2.04 HIGH TEMPERATURE EPOXY COATING

A. Filter backwash air piping shall be protected against corrosion by a shop or field applied high-solids epoxy coating as specified herein.

2.05 INSULATING FITTINGS

A. In all piping, insulating fittings shall be provided to prevent contact of dissimilar metals, including but not limited to, contact of copper, brass, or bronze pipe, tubing, fittings, valves, or appurtenances, or stainless steel pipe, tubing, fittings, valves, or appurtenances with iron or steel pipe, fittings, valves, or appurtenances. Insulating fittings shall also be provided to prevent contact of copper, brass, or bronze pipe, tubing, fittings, valves or appurtenances with stainless steel pipe, tubing, fittings, valves, or appurtenances.
PART 3 - EXECUTION

3.01 INSTALLATION

A. Materials furnished under this section will be installed in accordance with the Miscellaneous Piping and Accessories Installation section.

END OF SECTION
SECTION 15086

DUCT INSULATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes insulating the following duct services:
   1. Outdoor, exposed supply and return.

B. Related Sections:
   1. Division 15 Section "Metal Ducts" for duct liners.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
   1. Detail application of protective shields, saddles, and inserts at hangers for each type of insulation and hanger.
   2. Detail insulation application at elbows, fittings, dampers, specialties and flanges for each type of insulation.
   3. Detail application of field-applied jackets.
   4. Detail application at linkages of control devices.

1.3 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

1.4 QUALITY ASSURANCE

A. Surface-Burning Characteristics: For insulation and related materials, as determined by testing identical products according to ASTM E 84, by a testing agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing agency.
   1. Insulation Installed Outdoors: Flame-spread index of 75 or less, and smoke-developed index of 150 or less.
PART 2 - PRODUCTS

2.1 INSULATION MATERIALS

A. Comply with requirements in duct insulation schedules for where insulating materials shall be applied.

B. Products shall not contain asbestos, lead, mercury, or mercury compounds.

C. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871.

D. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable according to ASTM C 795.

E. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.

F. Mineral-Fiber Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 612, Type IA or Type IB. For duct and plenum applications, provide insulation airstream surface lined with an acrylic. Anti microbial coating. See Editing Instruction No. 1 in the Evaluations for cautions about naming manufacturers and products. See Division 1 Section "Product Requirements."

1. Products: Subject to compliance with requirements, basis of design ins Johns Mansville Linacoustic RC and available products that may be incorporated into the Work include, but are not limited to, the following:
   
   a. CertainTeed Corp.;
   b. Johns Manville;
   c. Owens Corning;

2.2 ADHESIVES

A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated unless otherwise indicated.

B. Mineral-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.
   1. Environmental Chambers."

2.3 MASTICS

A. Materials shall be compatible with insulation materials, jackets, and substrates; comply with MIL-PRF-19565C, Type II.

1. For indoor applications, use mastics that have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
B. Vapor-Barrier Mastic: Water based; suitable for indoor/outdoor use on below ambient services.

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. Hardcast DUCT-SEAL 321 TDS

2.4 SEALANTS

A. FSK and Metal Jacket Flashing Sealants:

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
   b. Eagle Bridges - Marathon Industries; 405.
   c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 95-44.
   d. Mon-Eco Industries, Inc.; 44-05.

2. Materials shall be compatible with insulation materials, jackets, and substrates.
3. Fire- and water-resistant, flexible, elastomeric sealant.
4. Service Temperature Range: Minus 40 to plus 250 deg F.
5. Color: Aluminum.

2.5 FIELD-APPLIED FABRIC-REINFORCING MESH

A. Woven Polyester Fabric: Approximately 1 oz./sq. yd. with a thread count of 10 strands by 10 strands/sq. in, in a Leno weave, for ducts.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
   b. Vimasco Corporation; Elastafab 894.

2.6 SECUREMENTS

A. Aluminum Bands: ASTM B 209, Alloy 3003, 3005, 3105, or 5005; Temper H-14, 0.020 inch thick, 3/4 inch wide with wing seal or closed seal.

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. ITW Insulation Systems; Gerrard Strapping and Seals.
b. RPR Products, Inc.; Insul-Mate Strapping, Seals, and Springs.

B. Insulation Pins and Hangers:

1. Metal, Adhesively Attached, Perforated-Base Insulation Hangers: Baseplate welded to projecting spindle that is capable of holding insulation, of thickness indicated, securely in position indicated when self-locking washer is in place. Comply with the following requirements:
   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) AGM Industries, Inc.; Tactoo Perforated Base Insul-Hangers.
      2) GEMCO; Perforated Base.
      3) Midwest Fasteners, Inc.; Spindle.
      4) <
   b. Baseplate: Perforated, galvanized carbon-steel sheet, 0.030 inch thick by 2 inches square.
   c. Spindle: Zinc-coated, low-carbon steel, fully annealed, 0.106-inch-diameter shank, length to suit depth of insulation indicated.
   d. Adhesive: Recommended by hanger manufacturer. Product with demonstrated capability to bond insulation hanger securely to substrates indicated without damaging insulation, hangers, and substrates.

2. Nonmetal, Adhesively Attached, Perforated-Base Insulation Hangers: Baseplate fastened to projecting spindle that is capable of holding insulation, of thickness indicated, securely in position indicated when self-locking washer is in place. Comply with the following requirements:
   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) GEMCO; Nylon Hangers.
      2) Midwest Fasteners, Inc.; Nylon Insulation Hangers.
   b. Baseplate: Perforated, nylon sheet, 0.030 inch thick by 1-1/2 inches in diameter.
   c. Spindle: Nylon, 0.106-inch-diameter shank, length to suit depth of insulation indicated, up to 2-1/2 inches.
   d. Adhesive: Recommended by hanger manufacturer. Product with demonstrated capability to bond insulation hanger securely to substrates indicated without damaging insulation, hangers, and substrates.

3. Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch-(0.41-mm-) thick, [galvanized-steel] [aluminum] [stainless-steel] sheet, with beveled edge sized as required to hold insulation securely in place but not less than 1-1/2 inches (38 mm) in diameter.
a. Products: Subject to compliance with requirements, [provide the following] [provide one of the following] [available products that may be incorporated into the Work include, but are not limited to, the following]:

1) AGM Industries, Inc.; RC-150.
2) GEMCO; R-150.
3) Midwest Fasteners, Inc.; WA-150.
4) Nelson Stud Welding; Speed Clips.
5) <Insert manufacturer's name; product name or designation>.

b. Protect ends with capped self-locking washers incorporating a spring steel insert to ensure permanent retention of cap in exposed locations.

4. Nonmetal Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch-thick nylon sheet, with beveled edge sized as required to hold insulation securely in place but not less than 1-1/2 inches in diameter.

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) GEMCO.
2) Midwest Fasteners, Inc.

PART 3 - EXECUTION

3.1 PREPARATION

A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.

3.2 GENERAL INSTALLATION REQUIREMENTS

A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of ducts and fittings.

B. Install insulation materials, vapor barriers or retarders, jackets, and thicknesses required for each item of duct system as specified in insulation system schedules.

C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.

D. Install insulation with longitudinal seams at top and bottom of horizontal runs.

E. Install multiple layers of insulation with longitudinal and end seams staggered.
F. Keep insulation materials dry during application and finishing.

G. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.

H. Install insulation with least number of joints practical.

I. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.
   1. Install insulation continuously through hangers and around anchor attachments.
   2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.
   3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.

J. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.

K. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.

L. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.

M. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.

3.3 PENETRATIONS

A. Insulation Installation at Aboveground Exterior Wall Penetrations: Install insulation continuously through wall penetrations.
   1. Seal penetrations with flashing sealant.
   2. For applications requiring only indoor insulation, terminate insulation inside wall surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
   3. Extend jacket of outdoor insulation outside wall flashing and overlap wall flashing at least 2 inches.
   4. Seal jacket to wall flashing with flashing sealant.

B. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.
C. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Terminate insulation at fire damper sleeves for fire-rated wall and partition penetrations. Externally insulate damper sleeves to match adjacent insulation and overlap duct insulation at least 2 inches.

1. Comply with requirements in Division 7 Section "Through-Penetration Firestop Systems" for firestopping and fire-resistant joint sealers.

D. Insulation Installation at Floor Penetrations:

1. Duct: For penetrations through fire-rated assemblies, terminate insulation at fire damper sleeves and externally insulate damper sleeve beyond floor to match adjacent duct insulation. Overlap damper sleeve and duct insulation at least 2 inches (50 mm).

2. Seal penetrations through fire-rated assemblies. Comply with requirements in Division 7 Section "Through-Penetration Firestop Systems."

3.4 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Tests and Inspections:

1. Inspect ductwork, randomly selected by Architect, by removing field-applied jacket and insulation in layers in reverse order of their installation. Extent of inspection shall be limited to [one] <Insert number> location(s) for each duct system defined in the "Duct Insulation Schedule, General" Article.

C. All insulation applications will be considered defective Work if sample inspection reveals noncompliance with requirements.

3.5 DUCT INSULATION SCHEDULE, GENERAL

A. Plenums and Ducts Requiring Insulation:

1. Outdoor, exposed supply and return.

B. Items Not Insulated:

1. Fibrous-glass ducts.

2. Metal ducts with duct liner of sufficient thickness to comply with energy code and ASHRAE/IESNA 90.1.

3. Factory-insulated flexible ducts.


5. Flexible connectors.


7. Factory-insulated access panels and doors.
3.6 ABOVEGROUND, OUTDOOR DUCT AND PLENUM INSULATION SCHEDULE

A. Insulation materials and thicknesses are identified below. If more than one material is listed for a duct system, selection from materials listed is Contractor's option.

B. Exposed, Supply-Air Duct and Plenum Insulation: Mineral-fiber blanket or board, 2 inches and with R8 insulation value.

C. Exposed, Return-Air Duct and Plenum Insulation: Mineral-fiber blanket or board, 2 inches and with R8 insulation value.

END OF SECTION 15086
SECTION 15092

INDUSTRIAL BUTTERFLY VALVES

PART 1 – GENERAL

1.01 SCOPE

A. This section covers the furnishing of manual or remote operated industrial butterfly valves as specified herein and as indicated in the Industrial Butterfly Valve Schedule.

B. Industrial type butterfly valves shall be provided where AWWA type butterfly valves are not required.

C. Piping, pipe supports, insulation, and accessories that are not an integral part of the valves or are not specified herein are covered in other sections. Powered actuators are covered in the Valve and Gate Actuators section.

1.02 GENERAL

1.02.1 General Equipment Stipulations:

A. The General Equipment Stipulations shall apply to all equipment furnished under this section. If requirements in this specification differ from those in the General Equipment Stipulations, the requirements specified herein shall take precedence.

1.02.2 Permanent Number Plates:

A. All industrial butterfly valves that have been assigned a number on the drawings or in the Industrial Butterfly Valve Schedule, shall be provided with a permanent number plate. The location of number plates and the method of fastening shall be acceptable to Engineer.

1.03 SUBMITTALS

A. Complete drawings, details, and specifications covering the valves and their appurtenances shall be submitted in accordance with the Submittals section. Included in the submittal shall be drawings by the valve manufacturer to indicate the position of the valve actuator and valve shaft.

B. Drawings shall include separate wiring diagrams for each electrically operated or controlled valve and the electrical control equipment. Each drawing shall be identified with the valve number or name as specified in this section.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Shipping shall be in accordance with the Shipping section. Handling and storage shall be in accordance with the Handling and Storage section.
PART 2 - PRODUCTS

2.01  CONSTRUCTION

A.  Unless otherwise specified, industrial butterfly valves shall be the rubber-seat, tight-closing type. Valves specified with an electric, air, or hydraulic actuators shall be the lugged wafer style. Valve discs shall seat at 90 degrees with the pipe axis.

B.  Industrial butterfly valves with center lines more than 7'-6" above the floor shall be provided with chain-wheels and operating chains as specified herein.

C.  Flanged end valves shall be of the short-body type. Where mechanical joint ends are specified, in the valve schedule, either mechanical joint or push-on ends conforming to ANSI/AWWA C111/A21.11 will be acceptable. For buried or submerged service, shaft seals shall be O-ring type.

2.01.1  Valves AIR-VBF:

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<thead>
<tr>
<th>Process</th>
<th>Rating</th>
<th>Body</th>
<th>Trim</th>
<th>Seat</th>
<th>Disc</th>
<th>Stem</th>
<th>Stem Seal</th>
<th>Stem Packing</th>
<th>Shaft Bearings</th>
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<th>End Connection</th>
<th>Temperature Limitations</th>
<th>Valve Operator</th>
<th>Manufacturer</th>
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<tbody>
<tr>
<td>AIR-VBF</td>
<td>150 psi shutoff</td>
<td>ASTM A126, Class B, cast iron</td>
<td>EPDM</td>
<td>ASTM B148, Alloy 952, aluminum bronze, or Nylon 11 coated ductile iron</td>
<td>ASTM A276, Grade 316 or 304, stainless steel</td>
<td>Synthetic O-rings</td>
<td>Buna-N</td>
<td>Upper and lower bearings or two upper bearings, bronze, reinforced Teflon, or acetal</td>
<td>Synthetic rubber O-rings</td>
<td>Wafer</td>
<td>-20 to 250°F</td>
<td>Electric Actuator</td>
<td>Pratt</td>
<td></td>
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</table>

2.01.2  Length Tolerance:

A.  Unless otherwise specified, the actual length of valves shall be within plus or minus 1/16 inch of the specified or theoretical length.

2.01.3  Shop Coatings:

A.  All ferrous metal surfaces of valves and accessories, both interior and exterior, shall be shop coated for corrosion protection. The valve manufacturer’s standard coating will be acceptable, provided it is functionally equivalent to the specified coating.
Coating Materials | Specification Compliance
--- | ---
Coal Tar Epoxy | High-build coal tar epoxy; Ameron "Amercoat 78HB Coal Tar Epoxy", Carboine "Bitumastic 300 M", Tnemec "46H-413 Hi-Build Tneme-Tar", or Sherwin-Williams "Hi-Mil Sher-Tar Epoxy".

Rust-Preventive Compound | As recommended by the manufacturer.

Surfaces To Be Coated

Unfinished Surfaces

- Exterior Surfaces of Valves To Be Buried, Submerged, or Installed in Manholes or Valve Vaults
- Exterior Surfaces of All Other Valves

Material

- Asphalt varnish or coal tar epoxy.
- Universal primer.
- Rust-preventive compound.
- Universal primer.

2.02 VALVE ACTUATORS

A. 6 inch valve for backwash air service shall have electric actuators. 8" valves for air service at the air supply blowers shall have enclosed, geared, hand-wheel or chain-wheel actuators with position indicators as specified herein.

B. Requirements for automatic or electric valve actuators shall be as specified in the Valve and Actuator section 15180. Valve and actuator manufacturer shall be responsible for determining the required torque for the based on the valve operating conditions.

2.02.1 Actuator Sizing

A. The valve manufacturer shall size the actuator in accordance with the governing standard, the operating conditions and requirements indicated in the Industrial Butterfly Valve Schedule, and the valve manufacturer's requirements.

B. Unless otherwise indicated or specified, actuator torque requirements shall be based on a maximum differential pressure across the valve equal to the maximum rated pressure associated with the valve as listed above and a maximum air flow as listed in the Industrial Butterfly Valve Schedule.
C. Valves with operating stands shall have actuator torques increased by 25 percent. Actuator torques determined by the above requirements shall be increased by any safety factors required by the governing standard or indicated or specified herein.

2.02.2 Manual Actuators:

A. Manual actuators of the types listed herein and in the Industrial Butterfly Valves Schedule shall be provided by the valve manufacturer.

B. Unless otherwise indicated or specified, each geared manual actuator shall be equipped with an operating hand-wheel.

C. The direction of rotation of the wheel, wrench nut, or lever to open the valve shall be to the left (counterclockwise). Each valve body or actuator shall have cast thereon the word "Open" and an arrow indicating the direction to open.

D. The housing of traveling-nut type actuators shall be fitted with a removable cover which shall permit inspection and maintenance of the operating mechanism without removing the actuator from the valve. Travel limiting devices shall be provided inside the actuator for the open and closed positions. Travel limiting stop nuts or collars installed on the reach rod of traveling-nut type operating mechanisms shall be field adjustable and shall be locked in position by means of a removable roll pin, cotter pin, or other positive locking device. The use of stop nuts or adjustable shaft collars which rely on clamping force or setscrews to prevent rotation of the nut or collar on the reach rod will not be acceptable.

E. Each actuator shall be designed so that shaft seal leakage cannot enter the actuator housing.

F. Valves for throttling service shall be equipped with an infinitely variable locking device or a totally enclosed gear actuator.

G. Actuators shall produce the required torque with a maximum pull of 80 lbs on the lever, hand-wheel, or chain. Actuator components shall withstand, without damage, a pull of 200 lbs on the hand-wheel or chain-wheel or an input of 300 foot-lbs on the operating nut.

2.02.3 Handwheels:

A. Handwheel diameters shall be as recommended by the valve manufacturer.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Materials furnished under this section will be installed in accordance with Valve Installation section.
SECTION 15093
CHECK VALVES

PART 1 - GENERAL

1.01 SCOPE
A. This section covers the furnishing of check valves as specified herein and as indicated in the Check Valve Schedule.
B. Piping, pipe supports, insulation, and accessories that are not an integral part of the valves or are not specified herein are covered in other sections.

1.02 GENERAL
A. Equipment furnished under this section shall be fabricated and assembled in full conformity with drawings, specifications, engineering data, instructions, and recommendations of the equipment manufacturer unless exceptions are noted by Engineer.
B. Valves shall be furnished with all necessary parts and accessories indicated on the drawings, specified, otherwise required for a complete, properly operating installation and shall be the latest standard products of a manufacturer regularly engaged in the production of valves.

1.02.1 General Equipment Stipulations:
A. The General Equipment Stipulations shall apply to all equipment furnished under this section. If requirements in this specification differ from those in the General

1.02 SUBMITTALS
A. Complete drawings, details, and specifications covering the valves and their appurtenances shall be submitted in accordance with the Submittals section. Included in the submittal shall be drawings by the valve manufacturer to indicate the position of the valve actuator and valve shaft.

1.04 DELIVERY, STORAGE, AND HANDLING
A. Shipping shall be in accordance with the Shipping section. Handling and storage shall be in accordance with the Handling and Storage section.

PART 2 - PRODUCTS

2.01 CONSTRUCTION
2-1.01 Valves VC-1. Not used.
2-1.02. **Valves VC-2.** Not used.

2-1.03. **Valves VC-3.** Not used.

2-1.04. **Valves VC-4.**

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<th>Rating</th>
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<tr>
<td>Air or vacuum service</td>
<td>Type</td>
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<td>2 inch or larger pipe</td>
<td>Body</td>
<td>Cast iron</td>
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</tr>
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<td></td>
<td>Springs</td>
<td>Stainless steel</td>
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<td></td>
<td>Bushings</td>
<td>Manufacturer’s standard</td>
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<td></td>
<td>End Connection</td>
<td>Plain, installed between ASME B16.1, Class 125, flat faced flanges</td>
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<tr>
<td></td>
<td>Temp. Limitations</td>
<td>-20 to 300°F</td>
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<td>Manufacturers</td>
<td>Pratt</td>
</tr>
</tbody>
</table>

2.01.5 **Valves VC-5:** Not used.

2.01.6 **Valves VC-6:** Not used.

2.01.7 **Valves VC-7:** Not used.

2.01.8 **Valves VC-8:** Not used.

2.01.9 **Valves VC-9:** Not used.

2.01.10 **Valves VC-10:** Not used.

2.01.11 **Valves VC-11:** Not used.

2.01.12 **Valves VC-12:** Not used.

2.01.13 **Valves VC-13:** Not used.

2.01.14 **Valves VC-14:** Not used.

2.01.15 **Valves VC-15:** Not used.

2.01.16 **Valves VC-16:** Not used.

2.01.17 **Valves VC-17:** Not used.

2.01.18 **Valves VC-18:** Not used.

2.01.19 **Valves VC-19:** Not used.
2.01.20 Shop Coatings:

A. All ferrous metal surfaces of valves and accessories, both interior and exterior, shall be shop coated for corrosion protection. The valve manufacturer’s standard coating will be acceptable, provided it is functionally equivalent to the specified coating.

Coating Materials

Coal Tar Epoxy
High-build coal tar epoxy; Ameron "Amercoat 78HB Coal Tar Epoxy", Carboline "Bitumastic 300 M", Tnemec "46H-413 Hi-Build Tneme-Tar", or Sherwin-Williams "Hi-Mil Sher-Tar Epoxy".

Epoxy Enamel (for liquid service)
Ameron "Amerlock 400 High-Solids Epoxy Coating", Carboline "Carboguard°891", or Tnemec "Series N140 Pota-Pox Plus".

Rust-Preventive Compound
As recommended by the manufacturer.

Surfaces To Be Coated

Unfinished Surfaces

Interior Surfaces

Liquid Service
Epoxy enamel.

Exterior Surfaces of Valves To Be Buried, Submerged, or Installed in Manholes or Valve Vaults
Asphalt varnish or coal tar epoxy.

Exterior Surfaces of All Other Valves
Universal primer.

Polished or Machined Surfaces
Rust-preventive compound.

Actuators and Accessories
Universal primer.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Materials furnished under this section will be installed in accordance with Valve Installation section.
B Street Water Treatment Plant &
North Water Treatment Plant Improvements
City of Meridian

END OF SECTION
SECTION 15101

AWWA BUTTERFLY VALVES

PART 1 – GENERAL

1.01 SCOPE

A. This section covers furnishing of AWWA butterfly valves for potable water, backwash water, settled water, filter re-wash service as indicated in the Butterfly Valve Schedules. All other butterfly valves are specified in the Industrial Butterfly Valves section.

B. AWWA butterfly valves shall be furnished complete with actuators and accessories as specified herein, as indicated in the schedule, and as specified in the Valve and Gate Actuators section.

1.02 GENERAL

A. Equipment provided under this section shall be fabricated and assembled in full conformity with Drawings, Specifications, engineering data, instructions, and recommendations of the equipment manufacturer, unless exceptions are noted by Engineer.

B. Valves shall be furnished with all necessary parts and accessories indicated on the Drawings, specified, or otherwise required for a complete, properly operating installation and shall be the latest standard products of a manufacturer regularly engaged in the production of valves.

1.02.1 General Equipment Stipulations:

A. The General Equipment Stipulations shall apply to all equipment furnished under this section. If requirements in this specification differ from those in the General Equipment Stipulations, the requirements specified herein shall take precedence.

1.02.2 Governing Standard:

A. Except as modified or supplemented herein, all butterfly valves and manual actuators shall conform to the applicable requirements of ANSI/AWWA C504.

1-2.03. Marking.

A. Supplementing the requirements of Section 6.1 of the governing standard, the country of origin of all castings and an identifying serial number shall be stamped on a corrosion-resistant plate attached to the valve body.

1.02.4 Temporary Number Plates:

A. Each butterfly valve shall be tagged or marked in the factory with the identifying number listed in the AWWA Butterfly Valve Schedule.
1.02.5 Identification:

A. AWWA butterfly valves shall be identified in accordance with the Equipment and Valve Identification section.

1.03 SUBMITTALS

A. Complete drawings, details, and specifications covering the valves and their appurtenances shall be submitted in accordance with the Submittals section. Included in the submittal shall be drawings by the valve manufacturer to indicate the position of the valve actuator and valve shaft.

B. Drawings shall include separate wiring diagrams for each electrically operated or controlled valve and the electrical control equipment. Each drawing shall be identified with the valve number or name as specified in this section.

C. Certified copies of test results for tests described in Section 5 of the governing standard, with an affidavit of compliance as indicated in Section 6.3 of the governing standard, shall be submitted to Engineer before the valves are shipped.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Shipping shall be in accordance with the Shipping section. Handling and storage shall be in accordance with the Handling and Storage section.

PART 2 - PRODUCTS

2.01 ACCEPTABLE PRODUCTS

A. Butterfly valves shall be by the manufacturers listed below.

Pratt (Mueller)

2.02 MATERIALS

A. Except as modified or supplemented herein, materials used in the manufacture of butterfly valves shall conform to the requirements of the governing standard.

B. Acceptable shop coatings are listed in the following table.

<table>
<thead>
<tr>
<th>Epoxy</th>
<th>For Raw or Treated Water Service in potable water facilities (NSF certified)</th>
</tr>
</thead>
<tbody>
<tr>
<td>PPG Amercoat “Amerlockt 400 High Solids Epoxy”, Carboline “Carboguard 891”, Sherwin-Williams &quot;Macropoxy 646NSF&quot; or Tnemec “Series N140 Pota-Pox Plus&quot;.</td>
<td></td>
</tr>
</tbody>
</table>

Rust-Preventive Compound As recommended by manufacturer.
2.03 VALVE CONSTRUCTION

2.03.1 Valve Bodies:

A. Valves shall be short-body type unless otherwise specified in the AWWA Butterfly Valve Schedule. The use of a stop or lug cast integrally with or mechanically secured to the body for the purpose of limiting disc travel by means of direct contact or interference with the valve disc (in either the open or closed position) will not be acceptable.

2.03.2 Flanges:

A. Flanges shall be finished to true plane surfaces within a tolerance limit of 0.005 inch. The finished face shall be normal to the longitudinal valve axis within a maximum angular variation tolerance of 0.002 inch per foot (0.017 percent) of flange diameter.

2.03.3 Mechanical Joint Ends:

A. Mechanical joint ends shall be either mechanical joint or push-on ends conforming to ANSI/AWWA C111/A21.11.

2.03.4 Valve Shafts:

A. Valve shafts shall be fabricated of AISI Type 304 or 316 stainless steel. The use of shafts having a hexagonal cross section will not be acceptable. The connection between shaft and disc shall be in accordance with ANSI/AWWA C504.

B. The connection between the shaft and the disc shall be mechanically secured by means of solid, smooth sided, stainless steel or monel taper pins or dowel pins. Each taper pin or dowel pin shall extend through or shall wedge against the side of the shaft and shall be mechanically secured in place. The use of set screws, knurled or fluted dowel pins, expansion pins, roll pins, tension pins, spring pins, or other devices instead of the pins specified herein will not be acceptable.

2.03.5 Valve Seats:

A. Acceptable seating surfaces mating with rubber are AISI Type 304 or 316 stainless steel, monel, or plasma-applied nickel-chrome overlay for all valves; bronze for 20 inch and smaller valves; and alloy cast iron for 20 inch and smaller manually operated valves.

B. Seats shall be located on the valve body. Valve seat configurations which rely on the mating pipe flange to hold the seat in position in the valve body will not be acceptable.

2.03.6 Shaft Seals:

A. Shaft seals shall be of the chevron type.

2.03.7 Thrust Bearings:

A. Each valve shall be provided with one or more thrust bearings in accordance with the
governing standard. Thrust bearings which are directly exposed to line liquid and which consist of a metal bearing surface in rubbing contact with an opposing metal bearing surface will not be acceptable.

2.04 VALVE ACTUATORS

A. Requirements for valve actuators shall be as specified herein, as indicated in the AWWA Butterfly Valve Schedule, and as specified in the Valve and Gate Actuators section.

B. All 8 inch and larger valves shall have geared actuators.

2.04.1 Actuator Sizing:

A. The valve manufacturer shall size the actuator in accordance with the governing standard, the operating conditions and requirements indicated in the AWWA Butterfly Valve Schedule, and the valve manufacturer's requirements.

B. Unless otherwise indicated or specified, actuator torque requirements shall be based on a maximum differential pressure across the valve equal to the maximum pressure associated with the valve class and a maximum velocity through the valve of 16 feet per second.

C. Valves with operating stands shall have actuator torques increased by 25 percent. Actuator torques determined by the above requirements shall be increased by any safety factors required by paragraphs 4.3.8.3 and 4.3.8.7 of the governing standard or indicated or specified herein.

2.05 SHOP PAINTING

A. All interior and exterior ferrous metal surfaces, except finished surfaces, bearing surfaces, and stainless steel components, of valves and accessories shall be shop painted for corrosion protection. The valve manufacturer's standard coating will be acceptable, provided it is functionally equivalent to the specified coating and is compatible with the specified field painting.

B. Surfaces shall be painted as follows:

- Unfinished Surfaces
  - Interior Surfaces: Epoxy.
  - Exterior Surfaces of Valves to be Buried or Installed in Manholes or Valve Vaults: Epoxy.
  - Exterior Surfaces of Valves to be Submerged: Epoxy.
  - Exterior Surfaces of All Other Valves: Universal primer.
Polished or Machined Surfaces

Flange Faces                       Rust-preventive compound.

Other Surfaces                     Epoxy.

C. Interior coatings shall comply with ANSI/AWWA C550 and shall be free of holidays. The total dry film thickness of shop-applied coatings shall be not less than:

<table>
<thead>
<tr>
<th>Type of Coating</th>
<th>Minimum Dry Film Thickness</th>
</tr>
</thead>
<tbody>
<tr>
<td>Epoxy</td>
<td>10 mils</td>
</tr>
<tr>
<td>Universal Primer</td>
<td>3 mils</td>
</tr>
</tbody>
</table>

2.06 ACCESSORIES

A. Requirements for extension stems and stem guides, position indicators, floor boxes, operating stands, torque tubes, valve boxes, and extension bonnets shall be as indicated in the AWWA Butterfly Valve Schedule and as specified in the Valve and Gate Actuators section.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Valves will be installed in accordance with the Valve Installation section.

B. An installation check by an authorize representative of the manufacturer is not required.

END OF SECTION
SECTION 15111

GATE INSTALLATION

PART 1 - GENERAL

1.1 SCOPE

A. This section covers the installation of new gates and actuators purchased by Contractor as part of this Work.

B. The following specification sections are applicable to gates to be installed under this contract:

1. Slide Gate

1.2 GENERAL

A. Equipment installed under this section shall be erected and placed in proper operating condition in full conformity with Drawings, Specifications, engineering data, instructions, and recommendations of the equipment manufacturer, unless exceptions are noted by Engineer.

B. Coordination. When installation check services are provided by the gate manufacturer, Contractor shall coordinate the services with the gate manufacturer. Contractor shall give Engineer written notice at least 30 days prior to the need for manufacturer's installation check services.

PART 2 - PRODUCTS

1.1 MATERIALS

A. Materials shall be as follows:

Grout As specified in the Grout section.

PART 3 - EXECUTION

3.1 INSPECTION

A. All gates and accessories shall be inspected for damage and cleanliness before being installed. Any material damaged or contaminated in handling on the job shall not be used unless it is repaired and recleaned to the original requirements by Contractor. Such material shall be segregated from the clean material and shall be inspected and approved by Owner or his representative before its use.

3.2 INSTALLATION
GATE INSTALLATION
B Street Water Treatment Plant &
North Water Treatment Plant Improvements
City of Meridian

A. General. Gates and appurtenances shall be installed with sufficient clearance for proper operation of any external mechanisms, and with sufficient clearance to dismantle the gate for maintenance. Installation shall be in accordance with the manufacturer's recommendations and the requirements specified herein.

B. All bolts shall be tightened and all items requiring lubrication, including pivot pins, shall be lubricated. Anti-seize thread lubricant shall be liberally applied to the threaded portion of stainless steel anchor bolts during the installation and tightening of nuts. Excess lubricant shall be thoroughly removed following final tightening.

C. Each gate shall be adjusted so that it does not bind or leak in excess of specified requirements. After installation, each gate shall be operated through at least two complete open-close cycles, re-adjusted and re-operated as necessary, and left in a condition acceptable to Engineer.

3.2.1 Installation Checks

A. When specified in the gate sections, the gate manufacturer will provide installation checks. For installation checks, the manufacturer's field representative will inspect the gate installation immediately following installation by Contractor. The manufacturer's representatives will revisit the site as often as necessary to ensure installation satisfactory to Owner.

3.2.2 Slide Gates

A. Each fabricated stainless steel slide gate shall be carefully installed and adjusted for proper operation. Care shall be taken to avoid warping the gate frames and to maintain tolerances between seating faces.

B. Wall thimbles, if required, shall be accurately positioned and supported to prevent shifting during placement of surrounding concrete. Square or rectangular thimbles shall be carefully braced both horizontally and vertically to prevent distortion.

C. Gates mounted directly on the vertical face of concrete walls shall be adjusted and grouted in place with non-shrinking grout in accordance with the manufacturer's recommendations.

D. Gates shall be installed so that frame members and anchor bolts do not rest upon or contact steel reinforcing bars. Anchor bolts shall be set using a template.

E. Grout fill shall be placed in the pit in front of each flush bottom closure gate after the gate has been adjusted.

F. Each actuator shall be accurately set and plumbed and shall be in proper alignment with the gate and stem before the actuator is grouted in place. Operating stems shall be installed in proper alignment and shall not bind in the lift nut or stem guides.
3.3 **GATE ACTUATORS**

A. Gate actuators and accessories shall be installed in accordance with the equipment manufacturer’s recommendations.

3.4 **FIELD QUALITY CONTROL**

A. **Field Testing.** After installation, all gates shall be pressure tested for leakage at the hydrostatic heads specified. Leakage exceeding the specified limits which is discovered within the correction period stipulated in the General Conditions shall be repaired by and at the expense of Contractor.

B. **Fabricated Stainless Steel Slide Gates.** For the maximum seating and unseating heads, the leakage shall not exceed 0.1 gpm per foot of seating perimeter.

3.5 **ADJUSTING**

A. After installation, the opening and closing time shall be adjusted as needed for each pneumatic, hydraulic, or electric actuated gate.

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SECTION 15114

OPEN-CHANNEL SLIDE GATES AND WEIR GATES

PART 1- GENERAL

1.1 SCOPE

A. This section covers furnishing slide gates and actuators as specified herein and as indicated in the Slide Gate Schedule. Slide gates shall be furnished complete with frames, slides, seals, actuators, operating stems, and appurtenances as specified herein, as indicated in the schedule and as specified in the Valve and Gate Actuator section.

1.2 GENERAL

A. Equipment furnished under this section shall be fabricated and assembled in full conformity with Drawings, Specifications, engineering data, instructions, and recommendations of the equipment manufacturer, unless exceptions are noted by Engineer.

B. Gates and actuators shall be furnished with all necessary parts and accessories indicated on the Drawings, specified, or otherwise required for a complete, properly operating installation and shall be the latest products of a manufacturer engaged in the production of slide gates.

C. General Equipment Stipulations. The General Equipment Stipulations shall apply to all equipment furnished under this section. If requirements in this specification differ from those in the General Equipment Stipulations, the requirements specified herein shall take precedence.

D. Governing Standard. Except as modified or supplemented herein, all slide gates shall conform to the applicable requirements of ANSI/AWWA C651-14.

E. Identification. Slide gates shall be tagged as specified in the Equipment and Valve Identification section.

1.3 SUBMITTALS

A. Complete drawings, construction details, and specifications covering the slide gates and appurtenances shall be submitted in accordance with the Submittals section. Each drawing shall be identified with the slide gate designation.

1.4 DELIVERY, STORAGE, AND HANDLING

A. In addition to the requirements specified in the Shipping section, frames shall be provided with corner bracing, plywood sheet backing, or other means to hold the frames in proper alignment during shipment and installation. The bracing or backing shall be
factory applied and shall not be removed until after the frames have been installed in the structures.

PART 2- PRODUCTS

2.1 PERFORMANCE AND DESIGN REQUIREMENTS

A. Slide gates shall be designed for the conditions and requirements indicated on the drawings.

B. Liberal factors of safety shall be used throughout the design, especially in the design of parts subject to intermittent or alternating stresses. In general, working stresses shall not exceed one-third of the yield point or one-fourth of the ultimate strength of each material.

C. Gates shall be designed for the seating and unseating heads indicated on the drawings.

D. Gates shall be designed to fit into the structures indicated on the drawings.

2.2 ACCEPTABLE MANUFACTURES

A. For slide gates acceptable manufacturers are Watterman, Rodney Hunt, Orbinox or equal.

2.3 MATERIALS

| Frames, Guides, Slides, Reinforcing Members, and Yoke Beams | Stainless steel, ASTM A-276, 304L or 316L. |
| Flush Bottom Closure Seal | Compressible neoprene. |
| Hollow Bulb J-Seals or Crown Seals | Compressible neoprene. |
| Seal Retainer Bar | Stainless Steel AISI type 316 |
| Slide Seats and Bearing Bars | UHMW polyethylene. |
| Operating Stems | Stainless steel, AISI Type 303 or 316. |
| Assembly Fasteners | Stainless steel, AISI Type 302, 303, 304 or 316 |
| Epoxy Enamel (required for non-stainless steel components) | PPG-Amercoat "Amercoat 385 Epoxy", Carboline "Carboguard 890", Sherwin-Williams “Macropoxy 646” or Tnemec “Series N69 Hi-Build Epoxoline II". |
2.4 CONSTRUCTION

A. Frames. Each frame shall be an integral unit of extruded or welded structural shapes at least 1/4 inch [6 mm] thick. Frames shall be designed for embedment in concrete or installation on the face of concrete walls as indicated in the Slide Gate Schedule. Embedded frames shall be recessed so that the waterway is not obstructed.

B. Guides shall be provided on each side of each frame. Guides shall be sufficiently strong to require no further reinforcing where they extend above the operating floor, and shall support the entire height of the slide in all positions.

C. Full-length plastic slide seats or bearing bars shall be provided on the downstream side of the slide on gates subject to seating pressure from one direction. Gates subject to seating pressure from either direction shall be provided with plastic seats or bearing bars on both faces of the slide. Seals shall be mechanically retained.

D. Self-contained gates shall be equipped with a yoke, attached to the top of vertical frame members to support the actuator. Yokes shall be fabricated from a pair of rolled or extruded channels or angles and shall be designed to deflect not more than 1/360 of the span when the gate is operated at the maximum actuator thrust with the safety factor as indicated in the governing standard. Each yoke shall be designed to permit vertical removal of the slide. Actuators shall be mounted so that no eccentric loads are transmitted to the yoke.

E. Slides. Slides shall be at least 1/4 inch [6 mm] thick and shall be provided with welded stiffeners to limit deflection to 1/360 under the maximum seating or unseating head indicated in the Slide Gate Schedule. Slides shall be adequately reinforced to withstand, without permanent distortion, the maximum thrust which can be transmitted by the operating stem. Each slide shall have a reinforced pocket or an internally threaded nut welded to the slide for connection of the stem. The pocket or nut shall be designed to withstand the maximum thrust which can be transmitted by the operating stem.

F. Closures. The bottom of each slide gate frame shall be recessed so that the waterway is not obstructed. A compressible seal shall be securely attached to the bottom of the slide or to the frame invert. The seal shall be of sufficient length to seal the bottom corners of each slide.

G. Where indicated, gates shall be provided with resilient hollow bulb J-seals or crown seals attached to the frame members.

H. For weir service, slides may be lowered below the bottom of the opening. A frame member shall be provided at the bottom of the opening to seal the space between the slide and the adjacent concrete. The side guides shall be extended below the bottom of the wall opening. A resilient hollow bulb J-seal or crown seal shall be attached to the frame along the invert of the opening and up both sides to seal the slide in any positions.

I. Each J-seal or crown seal shall be provided with a full-length retainer bar which shall compress the seal and prevent leakage between the seal and the frame member. The
method of attachment of J-seals or crown seal to frame members shall permit replacement of the seals without disassembling or removing the gate.

J. **Operating Stems.** Operating stems shall conform to the requirements of Section 4.3.6 of the governing standard. Contact surfaces of threads shall be rolled or machined to a 63 microinch [1600 nm] finish, or smoother. Each stem shall be securely attached to the slide.

K. Dual stems shall be provided where listed in the Slide Gate Schedule or where required for proper operation of the gate.

2.5 **ACTUATORS**

A. Actuators and their accessories shall be the type as indicated in the Slide Gate Schedule and as specified in the Valve and Gate Actuator section.

2.6 **SHOP PAINTING**

A. All surfaces of aluminum which will be in contact with concrete, mortar, grout, or dissimilar metals shall be given a coat of epoxy enamel or coal tar epoxy. The epoxy coating shall be NSF certified for gates installed in a potable water facility.

2.7 **SHOP TESTING**

A. Gates shall be completely assembled in the shop to ensure that all parts fit together properly.

PART 3 - **EXECUTION**

3.1 **INSTALLATION**

A. Slide gates and appurtenances will be installed in accordance with the Gate Installation section.

END OF SECTION
SECTION 15180

VALVE ACTUATORS

PART 1 - GENERAL

1.01 SCOPE

A. This section covers furnishing manual and powered valve actuators and accessories as specified herein.

B. Refer to Division 13 specifications for additional information on control schemes for valves.

1.02 GENERAL

A. Equipment provided under this section shall be fabricated and assembled in full conformity with Drawings, specifications, engineering data, instructions, and recommendations of the equipment manufacturer, unless exceptions are noted by Engineer.

B. Actuators shall be furnished with all necessary parts and accessories indicated on the Drawings, specified, or otherwise required for a complete, properly operating installation and shall be the latest standard products of a manufacturer regularly engaged in the production of actuators.

1.02.1 General Equipment Stipulations:

A. The General Equipment Stipulations shall apply to all equipment furnished under this section. If requirements in this specification differ from those in the General Equipment Stipulations, the requirements specified herein shall take precedence.

1.02.2 Governing Standards:

A. Except as modified or supplemented herein, cylinder and vane type actuators shall conform to applicable requirements of ANSI/AWWA C541.

B. Except as modified or supplemented herein, electric motor actuators shall conform to applicable requirements of ANSI/AWWA C542.

C. Except as modified or supplemented herein, actuators for butterfly and eccentric plug valves shall conform to the applicable requirements of ANSI/AWWA C504.

D. Except as modified or supplemented herein, manual actuators for ball valves shall conform to the applicable requirements of ANSI/AWWA C507.

1.02.3 Power Supply:

A. Power supply to electric actuators shall be as indicated on the drawings.

1.02.4 Marking:
A. Each actuator shall be marked with the manufacturer's name, model number, and the country of origin. An identifying serial number shall be stamped on a corrosion-resistant plate attached to the actuator.

1.02.5 Temporary Number Plates:

A. Each actuator shall be factory tagged or marked to identify the actuator and the applicable valve by number or service as indicated in the valve schedule.

1-3. SUBMITTALS.

A. Complete drawings, details, and specifications covering the actuators and their appurtenances shall be submitted in accordance with the Submittals section. Submittal drawings shall clearly indicate the country of origin of each actuator and its components.

B. Submittal drawings shall include separate wiring diagrams for each electrically operated or controlled actuator and the electrical control equipment. Each actuator drawing shall be identified with the respective valve number or name.

C. For networked valve actuators, information on the available input and output assemblies shall be submitted for the protocol(s) specified to be provided. The submittal shall identify the version of the selected network protocol for which the device has been tested and certified.

D. For electric, certified copies of reports covering proof-of-design testing of the actuators as set forth in Section 5 of ANSI/AWWA C542 or ANSI/AWWA C541 respectively, together with an affidavit of compliance as indicated in Section 6.3 of ANSI/AWWA C542 or ANSI/AWWA C542 respectively, shall be submitted to Engineer before the actuators are shipped.

PART 2 - PRODUCTS

2.01 PERFORMANCE AND DESIGN REQUIREMENTS

2.01.1 General:

A. Actuators and appurtenances shall be designed for the conditions and requirements as indicated in the respective valve and gate sections.

B. Liberal factors of safety shall be used throughout the design, especially in the design of parts subject to intermittent or alternating stresses. In general, working stresses shall not exceed one-third of the yield point or one-fifth of the ultimate strength of each material.
2.01.2 Valve Actuators:

A. Each actuator shall be designed to open or close the valve under all operating conditions. Actuators shall be designed for the maximum pressure differential across the valve and maximum velocities through the valve where indicated in the respective valve schedules.

B. Valve actuators shall be provided and adjusted by the valve manufacturer. Actuator mounting arrangements and positions shall facilitate operation and maintenance and shall be determined by the valve manufacturer unless indicated otherwise on the Drawings or directed by Engineer.

C. When valves are to be buried, submerged, or installed in vaults; the actuators and accessories shall be sealed to prevent the entrance of water. The design water depth shall be as indicated in the respective valve schedules but not less than 20 feet.

2.01.3 Limit Switches:

A. Limit switches for intelligent and standard electric actuators shall be as indicated in their respective paragraphs.

2.02 MATERIALS

A. Except as modified or supplemented herein, materials used in the manufacture of actuators shall conform to the requirements of the applicable governing standard(s).

2.03 VALVE MANUAL ACTUATORS

2.03.1 General:

A. Manual actuators of the types listed in the valve specifications shall be provided by the valve manufacturer.

B. Unless otherwise indicated or specified, each geared manual actuator shall be equipped with an operating handwheel.

C. The direction of rotation of the wheel, wrench nut, or lever to open the valve shall be to the left (counterclockwise). Each valve body or actuator shall have cast thereon the word "Open" and an arrow indicating the direction to open.

D. The housing of traveling-nut type actuators shall be fitted with a removable cover which shall permit inspection and maintenance of the operating mechanism without removing the actuator from the valve. Travel limiting devices shall be provided inside the actuator for the open and closed positions. Travel limiting stop nuts or collars installed on the reach rod of traveling-nut type operating mechanisms shall be field adjustable and shall be locked in position by means of a removable roll pin, cotter pin, or other positive locking device. The use of stop nuts or adjustable shaft collars which rely on clamping force or setscrews to prevent rotation of the nut or collar on the reach rod will not be acceptable.

E. Each actuator shall be designed so that shaft seal leakage cannot enter the actuator housing.
F. Valves for throttling service shall be equipped with an infinitely variable locking device or a totally enclosed gear actuator.

G. Actuators shall produce the required torque with a maximum pull of 80 lbs on the lever, handwheel, or chain. Actuator components shall withstand, without damage, a pull of 200 lbs on the handwheel or chainwheel or an input of 300 foot-lbs on the operating nut.

2.03.2 Handwheels:

A. Handwheel diameters shall be at least 8 inches, but not more than 24 inches for 30 inch and smaller valves and not more than 30 inches for 36 inch and larger valves.

2.04 INTELLIGENT ELECTRIC ACTUATORS

2.04.1 General:

A. Intelligent electric actuators as listed in the valve schedules shall be provided by the valve manufacturer.

B. Intelligent electric actuators with torque output requirements of 750 ft-lbs and less for butterfly valves and eccentric plug valves shall be quarter-turn type and shall be Auma "AUMATIC SGBV 05.1 through SGBV 12.1", EIM "HQ Series", Limitorque "QX" or Rotork "IQT Series" without exception.

C. All other intelligent electric actuators for open-close service shall be multi-turn type and shall be Auma "AUMATIC AC SABV 07.1 through SABV 16.1", EIM "TEC2000", Limitorque "MX", or Rotork "IQ Series", without exception.

D. Intelligent electric actuators for modulating service shall be capable of utilizing a 4-20ma control signal to operate valve. Auma "AUMATIC AC SARBV 07.1 through SARBV 16.1", EIM "TEC2000", Limitorque "MX", or Rotork "IQ Series", without exception.

E. Electric actuators for the North Plant Clearwell < 18" FV-736 > shall be REXA “XPAC” or engineer approved equal. Actuator shall be accurate within 0.15% of full stroke. Actuator shall be provided with a 316 SS NEMA 4X local control panel with 4-20ma networking capability, push button controls and ability to display the valve position, status, date and time. Actuator mechanical assembly shall be provided with pressure gauges and valve display. Valve shall be provided with loss of power failsafe in the closed position.

F. Intelligent electric actuators for explosion proof service shall be Auma “AUMATIC AC SAExBV/SARExBV 07.1 through SAExBV/SARExBV 16.1”, EIM “TEC2000”, Limitorque “MX”, or Rotork “IQ Series” without exception.

G. Intelligent electric actuators produced by other manufacturers are not acceptable.

H. Intelligent electric actuators shall be capable of non-intrusive configuration without requiring removal of any actuator covers. Configuration of actuator functions shall be by use of a hand held infrared linked device, laptop or PDA with compatible wireless
communication capability, or by local control switches and 32-character LCD display mounted on the actuator housing. The display language shall be English.

1. Actuators shall be furnished with Bluetooth connectivity for diagnostics and programming.

I. Each intelligent electric actuator shall be furnished complete with a motor, gearing, handwheel, configurable output relays, torque sensors, lubricants, wiring, and terminals. Each actuator shall be constructed as a self-contained unit with a ductile iron or aluminum alloy housing, of a type as indicated in the valve schedules, and shall be integrally assembled on the applicable valve by the valve manufacturer. Housings shall have two O-ring seals, one on the controls compartment and one on the terminal cover.

J. Actuators shall be designed to cycle the valve from the fully open to the fully closed position or the reverse in approximately 60 seconds or as indicated in the valve and gate schedules.

K. Actuator motors may be mounted horizontally adjacent to or vertically above the reduction gearing. All gearing shall be oil or grease lubricated.

2.04.2 Motors:

A. Motors shall be totally enclosed, high torque design made expressly for valve actuator service, capable of operating the valve under full differential pressure for two complete strokes or one complete cycle of travel without overheating. Motors shall be designed in accordance with NEMA standards and shall operate successfully at any voltage within 10 percent above or below rated voltage. Motor bearings shall be permanently lubricated. Motors shall be provided with stall, temperature, loss of phase, and reverse phase protection. Actuators shall be capable of indicating phase loss.

2.04.3 Power Gearing:

A. Power gearing shall consist of hardened steel spur or helical gears and alloy bronze or hardened steel worm gear, all suitably lubricated, designed for 100 percent overload, and effectively sealed against entrance of foreign matter. Steel gears shall be hardened to at least 350 Brinell. Planetary or cycloidal gearing, aluminum, mild steel, or nonmetallic gears will not be acceptable. Gearing shall be designed to be self-locking so that actuation of a torque switch or electronic torque protection device by a torque overload condition will not allow the actuator to restart until the torque overload has been eliminated. If a secondary gearbox is required, it shall be designed to withstand the locked rotor torque of the actuator.

2.04.4 Handwheel Mechanism:

A. The handwheel shall not rotate during motor operation. During handwheel operation the motor shall not affect the actuator operation. The actuator shall be responsive to electrical power and control at all times and, when under electrical control, shall instantly disengage the handwheel. The handwheel shall rotate counterclockwise to open the valve. An arrow indicating the opening direction and the word "Open" shall be cast on the handwheel.
force required to operate the handwheel shall not exceed 80 lbs. The handwheel shall have a padlockable declutch lever.

2.04.5 Torque Sensing:

A. Torque and thrust loads in both closing and opening directions shall be limited by a torque sensing device. Torque settings shall be adjustable and shall be indicated locally. The adjustment shall permit a variation of 40 to 100 percent of rated torque.

2.04.6 Terminal Facilities:

A. Terminal facilities for connection to motor leads, switches, and control and indication signals shall be provided in a readily accessible terminal compartment. The terminal compartment shall have at least two openings for external electrical conduits, one sized at least 3/4 inch and the other at least 1-1/4 inches. Each terminal compartment shall be large enough to allow easy routing and termination of fifteen 12 AWG conductors.

2.04.7 Controls Compartment:

A. Each actuator shall be furnished with a sealed compartment containing a reversing controller, multi tap transformer, electronic controls, and monitoring and protection modules. Reversing controllers shall be both mechanically and electrically interlocked and provided with the necessary direct-operated auxiliary contacts for required interlocking and control. The multi tap transformer shall provide power for all internal circuits, and shall provide 120 VAC supply for remote controls as indicated in the valve schedules, or in the schematics on the Drawings.

B. Where not networked, actuators for valves listed for modulating service in the valve schedules shall be provided with a control module for position modulating type service. The control module shall be mounted within the controls compartment. The module shall accept a standard 4-20 mA dc analog input signal with a load impedance of not greater than 400 ohms. The control module shall contain adjustments for span, zero, gain, and deadband. Non-networked modulating actuators shall have a 4 to 20 mA output signal proportional to valve position.

2.04.8 Local Controls:

A. Each actuator shall have controller devices mounted on the actuator as indicated in the valve schedules.

2-5.09. Remote Indication and Controls:

A. Valve position and actuator status indication for all valves, shall be provided by four configurable output relay contacts which can be selected to indicate any position of the valve. These shall be installed on all valves whether networked or not. Relays shall be configurable to the normally open or normally closed states. Relays shall maintain and update position indication during handwheel operation. Contacts shall be rated 5 A, 250 VAC, 30 VDC. When not used for position indication, any of the four configurable relays shall be selectable to signal one of the following:
1. Valve opening, closing, or moving.
2. Thermostat tripped, phase loss.
4. Remote mode selected.
5. Local mode selected.

B. Where indicated in the valve schedules for B Street Plant, valves shall be equipped with an analog proportional position indication via a 4-20 ma signal as well as the position relays.

C. Control commands and actuator status indication for networked valves shall be communicated over the network. The actuator shall accept remote controls through the network to open, close, and stop the actuator and shall also accept a position setpoint. Hardwired signals to the actuator shall prevent or allow the actuator to operate as indicated on the Drawings. A hardwired permissive, inhibit or emergency stop interlock(s) shall override commands transmitted through the network.

D. At a minimum, the actuator shall transmit the following status information through network:
   1. Valve opening, closing, or moving.
   2. Valve full open, full closed.
   3. Thermostat tripped, phase loss.
   5. Remote mode selected.
   6. Local mode selected.
   7. Valve position.
   8. Valve torque.

2.04.10 Valve Configuration and Programming:

A. B Street Plant
   1. B Street Plant valves for all services shall be networked and hard wire logic.
   2. B Street valves for Open-Closed service shall be provided and programmed to full stroke Open or Closed with three wire control. Valve shall use a momentary signal input to fully travel to Open or Closed position.

   3. Modulating valves for B Street Pant shall be provided and programmed to be able to use “inching” momentary signals to move the valve position either direction, traveling only while signal is present. Modulating valves shall be equipped with an analog proportional position indication via a 4-20ma signal as well as position relays.

B. North Plant
   1. North Plant valves are not networked, hard wired control.
   2. North Pant valves for Open-Closed service shall be provided and programmed with two wire control for full open, full closed operation. Control shall be Energize to Close, De-energize to Open.
3. Modulating valves for North Pant shall be provided and programmed with 4-20ma control and also be able to use “inching” momentary signals to move the valve position either direction, traveling only while signal is present.

2.05 SHOP PAINTING

C. All ferrous metal surfaces, except bearing and finished surfaces and stainless steel components of valve actuators and accessories, shall be shop painted for corrosion protection. The valve manufacturer’s standard coating will be acceptable, provided it is functionally equivalent to the specified coating and is compatible with the specified field painting.

D. The following surfaces shall be painted:

1. Polished or Machined Surfaces: Rust-preventive compound.
2. Other Surfaces: Epoxy.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Actuators will be installed on the valves in accordance with the Valve Installation section.

3.02 NETWORK SETUP

A. A manufacturer’s representative for the intelligent electric actuator manufacturer shall inspect all network terminations for conformity with the manufacturer’s recommended methods of terminating the network to each actuator, and shall notify the Contractor of any wiring modifications required. The manufacturer’s representative shall also set addresses for each valve and prove communication over the network. The valve manufacturer shall furnish the required information to the control system supplier that will allow the specified control and monitoring for each intelligent electric actuator.

B. The Contractor shall coordinate these activities between the actuator manufacturer and the control system supplier.

END OF SECTION
SECTION 15815

METAL DUCTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Rectangular ducts and fittings.
   2. Sheet metal materials.
   3. Sealants and gaskets.

B. Related Sections:
   1. Division 15 Section "Nonmetal Ducts" for fibrous-glass ducts, thermoset fiber-reinforced plastic ducts, thermoplastic ducts, PVC ducts, and concrete ducts.
   2. Division 15 Section "HVAC Casings" for factory- and field-fabricated casings for mechanical equipment.
   3. Division 15 Section "Duct Accessories" for dampers, sound-control devices, duct-mounting access doors and panels, turning vanes, and flexible ducts.
   4. Division 15 Section "Testing, Adjusting, and Balancing" for testing, adjusting, and balancing requirements for metal ducts.

1.2 PERFORMANCE REQUIREMENTS

A. Delegated Duct Design: Duct construction, including sheet metal thicknesses, seam and joint construction, reinforcements, and hangers and supports, shall comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" and performance requirements and design criteria indicated in "Duct Schedule" Article.

B. Structural Performance: Duct hangers and supports shall withstand the effects of gravity loads and stresses within limits and under conditions described in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible".

C. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings:
   1. Fabrication, assembly, and installation, including plans, elevations, sections, components, and attachments to other work.
2. Factory- and shop-fabricated ducts and fittings.
3. Duct layout indicating sizes, configuration, and static-pressure classes.
4. Elevation of top of ducts.
5. Dimensions of main duct runs from building grid lines.
6. Fittings.
7. Reinforcement and spacing.
8. Seam and joint construction.
9. Penetrations through fire-rated and other partitions.
10. Equipment installation based on equipment being used on Project.
11. Locations for duct accessories, including dampers, turning vanes, and access doors and panels.
12. Hangers and supports, including methods for duct and building attachment and vibration isolation.

1.4 QUALITY ASSURANCE


B. Welding Qualifications: Qualify procedures and personnel according to the following:

C. ASHRAE/IESNA Compliance: Applicable requirements in ASHRAE/IESNA 90.1, Section 6.4.4 - "HVAC System Construction and Insulation."

PART 2 - PRODUCTS

2.1 RECTANGULAR DUCTS AND FITTINGS

A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" based on indicated static-pressure class unless otherwise indicated.

B. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-1, "Rectangular Duct/Transverse Joints," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

C. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-2, "Rectangular Duct/Longitudinal Seams," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
D. Elbows, Transitions, Offsets, Branch Connections, and Other Duct Construction: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 4, "Fittings and Other Construction," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

E. Ducts and fittings to have internal insulation.

2.2 SHEET METAL MATERIALS

A. General Material Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.

B. Galvanized Sheet Steel: Comply with ASTM A 653/A 653M.
   2. Finishes for Surfaces Exposed to View: Mill phosphatized.

C. Carbon-Steel Sheets: Comply with ASTM A 1008/A 1008M, with oiled, matte finish for exposed ducts.

D. Stainless-Steel Sheets: Comply with ASTM A 480/A 480M, Type 304 or 316, as indicated in the "Duct Schedule" Article; cold rolled, annealed, sheet. Exposed surface finish shall be No. 2B, No. 2D, No. 3, or No. 4 as indicated in the "Duct Schedule" Article.

E. Aluminum Sheets: Comply with ASTM B 209 Alloy 3003, H14 temper; with mill finish for concealed ducts, and standard, one-side bright finish for duct surfaces exposed to view.

F. Reinforcement Shapes and Plates: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.
   1. Where black- and galvanized-steel shapes and plates are used to reinforce aluminum ducts, isolate the different metals with butyl rubber, neoprene, or EPDM gasket materials.

G. Tie Rods: Galvanized steel, 1/4-inch minimum diameter for lengths 36 inches or less; 3/8-inch minimum diameter for lengths longer than 36 inches.
2.3 SEALANT AND GASKETS

A. General Sealant and Gasket Requirements: Surface-burning characteristics for sealants and gaskets shall be a maximum flame-spread index of 25 and a maximum smoke-developed index of 50 when tested according to UL 723; certified by an NRTL.

B. Two-Part Tape Sealing System:

1. Tape: Woven cotton fiber impregnated with mineral gypsum and modified acrylic/silicone activator to react exothermically with tape to form hard, durable, airtight seal.
2. Tape Width: 4 inches.
5. Mold and mildew resistant.
6. Maximum Static-Pressure Class: 10-inch wg, positive and negative.
7. Service: Indoor and outdoor.
8. Service Temperature: 15 to plus 200 deg F.
9. Substrate: Compatible with galvanized sheet steel (both PVC coated and bare), stainless steel, or aluminum.
10. For indoor applications, sealant shall have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
11. Sealant 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. Water-Based Joint and Seam Sealant:

1. Application Method: Brush on.
2. Solids Content: Minimum 65 percent.
5. Mold and mildew resistant.
6. VOC: Maximum 75 g/L (less water).
7. Maximum Static-Pressure Class: 10-inch wg, positive and negative.
8. Service: Indoor or outdoor.
9. Substrate: Compatible with galvanized sheet steel (both PVC coated and bare), stainless steel, or aluminum sheets.

D. Flanged Joint Sealant: Comply with ASTM C 920.

2. Type: S.
3. Grade: NS.
5. Use: O.
6. For indoor applications, sealant shall have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
7. Sealant 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. Flange Gaskets: Butyl rubber, neoprene, or EPDM polymer with polyisobutylene plasticizer.

PART 3 - EXECUTION

3.1 DUCT INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of duct system. Indicated duct locations, configurations, and arrangements were used to size ducts and calculate friction loss for air-handling equipment sizing and for other design considerations. Install duct systems as indicated unless deviations to layout are approved on Shop Drawings and Coordination Drawings.

B. Install ducts according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" unless otherwise indicated.

C. Install round ducts in maximum practical lengths.

D. Install ducts with fewest possible joints.

E. Install factory- or shop-fabricated fittings for changes in direction, size, and shape and for branch connections.

F. Unless otherwise indicated, install ducts vertically and horizontally, and parallel and perpendicular to building lines.

G. Install ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building.

H. Route ducts to avoid passing through transformer vaults and electrical equipment rooms and enclosures.

I. Protect duct interiors from moisture, construction debris and dust, and other foreign materials.

3.2 INSTALLATION OF EXPOSED DUCTWORK

A. Protect ducts exposed in finished spaces from being dented, scratched, or damaged.

B. Trim duct sealants flush with metal. Create a smooth and uniform exposed bead. Do not use two-part tape sealing system.
C. Grind welds to provide smooth surface free of burrs, sharp edges, and weld splatter. When welding stainless steel with a No. 3 or 4 finish, grind the welds flush, polish the exposed welds, and treat the welds to remove discoloration caused by welding.

D. Maintain consistency, symmetry, and uniformity in the arrangement and fabrication of fittings, hangers and supports, duct accessories, and air outlets.

E. Repair or replace damaged sections and finished work that does not comply with these requirements.

3.3 DUCT SEALING

A. Seal ducts for duct static-pressure, seal classes, and leakage classes specified in "Duct Schedule" Article according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

3.4 CONNECTIONS

A. Make connections to equipment with flexible connectors

B. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for branch, outlet and inlet, and terminal unit connections.

3.5 DUCT SCHEDULE

A. Fabricate ducts with galvanized sheet steel except as otherwise indicated and as follows:

B. Supply Ducts:

1. Ducts Connected to Blower:
   a. Pressure Class: Positive 2-inch wg.
   b. Minimum SMACNA Seal Class: C.
   c. SMACNA Leakage Class for Rectangular: 24.
   d. SMACNA Leakage Class for Round and Flat Oval: 12.

C. Intermediate Reinforcement:


D. Elbow Configuration:

1. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-2, "Rectangular Elbows."
   a. Radius Type RE 1 with minimum 1.5 radius-to-diameter ratio.
b. Radius Type RE 3 with minimum 1.0 radius-to-diameter ratio and two vanes.

c. Mitered Type RE 2 with vanes complying with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-3, "Vanes and Vane Runners," and Figure 4-4, "Vane Support in Elbows."

END OF SECTION
B Street Water Treatment Plant &
North Water Treatment Plant Improvements
City of Meridian

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SECTION 16010

BASIC ELECTRICAL REQUIREMENTS

PART 1  GENERAL

1.1  SUMMARY

A. This section is an extension of the General Requirements (DIVISION 1 of these Specifications) and certain items of a common or administrative nature that pertain to all electrical work.

B. The work of this section consists of furnishing materials, equipment, constant competent supervision, special tools, test equipment, technicians, and labor necessary for installation of a complete working electrical system as indicated herein and on the Drawings.

C. The work shall include but not necessarily be limited to the following:

1. Demolition of electrical needed for the replacement of equipment.
2. Installation of conduit, wire, cable, devices, etc. required for the replacement of equipment and new equipment.
3. Provide temporary power where and as needed to maintain plant operations during electrical outages.
4. Electrical work incidental to the requirements of DIVISION 15 work.
5. Low voltage distribution equipment.
6. Raceways and fittings.
7. Power distribution systems feeder and branch circuits/panels/motor starters/wiring/ lighting/devices/etc.
8. Conductors, raceways and fittings.
9. Electrical panels and transformers.
10. Motor Control Center (MCC) including starters and breakers.
11. Control systems raceway and cables.
12. Lighting fixtures and installation.

1.2  QUALITY ASSURANCE

A. The electrical installation shall conform to the requirements of the 2014 edition of the National Electrical Code (NEC). Notify Architect/Engineer of conflicts before performance.

B. Electrical material shall be built and tested in accordance with the applicable standards of the National Electrical Manufacturers’ Association (NEMA), the American National Standards Institute (ANSI) the American Society for Testing and Materials (ASTM), and the Institute of Electrical and Electronic Engineers (IEEE)
C. Electrical materials shall be new and unused and shall be listed and labeled for the service intended by Underwriters' Laboratories, Inc., where such labeling service is available.

D. All electrical equipment such as switchboards, panelboards, control panels, disconnects, etc. shall be labeled to identify potential electric arc flash hazards in compliance with the requirements of NFPA 70E-2015 "standard for electrical safety in the workplace" and ANSI Z535.4.-1998 "product safety signs and labels".

E. Applicable sections of the following codes and standards shall also be followed:

2. OSHA Code of Federal Regulations (for construction practices).
4. Applicable state and local codes/ordinances.
5. CBM - Certified Ballast Manufacturer
6. IPCEA - Insulated Power Cable Engineers' Association
7. FM - Factory Mutual
8. ETL - Electrical Testing Laboratories
9. IES - Illuminating Engineering Society
10. NECA – National Electrical Contractors Association

F. Include all items of labor and materials required to comply with the above referenced codes and standards. Where quantities, sizes, or other requirements indicated on Drawings or herein specified are in excess of the requirements of the standards and codes, the Specifications or Drawings shall govern.

1.3 REGULATORY REQUIREMENTS

A. Permits: Obtain and pay for all necessary permits, inspections, connection charges, fees, insurance, bond, licenses, and comply with all governing laws, ordinances, rules and regulations including those of the National Fire Protection Association and all municipal, state or other authority having jurisdiction over the work.

B. Certificates of Inspection: Upon completion and before the date of substantial completion of each designated Phase, furnish a certificate of inspection issued by the proper authorities to the effect that the installation is in full conformity with all local and state requirements.

1.4 COORDINATION

A. Lay out the work and be responsible for its correctness. Take such measurements as may be necessary to assure approved fitting and proper installation of work, and all other work depending thereon.

B. Arrange work in a neat, well organized manner with exposed conduit and similar services running parallel with primary lines of the building construction, high as possible with a minimum of 8'-0" overhead clearance or as directed by the Architect/Engineer.
C. Perform all work in the best and most substantial manner by workmen skilled in the work to be done. Provide adequate supervision at all times.

D. Cooperate with other contractors to avoid complications between the installation of the various items of equipment. Advise other trades of openings required in their work for the subsequent move-in of large units of electrical equipment.

E. Locate operating and control equipment properly to provide easy access, and arrange entire electrical work with adequate access for operation and maintenance.

F. Where the method of installation is not certain, ask for details. Lack of details, not requested, will not be an excuse for improper installation, and any such work must be corrected at the contractor’s expense.

G. Coordination Drawings: For locations where several elements of electrical or combined mechanical and electrical work must be sequenced and positioned with precision in order to fit into the available space, prepare coordination drawings showing the actual physical dimensions (at accurate scale, minimum 1/4”) required for the installation. Prepare and submit coordination drawings prior to purchase-fabrication-installation of any of the elements involved in the coordination.

H. All Bidders shall be responsible to ensure that equipment selected, switchboards, panelboards, etc., fit in spaces selected, along with NEC compliance. If standard equipment does not fit, Contractor shall be required to utilize custom equipment as required.

1.5 DRAWINGS AND SPECIFICATIONS

A. Contract Documents (Drawings and Specifications) are intended to convey the scope of work and indicate general arrangements of equipment, fixtures and piping, and approximate sizes and locations of equipment and outlets. Follow these documents in laying out the work, check all Drawings to become familiar with all conditions affecting the work, and verify spaces in which the work will be installed.

B. The contract documents are diagrammatic in showing certain but not all, physical relationships which must be established within the electrical work. Its interface with other work including plumbing, fire protection and mechanical work, is the exclusive responsibility of the Contractor. The Drawings show approximate locations only of selected feeders, branch circuits, outlets, etc., except where specific routing or dimensions are indicated. The Architect/Engineer reserves the right to make reasonable changes in locations indicated before roughing-in without additional cost to the Owner.

C. Because of the small scale of the Drawings, it is not possible to indicate all of the offsets, fittings, and accessories required. Contractor shall investigate the structural and finish conditions affecting DIVISION 16 work and shall arrange such work accordingly, furnishing fittings, bends, junction boxes, pull boxes, access panels, and accessories required to meet such conditions.
These Specifications, together with the accompanying Drawings, contemplate apparatus fully erected, and in satisfactory operating condition with the Contractor furnishing and installing everything that may be necessary to complete the job.

1.6 SUBMITTALS

A. Refer to DIVISION 1 for Submittal Requirements. The following paragraphs are an extension of DIVISION 1 requirements.

B. Review of shop drawings shall in no way modify the contract or relieve the Contractor from compliance with the contract.

C. Names of manufacturers or catalog numbers are listed in the Specification in order to establish a standard for the type, general design and quality of the product required. Where "or equal" is indicated, other products similar in design and of equal quality and complying with the Drawings and Specifications will be considered for acceptance. See DIVISION 1 specifications.

D. Any item not specified herein, but submitted as a substitute for the specified item, shall be submitted in accordance with Section 01340 - Product Requirements and accompanied by manufacturer's documentation stating/illustrating the following applicable information in addition to the specific information requested in other sections:

1. Dimensions/weight.

2. Electrical ratings-voltage, amperage, short circuit capability, etc.

3. Construction - gauge of steel/aluminum, paint finish / application method, color, NEMA type, etc.

4. Warranty.

5. Local manufacturer's representative or nearest stocking distributor.

6. Length of time the product has been available to the public.

7. Any deviations.

E. Shop Drawings:

1. Listed below are shop drawings required for transmittal. Refer to DIVISION 1 for scheduling of submittal. No time delays will be allowed for failure to be so informed.

   a. Raceways including fittings and expansion fittings
   b. Connectors
   c. Circuit Breakers
   d. Conductors, wire and cables
   e. Conduit Layout Drawings w/ Dimensions
   f. Panelboards
g. Motor Control Centers  
h. Luminaires  
i. Pull boxes and junction boxes  
j. Safety switches  
k. Grounding components

2. Further descriptions or information required with shop drawings shall be included with the description of materials specified herein as follows:

   a. Grounding Products: Include a complete grounding system diagram with materials and ground conductor sizes.  
b. Miscellaneous Electrical Controls and Control Wiring: Include control wiring diagrams for all miscellaneous electrical controls.  
c. Housekeeping Pads: Include location and dimensions of housekeeping pads, including blockouts and anchor bolts.  
d. Firestops: Include all firestop materials for the project, indicating intended use and UL fire rating where applicable.  
e. In preparing shop drawings, establish lines and levels for the work specified and check the drawings to avoid interference with structural features, and the work of other trades. Immediately call to the attention of the Architect/Engineer in writing any interferences for clarification.  
f. Detailed, dimensioned shop drawing for the installation of any conduits to be installed in the floor slab. All feeder conduits, lighting conduits, power conduits and system conduits that will be sleeved through slabs. Include all proposed core drill locations for review by the Structural Engineer. These shop drawings shall be new drawings prepared by the contractor and shall show all conduit rating, locations where conduits are exiting slab. All junction boxes and concrete rings shall have dimensioned locations. Coordinate conduit “turn-up” or turn downs” with Architect/Engineer. Drawings to insure all conduits will be concealed either in the slab or in the walls.

3. Corrections or comments made on shop Drawings during the review do not relieve the Contractor from compliance with requirements of the contract documents. Shop Drawings will be checked for general conformance with the design concept of the project and general compliance with information given in the contract documents. Review of the shop Drawings shall not relieve the Contractor from responsibility for confirming and correlating all quantities and dimensions, coordinating work with that of all other trades, and performing work in a safe and satisfactory manner. Review of shop Drawings shall not permit any deviation from Drawings and Specifications. Shop Drawings must be accompanied by signed statement from contractor, stating that he has reviewed the submittal and checked it for compliance.

4. Contractor shall provide products as specified if submittals for review of materials are not received within thirty (30) days after award of the Contract.

1.7 PROTECTION OF APPARATUS

A. At all times the Contractor shall take precautions necessary to protect his apparatus from damage. Failure on the part of the Contractor to comply with the above to the
Architect/Engineer’s satisfaction shall be sufficient cause for the rejection of the particular piece of apparatus in question.

1.8 PROJECT/SITE CONDITIONS

A. Visit the site before bidding to become familiar with conditions under which the work will be performed.

B. No additional compensation will be allowed for failure to be so informed.

1.9 CUTTING AND PATCHING

A. Do all cutting, fitting, and all other work that may be required to make the several parts come together and fit. Cutting for equipment entry shall be under other DIVISIONs. Do not endanger any work by cutting, digging, or otherwise, and do not cut or alter the work of any other DIVISIONs, except with the consent of the Architect/Engineer. Cutting shall be done under the supervision of the Project Superintendent. Patching, including patching of bonded roofing, shall be performed under DIVISION 1.

B. Provide, properly located and sized, all required chases, shafts, openings, furred spaces, etc., required for the work or to conceal any of the work, in any part of the structure.

C. It is the responsibility of this DIVISION to coordinate with other responsible DIVISIONs for required cutting and patching.

1.10 INSERTS AND THIMBLES

A. Set in place as form work progresses, all necessary inserts and thimbles as may be required. Cutting of beams or of concrete floors or walls will not be permitted.

B. All thimbles set in concrete shall be of standard pipe, plain ends, and shall be of proper size to allow for freedom around piping passing through thimble.

C. Thimbles set in the walls, partitions or in chases where structural requirements will allow, shall be of rigid galvanized steel conduit.

D. Inserts shall be nailed to form work and shall be of size to allow for installation of hangers for the particular pipe served.

1.11 RECORD DRAWINGS

A. Prepare Record Drawings in accordance with the requirements in DIVISION 1.

B. In addition to the requirements specified in DIVISION 1, indicate the following installed conditions:

1. Equipment locations (exposed and concealed), dimensioned from prominent building lines.
2. Approved substitutions, Contract Modifications, and actual equipment and materials installed.


4. Complete As-Built Drawings of DIVISION 16 work shown and not shown on the contract drawings in the new and existing facilities.

C. Equipment Manuals:

1. Before the date of substantial completion, Contractor shall furnish to the Architect/Engineer three (3) bound sets of descriptive, dimensional and parts data on all major items of electrical equipment and material including those items listed above under "Shop Drawings:"

2. Each set of this literature shall be bound in a permanent type hard cover ring binder and shall be suitably indexed.

3. This submittal shall be accompanied by final Electrical Inspection Certificate from the authority having jurisdiction and Statement of Inspection from State Fire Marshal's Office.

1.12 WARRANTY/GUARANTEE

A. Except where longer periods of warranty are specified, guarantee all labor and materials for a period of twelve (12) months from the date of substantial completion of the particular phase of the work. Repair all defective materials and work; replace with new materials and/or equipment, any material and/or equipment failing to give satisfactory service.

B. During the period of guarantee, promptly correct any defects in equipment, materials or workmanship without cost to the Owner.

C. Guarantee includes equipment capacity and performance ratings specified without excessive noise levels. Any deficiencies in equipment specified shall be promptly corrected.

D. Contractor's warranty shall include an inspection of the system one (1) week before the end of the one (1) year warranty period. Replace or repair any items found to be defective at this time.

1.13 TESTS AND BALANCING

A. At such times as the Engineer / Owner directs, conduct operating tests to demonstrate that the electrical systems are installed and will operate properly and in accordance with the requirements of this Specification. Tests shall be performed in the presence of the Owner's representative. Furnish instruments and personnel required for such tests.
B. Perform tests to show Engineer / Owner that the power and lighting loads are equally divided among phases of feeders serving each piece of equipment and each panelboard, and record the results of such tests and turn over to the Architect/Engineer.

C. Any work and materials tested and found varying from the requirements of the Drawings and Specifications shall be replaced without additional cost to the Owner.

D. This section does not relieve the Contractor from testing equipment installed under this DIVISION but not listed in this section. Contractor is required to test all equipment, feeders, etc., installed under this DIVISION.

PART 2 PRODUCTS

2.1 GENERAL

A. Refer to DIVISION 1 sections for general requirements on products, materials and equipment. The provisions outlined below expand or modify the requirements as applicable to electrical work. Refer to other DIVISION 16 sections for additional requirements.

B. Materials and equipment shall conform in all respects to the requirements set forth in these Specifications and the accompanying Drawings.

C. Provide products which are compatible with other products of the electrical work, and with other work requiring interface with the electrical work, including electrical connections and control devices. For exposed electrical work, coordinate colors and finishes with the Architect/Engineer and as referenced elsewhere in the documents. Determine in advance of purchase that equipment and materials proposed for installation will fit into the confines indicated, leaving adequate clearance as required by applicable codes, and for adjustment, repair, or replacement.

2.2 MANUFACTURERS' NAMEPLATES

Each major component of the equipment shall have the manufacturer's name, address, model number, and rating on a plate securely affixed in a conspicuous place. The nameplate of a distributing agent will not be acceptable. NEMA Code ratings, or other data which are die-stamped into the surface of the equipment shall be stamped in an easily visible location.

PART 3 EXECUTION

3.1 GENERAL

A. Visit the building / project site before bidding to determine existing conditions and assume all responsibility and bear all expenses in allowing for these conditions in the bid.

B. Obtain all necessary permits, pay all legal fees and charges, pay all utility charges, and comply with all state and local building codes and safety laws, ordinances and
regulations relating to the building and public health and safety. Refer to DIVISION 1 for utility construction demolition, installation, and service connection charge allowances.

C. No work shall be concealed until approved by the local inspector and all local regulations are adhered to.

D. Upon completion, a certificate of approval from the appropriate regulatory agency shall be furnished to the Architect/Engineer.

E. Cooperate with other trades in installing work in order that there will be no conflict of space required by conduit, piping, ducts, outlets, etc. If an interference develops, it shall be referred to the Architect/Engineer for a decision as to which equipment, piping, conduit, etc, is to be relocated. Such relocations shall be made without additional cost to the Owner.

F. Study all sections of the Specifications and Drawings. Notify Architect/Engineer of conflict between Drawings and Specifications before bidding. The Architect/Engineer's decision will govern.

G. Electrical Drawings are diagrammatic except where dimensioned. Do not scale. Follow manufacturer's certified shop drawings for accuracy. Consult Architect / Engineer in cases of doubt or conflict. Unless noted as fixed, dimensions are based on the product of one (1) manufacturer. Verify dimensions with certified shop Drawings of the materials actually approved and purchased.

3.2 TEMPORARY WIRING, LIGHTING AND POWER AT THE SITE

A. Refer to DIVISION 1 specifications for required temporary utilities and services for this project. Furnish and install provisions for required temporary utilities and services to conform with DIVISION 1 specifications and this DIVISION and these specifications.

B. Furnish and install provisions for temporary electrical service and construction light and power during the construction period conforming to the contract documents, all local code and State labor law requirements. Temporary light and power provisions to be included shall be as hereinafter specified and as required in Section - Temporary Facilities and Services.

C. Arrange for temporary service with the owner. Furnish generator for switchover of feeders so not to interrupt plant operations.

D. Furnish, install, and maintain all temporary service equipment as required until permanent service is installed switch-over of temporary systems on the permanent service when latter is ready for same.

E. Furnish, install, maintain, and switch on and off on all regular work days a complete temporary light system, for the building while under construction.

F. Provide any and/or all relocations of temporary electric facilities as necessary to clear the permanent installations of all trades.
3.3  WIRING FOR EQUIPMENT BY OTHERS

A. Electrical service for all equipment furnished under this Specification and/or indicated on the Drawings shall be roughed-in and connected under this DIVISION. It is the responsibility of the Contractor to obtain correct roughing-in dimensions and requirements for this equipment.

B. Electrical work for equipment specified in DIVISION 15 - Mechanical shall be as specified.

C. Raceways, outlets, backboards, cabinets, grounding connections, handholes, underground distribution system, and other roughing-in indicated shall be provided as work of this DIVISION for telephone system, lightning protection system.

3.4  MECHANICAL EQUIPMENT

A. All power wiring associated with DIVISION 15, Mechanical shall be done as work of DIVISION 16, Electrical. All power disconnect switches and single speed manual starting switches shall be furnished and installed under DIVISION 16. Multi-speed manual starters, magnetic starters shall be furnished and installed under DIVISION 16.

B. All control wiring and conduit shown on the Division 16 drawings shall be furnished and installed by Division 16. Except as may be indicated on the Drawings and/or hereinafter noted, all other control wiring, including all temperature control wiring, interlocking, start-stop wiring, shall be furnished and installed under DIVISION 15. This includes, but is not limited to, wiring to low voltage thermostats, damper motors, aquastats, firestats, pushbuttons, selector switches, and control panel(s). All disconnect switches for control wiring shall be furnished and installed under DIVISION 15. All power wiring conduits shall be furnished and installed under DIVISION 16. All HVAC system control wiring to be furnished and installed under DIVISION 15, but using DIVISION 16 specifications for installing conduits. All control wiring and conduits associated with the lighting controls to be provided and installed by DIVISION 16. Coordinate with Division 13 before installing any controls wiring.

C. Work of other DIVISIONs will include furnishing and setting motors.

D. All magnetic starters will be furnished under DIVISION 16, except for packaged equipment that will be furnished under another DIVISION of the Specifications. Overload elements in all starters shall be selected according to actual motor nameplate full load current. Responsibility for this coordination shall lie with the DIVISION under which the particular starter was furnished.

E. Firestats for single phase exhaust fans with manual starting switches and wall mounted thermostats which interrupt line voltage power circuits to motors shall be furnished and set under DIVISION 15, and electrically connected in the branch circuit wiring as work of DIVISION 16.

3.5  WORKMANSHIP
A. Install all materials and electrical components of the work in accordance with instructions of manufacturer following the best modern construction practices and conforming with the Contract Documents. Workmanship shall be first class, in both function and appearance, whether finally concealed or exposed and shall be performed by experienced workmen skilled in the type of work. As practicable, the lines of all components of the system shall be perpendicular or parallel. In general, workmanship shall conform to guidelines set forth in N.E.C.A. manuals.

3.6 CLEANING UP

A. Remove once per week and at the completion of the work all empty cartons, scrap wire, raceways, rubbish, etc., accumulated on the project as a result of work performed.

B. Remove all marks, stains, fingerprints, bugs, dust and other foreign material from all electrical components. Refinish damaged surfaces and restore original finish to the satisfaction of the Architect/Engineer.

3.7 SAFETY

A. It shall be the Contractor's responsibility to do all things necessary in the pursuit of the installation or testing to provide safe conditions in which to work.

3.8 MOUNTING HEIGHTS

A. Unless otherwise noted on the Drawings or required by the Architect/Engineer, the following mounting heights shall apply:

- Toggle Switches: 4'-0" CL
- Receptacles: 44"
- Panelboards: 6'-6" to top

B. Upon approval of the Architect / Engineer mounting heights may be adjusted, except where mounting heights are indicated by code.

END OF SECTION 16010
SECTION 16047

ELECTRICAL DEMOLITION

1.0 GENERAL

1.01 RELATED DOCUMENTS:

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

1.02 DESCRIPTION OF WORK:

A. The extent of general demolition work is shown on drawings. Coordinate the required electrical work with the general demolition.

B. The Owner shall have the option of retaining any items removed. The Contractor shall deliver these items to the Owner's designated storage area. Any items not retained by the Owner shall be disposed of, off site, by the Contractor.

1.03 JOB CONDITIONS:

A. Condition of Structure: The owner assumes no responsibility for actual conditions of structures to be demolished.

Conditions of the structure existing at time of inspection for bidding purposes will be maintained by Owner in so far as practicable. However, variations within structure may occur by Owner's removal and salvage operations prior to start of demolition work. The drawings are schematic and provided as an aid in bidding. The Contractor shall visit the site and determine the actual conditions prior to bidding.

B. Partial Removal:

1. Items of salvageable value to Contractor may be removed from structure as work progresses. Salvaged items must be transported from site as they are removed.

2. Storage or sale of removed items on site will not be permitted.

C. Traffic: Conduct demolition operations and removal of debris to ensure minimum interference with roads, streets, walks, occupied areas, and other adjacent occupied or used facilities.

D. Protection: Ensure safe passage of persons around or through area of demolition. Conduct operations to prevent injury to adjacent structures, other facilities, and persons.
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Install temporary electrical services, lighting, etc., as required by Owner or
authorities having jurisdiction.

E. Damages: Promptly repair damages caused to adjacent facilities by demolition
operations at no cost to owner.

F. Utility Service: Maintain existing utilities indicated to remain, keep in service, and
protect against damage during demolition operations. Allow no interruption in
service unless coordinate with owner at least 24-hours in advance.

Do not interrupt existing utilities serving occupied or used facilities, except when
authorized in writing by authorities having jurisdiction. Provide temporary services
during interruptions to existing utilities, as acceptable to governing authorities.

Contractor will disconnect and seal utilities serving each structure to be demolished,
or interior area to be demolished, prior to start of demolition work.

G. If Contractor is required to disconnect utility services or other services to an
occupied area, the Contractor shall provide temporary or alternative service to that
area.

2.0 PRODUCTS

NOT APPLICABLE.

3.0 EXECUTION

3.01 DEMOLITION:

A. Refer to plans for extent of demolition work to be performed.

3.02 DISPOSAL OF DEMOLISHED MATERIALS:

A. General:

1. Remove from site debris, and other materials resulting from demolition
operations. Pay all fees related to removal and dumping.

2. Burning of removed materials from demolished structures will not be permitted
on site.

B. Removal:

1. Transport materials removed from demolished structures and dispose of off site.

END OF SECTION 16047
SECTION 16051

ELECTRICAL RELATED WORK

PART 1  GENERAL

1.1  SUMMARY

A.  Extent of electrical related work required by this section is indicated on Drawings and/or specified in other Division 16 sections.

B.  Types of electrical related work specified in this section include the following:

1. Access to Electrical Work:
   a. Removable cover plate in walls, ceiling and floors.

2. Excavating, Trenching and Backfill for Electrical Work.

3. Foundations and Supports.

4. Cutting and patching.

5. Concrete for Electrical Work:
   a. Electrical equipment foundations and mounting pads.
   b. Rough grouting in and around electrical work.
   c. Patching concrete which has been cut to accommodate electrical work.

1.2  PROJECT/SITE CONDITIONS

A.  Protect property from damages which might result from excavating and backfilling.

B.  Protect persons from injury at excavations by barricades, warnings and illumination.

C.  Coordinate excavations with weather conditions, to minimize possibility of washouts, settlements and other damages and hazards.

PART 2  PRODUCTS

2.1  ACCESS TO ELECTRICAL WORK

A.  Where switches, control devices, pull boxes and similar elements of electrical work are located within or behind wall, ceiling or floor construction of finishes, or below grade, provide removable access doors of types and sizes needed for access requirements.

2.2  EXCAVATING FOR ELECTRICAL WORK
A. Backfill Materials: Refer to Division 2 Section, Earthwork.

B. MATERIALS OF CONCRETE WORK: Refer to Division 3 Section, Concrete.

PART 3 EXECUTION

3.1 EXCAVATION, TRENCHING AND BACKFILLING

A. Perform all excavation of every description and of whatever substances encountered to the depths indicated on the Drawings or as otherwise specified. During excavation, material suitable for backfilling shall be piled in an orderly manner a sufficient distance from the banks of the trench to avoid overloading and to prevent slides or cave-ins. All excavated materials not required or not suitable for backfill shall be removed and wasted or removed from jobsite as indicated on the Drawings or as directed by Architect at no additional cost to Owner.

B. Sheeting and shoring shall be done as necessary for the protection of the work and for the safety of personnel. Provide necessary pumping and/or well pointing at all times to maintain a dry working condition in all trenches. Unless otherwise indicated, excavations shall be by open cut except that short sections of a trench may be tunneled if, in the opinion of the Architect the conduit can be safely and properly installed and backfill can be properly tamped in such tunneled sections.

C. No excavation or trenches shall be cut near or under footings without first consulting Architect / Engineer.

D. Bottom of trench shall be shaped to give substantially uniform circumferential support to lower third of each pipe. Each pipe shall be laid true to line and grade and in such manner as to form a close concentric joint with adjoining pipe and to prevent sudden offset to flow line. As work progresses, interior of pipe shall be cleared of dirt and superfluous materials of every description.

E. Wherever wet or otherwise unstable soil that is incapable of properly supporting the pipe, as determined by the Architect / Engineer is encountered in the bottom of the trench, such soil shall be removed to the depth required and the trench backfilled to the proper grade with coarse sand, fine gravel, or other suitable material, and approved by the Architect / Engineer.

F. Trenches for utilities shall be of a depth that will provide the following minimum depth of cover from existing grade or from indicated finish grade, whichever is lower, unless otherwise specifically shown:

1. 30-Inch Minimum Cover - Electrical Conduits/Cables over 600 volts

2. 24-Inch Maximum (See NEC 300-5) - Electrical Cables/Conduits Under 600 volts.

3. 36-Inch Minimum for Utility Service Cables/Conduits.
G. Backfill shall be installed in layers 6" deep, adequately wetted and tamped using materials as noted above. The surface shall be graded to a reasonable uniformity and the mounding over trenches left in a uniform and neat condition as approved by the Architect. Refer to Division 2 for compaction densities.

H. Raceways that are not encased in concrete and that are buried 18 in. or more below grade shall have their location identified by a 6" wide red warning ribbon that is placed in the trench at least 12 in. above the underground installation.

I. Restore all hard finished surfaces such as roadways, sidewalks, grass, shrubbery, etc., removed for installation of utilities (and not shown on Drawings or specified to be reworked under other sections of the work) to their original condition using the same type as original materials. Patching concrete roadways shall require dowelling to tie-in matching reinforcement rods or highway mesh to existing roadway. Dowelling shall occur every 18 inches on both sides of the trench. Restore to near original condition acceptable to Architect.

J. Carefully plan all work to avoid existing utilities and other interferences. The Drawings do not indicate all existing underground utilities. Existing utility lines to be retained that are shown on the Drawings or the locations of which are made known to the Contractor prior to excavation, as well as all utility lines uncovered during excavation operations, shall be protected from damage during excavation and backfilling and, if damaged, shall be repaired by Contractor at his expense. Prior to doing any excavation with power tools, carefully investigate and locate any exiting conduit, pipes, and other lines.

3.2 FOUNDATIONS AND SUPPORTS

A. Provide concrete pedestals, bases, pads, curbs, anchor blocks, anchor bolts, slab inserts, hangers channels, cradles, saddles, etc. for installation of floor mounted equipment such as switchboards, transformers, etc. and apparatus shown on the Drawings and specified in the various sections of Specification Division 16.

B. Concrete pads for floor mounted electrical equipment shall be 4 inches high, unless otherwise indicated, poured integral with the floor slab wherever practical. Wherever integral slab poured pads are not practicable, construct 4 inch high housekeeping pads, reinforced with No. 3 steel wire mesh 6 X 6 inches, fastened to structural slabs with 1/2 inch diameter bolts embedded in structural slabs with expansion bolts at all corners (inset 3 inches) and no further apart than 18 inches. Score structural slab thoroughly to assure concrete bonding between structural slab and housekeeping pad. Construct in full accordance with "concrete" specifications for 2500 psi minimum compressive strength. Finish tops of housekeeping pads smooth and level within 1 percent of span. Pads shall be extended at least 4" (10 cm) beyond the equipment outline on all four sides.

3.3 CUTTING AND PATCHING

A. Comply with the requirements of DIVISION 1 for cutting and patching of
other work to accommodate the installation of electrical work. Except as individually authorized by the Architect/Engineer, cutting and patching of electrical work to accommodate the installation of other work is not permitted. Coordinate all cutting and patching of walls and ceiling with Division 1, to install and conceal new raceway in existing finished areas.

3.4 PAINTING

A. Factory painted equipment shall have finish restored to Manufacturer's finish if scratched or damaged before acceptance or use by Owner.

END OF SECTION 16051
SECTION 16110

RACEWAY

PART 1 - GENERAL

1.1 SUMMARY
   
   A. Section Includes:
   
      1. Metal conduits and fittings.
      2. Nonmetal conduits and fittings.
      3. Fiberglass Conduit.

1.2 ACTION SUBMITTALS
   
   A. Product Data: For surface raceways, conduit, fittings.

1.3 INFORMATIONAL SUBMITTALS
   
   A. Coordination Drawings: Conduit routing plans, drawn to scale, on which the following
      items are shown and coordinated with each other, using input from installers of items
      involved:
      
      1. Structural members in paths of conduit groups with common supports.
      2. HVAC and plumbing items and architectural features in paths of conduit groups
         with common supports.

PART 2 - PRODUCTS

2.1 METAL CONDUITS AND FITTINGS
   
   A. Listing and Labeling: Metal conduits, tubing, and fittings shall be listed and labeled as
      defined in NFPA 70 NEC), by a qualified testing agency, and marked for intended
      location and application.
   
   B. RAC: Comply with ANSI C80.5 and UL 6A, copper free aluminum.
   
   C. LFMC: Flexible metal conduit with PVC jacket and complying with UL 360, core
      galvanized steel, stainless steel, or copper free aluminum to match raceway.
   
   D. Fittings for Metal Conduit: Comply with NEMA FB 1 and UL 514A, 514B.
1. Conduit Fittings for Hazardous (Classified) Locations: Comply with UL 886 and NFPA 70 (NEC), shall be compatible with raceway (conduit).

2. Expansion Fittings: Stainless steel or copper free aluminum with corrosion resistant coating, to match conduit type, complying with UL 651, rated for environmental conditions where installed, and including flexible external bonding jumper.

3. Coating for Fittings for PVC-Coated Conduit: Minimum thickness of 0.040 inch (1 mm), with overlapping sleeves protecting threaded joints. PVC coated inside and outside, Rob Roy or equivalent.

4. Fittings shall be gasketed for raintight / drip-tight connections.

5. LFMC fittings shall be copper free aluminum or stainless steel to match LFMC.

E. Joint Compound for stainless steel or RAC: Approved, as defined in NFPA 70 (NEC), by authorities having jurisdiction for use in conduit assemblies, and compounded for use to lubricate and protect threaded conduit joints from corrosion and to enhance their conductivity.

2.2 NONMETALLIC CONDUITS AND FITTINGS

A. Listing and Labeling: Nonmetallic conduits, tubing, and fittings shall be listed and labeled as defined in NFPA 70 (NEC), by a qualified testing agency, and marked for intended location and application.

B. RNC: Type EPC-40-PVC or schedule 80 as indicated, complying with NEMA TC 2 and UL 651 unless otherwise indicated.

C. Fittings for and RNC: Comply with NEMA TC 3; match to conduit type and material.

D. Solvent cements and adhesive primers shall have a VOC content of 510 and 550 g/L or less, respectively, when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

E. Solvent cements and adhesive primers shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

F. Heavy wall fiberglass conduits and fittings, UL Listed, conform to NFPA 130.
PART 3 - EXECUTION

3.1 RACEWAY APPLICATION

A. Outdoors: Apply raceway products as specified below unless otherwise indicated:

2. Concealed Conduit, Above ground: RAC.
4. Underground Conduit: RNC, Type EPC-40-PVC, Type EPC-80-PVC, direct buried or concrete encased as indicated.
5. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.

B. Indoors: Apply raceway products as specified below unless otherwise indicated.

1. Exposed, Not Subject to Physical Damage: RAC.
2. Exposed, Not Subject to Severe Physical Damage: RAC.
3. Exposed and Subject to Severe Physical Damage: RAC. Raceway locations include the following:
   a. Mechanical rooms.
4. Concealed in Ceilings and Interior Walls and Partitions: RAC.
5. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC, except use LFMC in damp or wet locations.
6. Damp or Wet Locations: RAC.

C. Minimum Raceway Size: 3/4-inch (21-mm) trade size.

D. Raceway Fittings: Compatible with raceways and suitable for use and location.

1. Rigid Aluminum conduit: Use threaded RAC fittings unless otherwise indicated. Comply with NEMA FB 2.10.
2. PVC Coated, Rigid Steel Conduits: Use only fittings listed for use with this type of conduit. PVC coated inside and outside, Rob Roy or equivalent. Patch and seal all joints, nicks, and scrapes in PVC coating after installing conduits and fittings. Use sealant recommended by fitting manufacturer and apply in thickness and number of coats recommended by manufacturer.
3. Flexible Conduit: Use only fittings listed for use with flexible conduit. Comply with NEMA FB 2.20.
4. All conduit bodies (condulets) shall be of same material as raceway and gasketed with stainless steel cover screws.
5. Mogul fittings shall be used to allow for proper bend radius of conductors.

E. Do not install aluminum conduits, boxes, or fittings in direct contact with concrete or earth.
F. Install surface raceways only where indicated on Drawings.

G. Do not install nonmetallic conduit where ambient temperature exceeds 120 deg F (49 deg C).

3.2 INSTALLATION

A. Comply with NECA 1 and NECA 101 for installation requirements except where requirements on Drawings or in this article are stricter. Comply with NECA 102 for aluminum conduits. Comply with NFPA 70 (NEC) limitations for types of raceways allowed in specific occupancies and number of floors.

B. Mechanically fasten together metal conduits, enclosures, and raceways for conductors to form continuous electrical conductor. Connect to electrical boxes, fittings and cabinets to provide electrical continuity and firm mechanical assembly.

C. Contractor shall avoid use of dissimilar metals throughout raceway system to prevent possibility of electrolysis. Where impractical or not feasible, contractor shall use dielectric compound where dissimilar metals are in contact, coat surfaces with corrosion inhibiting compound before assembling in accordance with manufacturer's recommendations.

D. Keep raceways at least 6 inches (150 mm) away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.

E. Comply with requirements in Division 16 Section "Supporting Devices" for hangers and supports.

F. Arrange stub-ups so curved portions of bends are not visible above finished slab.

G. Install no more than the equivalent of three 90-degree bends in any conduit run except for control wiring conduits, for which fewer bends are allowed. Support within 12 inches (300 mm) of changes in direction.

H. Conceal conduit within finished walls, ceilings, and floors unless otherwise indicated. Install conduits parallel or perpendicular to building lines.

I. Support conduit within 12 inches (300 mm) of enclosures to which attached.

J. Raceways Embedded in Slabs:
   1. Run conduit larger than 1-inch (27-mm) trade size, parallel or at right angles to main reinforcement. Where at right angles to reinforcement, place conduit close to slab support. Secure raceways to reinforcement at maximum 10-foot (3-m) intervals.
   2. Arrange raceways to cross building expansion joints at right angles with expansion fittings.
   3. Arrange raceways to keep a minimum of 2 inches (50 mm) of concrete cover in all directions.
4. Do not embed threadless fittings in concrete unless specifically approved by Engineer for each specific location.
5. Change from RNC to RAC before rising above floor.

K. Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound to threads of raceway and fittings before making up joints. Follow compound manufacturer’s written instructions.

L. Raceway Terminations at Locations Subject to Moisture or Vibration: Use insulating bushings to protect conductors including conductors smaller than No. 4 AWG.

M. Terminate threaded conduits into threaded hubs or with locknuts on inside and outside of boxes or cabinets. Install bushings on conduits up to 1-1/4-inch (35-mm) trade size and insulated throat metal bushings on 1-1/2-inch (41-mm) trade size and larger conduits terminated with locknuts. Install insulated throat metal grounding bushings on service conduits.

N. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb (90-kg) tensile strength. Leave at least 12 inches (300 mm) of slack at each end of pull wire. Cap underground raceways designated as spare above grade alongside raceways in use.

O. Install raceway sealing fittings at accessible locations according to NFPA 70 (NEC) and fill them with listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces.

P. Install devices to seal raceway interiors at accessible locations. Locate seals so no fittings or boxes are between the seal and the following changes of environments. Seal the interior of all raceways at the following points:

1. Where conduits pass from warm to cold locations, such as boundaries of refrigerated or air conditioned spaces.
2. Where an underground service raceway enters a building or structure.
3. Where conduits pass from classified to unclassified areas.
4. Where conduits enter panels or enclosures passing from hazardous or corrosive environments.
5. Where otherwise required by NFPA 70 (NEC) and/or where shown on drawings.

Q. Expansion-Joint Fittings (8” of travel required):

1. Install in each run of aboveground RNC that is located where environmental temperature change may exceed 30 deg F (17 deg C) and that has straight-run length that exceeds 25 feet (7.6 m).
2. Install type and quantity of fittings that accommodate temperature change listed for each of the following locations:

   a. Outdoor Locations Not Exposed to Direct Sunlight: 125 deg F (70 deg C) temperature change.
b. Outdoor Locations Exposed to Direct Sunlight: 155 deg F (86 deg C) temperature change.
c. Indoor Spaces Connected with Outdoors without Physical Separation: 125 deg F (70 deg C) temperature change.
d. Attics: 135 deg F (75 deg C) temperature change.

3. Install fitting(s) that provide expansion and contraction for at least 0.00041 inch per foot of length of straight run per degree F (0.06 mm per meter of length of straight run per degree C) of temperature change for PVC conduits.

4. Install expansion fittings at all locations where conduits cross building or structure expansion joints. Install expansion fittings in vertical portion of conduits where they emerge from the ground at the building or structure. Where installed to compensate for settlement, fittings shall be installed vertically in the compressed position.

5. Install each expansion-joint fitting with position, mounting, and piston setting selected according to manufacturer's written instructions for conditions at specific location at time of installation. Install conduit supports to allow for expansion movement.

R. Flexible Conduit Connections: Comply with NEMA RV 3. Use a maximum of 18 inches (460 mm) of flexible conduit for equipment subject to vibration, noise transmission, or movement; and for transformers and motors.

1. Use LFMC in damp or wet locations subject to severe physical damage.
2. Use LFMC in damp or wet locations not subject to severe physical damage.

S. Aluminum raceway shall not be in contact with concrete or earth.

T. Where RAC/GRC raceway exits concrete, it shall be PVC coated or isolated from contact with concrete using 3M heat shrink tubing or (2) layers of 3M mastic wrap tape.

U. Additional Fiberglass Conduit Requirements
1. Make joints in accordance with recommendations of manufacturer with two part epoxy resin adhesive system. Use cartridge adhesive gun system utilizing mixing applicator tips. Use proper adhesive for ambient temperature at time of installation.
2. Install Fiberglass conduits in accordance with manufacturer's instructions, the NEC, and in compliance with local utility practices.
3. All fiberglass conduits entering boxes, enclosures, or equipment, shall use proper adapters for the application.

V. Conduit installation in hazardous areas shall comply with NEC 501.

3.3 INSTALLATION OF UNDERGROUND CONDUIT

A. Direct-Buried Conduit:
1. Excavate trench bottom to provide firm and uniform support for conduit. Prepare trench bottom as specified in Division 2 Section "Earthwork" and “Trenching and backfilling” for pipe less than 6 inches (150 mm) in nominal diameter.

2. Install backfill as specified in Division 2 Section "Earthwork" and “Trenching and backfilling”.

3. After installing conduit, backfill and compact. Start at tie-in point, and work toward end of conduit run, leaving conduit at end of run free to move with expansion and contraction as temperature changes during this process. Firmly hand tamp backfill around conduit to provide maximum supporting strength. After placing controlled backfill to within 12 inches (300 mm) of finished grade, make final conduit connection at end of run and complete backfilling with normal compaction as specified in Division 2 Section "Earthwork" and “Trenching and backfilling”.

4. Install manufactured duct elbows for stub-up at poles and equipment and at building entrances through floor unless otherwise indicated. Encase elbows for stub-up ducts throughout length of elbow.

5. Install manufactured fiberglass conduit elbows for stub-ups at poles and equipment and at building entrances through floor.
   a. Couple fiberglass conduits to ducts with adapters designed for this purpose, and encase coupling with 3 inches (75 mm) of concrete for a minimum of 12 inches (300 mm) on each side of the coupling.
   b. For stub-ups at equipment mounted on outdoor concrete bases and where conduits penetrate building foundations, extend fiberglass conduit horizontally a minimum of 60 inches (1500 mm) from edge of foundation or equipment base. Install insulated grounding bushings on terminations at equipment.

6. Underground Warning Tape: Comply with requirements in Division 16 Section "Electrical Identification."

3.4 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS

A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies. Comply with requirements in division 16, section 16010 and other applicable divisions.

3.5 PROTECTION

A. Protect coatings, finishes, and cabinets from damage and deterioration.
   1. Repair damage to PVC coatings or paint finishes with matching touchup coating recommended by manufacturer.

END OF SECTION 16110
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SECTION 16120

WIRES AND CABLES

PART 1  GENERAL

1.1  SUMMARY

A. The work of this section consists of providing labor, materials, tools, appliances and miscellaneous accessories associated with the electrical wire and cable work indicated by the Drawings and schedules.

B. Types of wire, cable and connectors in this section include the following:

1. Copper conductors.
3. Fixture wires.
4. Ground wire.

C. Applications for wire, cable and connectors required for project are as follows:

1. Power distribution circuitry.
2. Branch circuitry.
3. Control circuitry.

PART 2  PRODUCTS

2.1  MANUFACTURERS

Available Manufacturers: Subject to compliance with requirements, provide products of one of the following (for each type of wire and cable):

1. Wire and Cable:
   a. Alcan Cable
   b. American Insulated Wire and Cable.
   c. Anixter
   d. Belden.
   e. Cerro Wire and Cable Co.
   f. Okonite Co.
   g. Phelps Dodge Wire & Cable.
   h. Southwire.
   i. BICC General

2. Connectors:
   a. AMP, Inc.
   b. Appleton Electric Co; Emerson Electric Co.
   c. Burndy Corporation.
   d. Brand-Rex Div, Pyle National Co.
2.2 WIRE AND CABLE

A. General

1. Except as otherwise indicated, provide UL listed wire, cable and connectors of manufacturer's standard materials, as indicated by published product information, designed and constructed as recommended by manufacturer, and as required for the installation.

B. 600 Volt Building Cable and Wire:

1. Provide soft or annealed copper wires meeting, before stranding, the requirements of ASTM B3, "Standard Specification for Soft or Annealed Copper Wire for electrical Purposes", latest edition.

C. Branch feeder and circuit conductors shall be copper, single conductor heat and moisture resistant and thermal plastic insulated for all sizes, rated 600 volts, stranded. Use solid wire up to #10 for final connection to wiring devices with screw terminals.

D. Lighting branch circuit wiring and motor control wiring shall be suitable for 60° C operating temperature, of types appropriate for dry or wet locations.

E. Feeders, sub-feeders and motor power wiring regardless of size shall be rated 600 volts and shall be suitable for 75° C operating temperature, of types appropriate for dry and wet locations.

F. Fixture wiring shall be 14 or 16 gauge, stranded, rated 600 volts and shall be suitable for 90° C operating temperature, (150° C under high temperature operating conditions) of types appropriate for dry or wet locations.

G. Multiconductor Cable: Cable shall be UL listed TC-ER tray cable consisting of multiple stranded copper THHN/THWN insulated conductors with bare copper ground conductor, covered by an overall sunlight and UV resistant crush resistant PVC or CPE jacket.

1. Minimum conductor size shall be #12 AWG unless specified otherwise on drawings.
2. Cable shall be NTL listed:
   a. UL 66 NEC Type TFN conductors
   b. UL 1277 Type TC-ER
H. Shielded Instrument Cable: Cable shall be UL listed instrumentation, cable consisting of one or more shielded twisted pairs, solid or stranded tinned copper as indicated on drawings. PVC insulated conductors with foil shield and/or tinned copper braid shield. bare copper ground conductor, covered by an overall sunlight and UV resistant crush resistant PVC or CPE jacket.
   1. Minimum conductor size shall be #22 AWG unless specified otherwise on drawings.
   2. Cable shall be NTL listed:
      a. NE/UL CMG, ITC, PLTC, PLTC-ER
      b. UL 1685
      c. UL 2464
      d. UL 20201
   3. Shielded Instrument cable shall be Belden as specified on drawings or Engineer approved equivalent.

I. Ethernet Cable: Cable shall be UL listed Cat 5e or 6, cable consisting of four bonded twisted pairs, solid copper polyolefin insulated conductors with unshielded, covered by an overall sunlight and UV resistant crush resistant PVC or CPE jacket.
   1. Minimum conductor size shall be #22 AWG unless specified otherwise on drawings.
   2. Cable shall be NTL listed:
      a. NE/UL CMG, CMX, PLTC
      b. UL 1661
   3. Ethernet cable shall be Belden as specified on drawings or Engineer approved equivalent.

J. Unless otherwise specified, wire for the various services shall be of the following types:
   1. Branch lighting circuits, Type "THW" or "THHN/THWN" copper.
   2. Branch power circuits, Type "THW" or "THWN" copper.
   3. Main feeders and sub-feeders, Type "THW" or "THHN/THWN" copper.
   4. Fixture wiring, Type "TFFN" (Type "SFF for high temperatures) copper.
   5. Motor control wiring, Type "TW" copper.

K. Insulation: Insulation shall meet or exceed the requirements of UL 83, "Standard for Thermoplastic Insulated Wires."
   1. Insulation for conductors sized No. 18 AWG through No. 10 AWG shall be UL Type THW, or THHN/THWN.
   2. Insulation for conductors sized No. 8 AWG and larger shall be UL Type THW, THHN/THWN.
   3. All wiring inside lighting fixtures shall be temperature rated per the NEC.

PART 3 EXECUTION
3.1 INSTALLATION

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

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

C. Pull conductors together where more than one is being installed in a raceway.

D. Use pulling compound or lubricant, where necessary; compound must not deteriorate conductor or insulation. Use only U.L. listed lubricant.

E. Use pulling means, including fish tape, cable or rope which cannot damage raceway.

F. No conductor shall bear more than eighty percent (80%) of its rated ampacity. All conductors, including neutrals, shall be tested under full load conditions to ensure proper loading.

G. Keep conductor splices to minimum. Feeder conductor splices are not allowed unless approved by Engineer.

H. Use splice and tap connectors which are compatible with conductor material.

I. The system shall be properly grounded and continuously polarized throughout following the color coding specified.

J. In general, conductors shall be of the same size from the last protective device to the load.

K. Do not pull conductors into raceways until raceway system (including all outlets, cabinets, bushings and fittings) is completed. Verify that all work of other trades which may cause conductor damage is completed. Use only approved cable lubricants when necessary.

L. On termination at branch circuit outlets leave a minimum of eight inches (8") free conductor for installation of devices and fixtures.

M. Cover uninsulated splices, joints and free ends of conductor with rubber and friction tape of PVC electrical tape. Plastic insulating caps may serve as insulation.

N. Do not use mechanical means to pull wire No. 8 or smaller.

O. Branch circuit conductors shall not be smaller than #12AWG and shall be sized as required by the load served and for specific N.E.C. requirements. Conductors for 20 amp branch circuits of 120 volts, more than 100 ft. long (to the first fixture or other current-consuming outlet) shall be No. 10-AWG minimum.
Control circuit conductors shall be #14 AWG, stranded. Contractor responsible for sizing conductors for voltage drop.

All single conductor cables shall be installed in conduit.

Tray cable shall be installed in tray per NEC and secured to tray rungs with sunlight and UV resistant nylon zip ties listed and approved for tray use. Tray cable may be run in conduit where shown on drawings observing proper conduit fill per NEC.

Ground conductors #6 AWG and smaller shall either be bare metal or have green insulation. Ground conductors larger than #6 AWG shall have a minimum of 6" taped with green tape at all terminations and/or splices. All uninsulated ground conductors shall be tin coated copper.

All exposed copper conductors/terminations shall be coated with a UL listed oxide/corrosion inhibitor.

Prior to energization, test cable and wire for continuity of circuitry, and also for short circuits. Correct malfunctions when detected.

Subsequent to wire and cable hook-ups, energize circuitry and demonstrate functioning in accordance with requirements.

END OF SECTION 16120
SECTION 16135

ELECTRICAL BOXES AND FITTINGS

PART 1 - GENERAL

1.1 SUMMARY

A. The work of this section consists of providing labor, material, tools, appliances and miscellaneous accessories associated with the electrical box and electrical fitting work indicated by drawings and schedules.

B. Types of electrical boxes and fittings in this section include the following:

1. Outlet boxes.
2. Junction boxes.
3. Pull boxes.
5. Locknuts.

PART 2 PRODUCTS

2.1 OUTLET BOXES

A. Provide copper free aluminum or stainless steel boxes, of shapes, cubic inch capacities, and sizes, including box depths, for interior air conditioned spaces. Construct outlet boxes with mounting holes, and with cable and conduit-size knockout openings in bottom and sides. Provide boxes with threaded screw holes, with corrosion-resistant cover and grounding screws for fastening surface and device type box covers, and for equipment type grounding. Provide one-piece condulet cast device boxes for interior/exterior non-conditioned areas constructed of copper free aluminum with mounting lugs and raised hubs for threaded rigid conduit. Threaded conduit sizes and single / multi-gang boxes as required to be installed for all surface mounted devices mounted below 8'-0" A.F.F. Sizes and minimum depths shall be as follows:

1. Surface: Provide one-piece, corrosion-resistant, cast copper free aluminum outlet wiring boxes, of types FS or FD, cast threaded raised conduit hubs, shapes and sizes, including depth of boxes to suit each respective location and installation; construct with threaded conduit ends and with threaded screw holes for securing box covers and wiring devices. Contractor to furnish matching cover plates as required.
2. Special: Where above types are not suitable, furnish boxes constructed of type 316 stainless steel to suit the use taking into account space available, appearance, and Code requirements.

3. Gangable boxes are prohibited.

B. Outlet Box Accessories:

1. Provide outlet box accessories as required for each installation, including box supports mounting ears and brackets, fixture studs, cable clamps and metal straps for supporting outlet boxes, which are compatible with outlet boxes being used to fulfill installation requirements of individual wiring situations. Choice of accessories is Installer's code-compliance option.

2. Manufacturer: Subject to compliance with requirements, provide interior outlet boxes and accessories of one of the following:
   a. Appleton Electric Co.
   b. Crouse-Hinds
   c. Thomas & Betts

C. Weatherproof Outlet Boxes:

1. Provide corrosion-resistant cast copper free aluminum weatherproof outlet wiring boxes, of types, shapes and sizes, cast threaded raised conduit hubs, including depth of boxes to suit each respective location and installation; construct with threaded conduit ends and with threaded screw holes for securing box covers and wiring devices.

2. Manufacturer: Subject to compliance with requirements, provide weatherproof outlet boxes of one of the following:
   a. Appleton Electric Co.
   b. Crouse-Hinds Co.
   c. Thomas & Betts

2.2 BOXES, ENCLOSURES, AND CABINETS

A. General Requirements for Boxes, Enclosures, and Cabinets: Boxes, enclosures, and cabinets installed in wet locations shall be listed for use in wet locations. Die-cast metal enclosure are not acceptable.

B. Sheet Metal Outlet and Device Boxes: Comply with NEMA OS 1 and UL 514A.

C. Cast-Metal Outlet and Device Boxes: Comply with NEMA FB 1, galvanized ferrous alloy or copper free aluminum, Type FD, with gasketed cover.

D. Nonmetallic Outlet and Device Boxes: Comply with NEMA OS 2 and UL 514C.
E. Luminaire Outlet Boxes: Nonadjustable, designed for attachment of luminaire weighing 50 lb (23 kg). Outlet boxes designed for attachment of luminaires weighing more than 50 lb (23 kg) shall be listed and marked for the maximum allowable weight.

F. Cast-Metal Access, Pull, and Junction Boxes: Comply with NEMA FB 1 and UL 1773, galvanized, cast steel or copper free aluminum, with neoprene gasketed cover and stainless steel screws.

G. Device Box Dimensions: 4 inches square by 2-1/8 inches deep (100 mm square by 60 mm deep).

H. Gangable boxes are prohibited.

I. Hinged-Cover Enclosures: Comply with UL 50 and NEMA 250, Type 1, 3RX, 4X (316 stainless steel) as required with continuous-hinge cover with surface mounted, welded in place, pad-lockable latches unless otherwise indicated. Type 3RX or 4X enclosures shall have continuous poured in place gaskets with clamp type closures. Glued in place or adhesive backed gaskets are not allowed.

J. Cabinets:

4. NEMA 250, Type 1, 3RX, 4X (316 stainless steel) as required, galvanized-steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel.
5. Hinged door in front cover with flush latch and concealed continuous hinge.
6. Continuous poured in place gaskets. Glued in place or adhesive backed gaskets are not allowed.
7. Key latch to match panelboards.
8. Metal barriers to separate wiring of different systems and voltage.
9. Accessory feet where required for freestanding equipment.
10. Nonmetallic cabinets shall be listed and labeled as defined in NFPA 70 (NEC), by a qualified testing agency, and marked for intended location and application.

2.3 BUSHINGS, KNOCKOUT CLOSURES AND LOCKNUTS

D. Provide stainless steel punched-steel knockout closures, conduit locknuts and plastic conduit bushings, and offset connectors, of types and sizes to suit respective uses and installation.

E. Manufacturer: Subject to compliance with requirements, provide bushings, knockout closures, locknuts and connectors of one of the following:
1. Appleton Electric Co.
2. O-Z/Gedney Co.
3. RACO, Inc.
4. Steel City/Midland-Ross Corp.
5. Thomas and Betts Co., Inc.

METAL WIREWAYS AND AUXILIARY GUTTERS

F. Description: Sheet metal, complying with UL 870 and NEMA 250, Type 1, 3RX or 4X (316 stainless steel) as required and sized according to NFPA 70 (NEC).

1. Metal wireways installed outdoors shall be listed and labeled as defined in NFPA 70 (NEC), by a qualified testing agency, and marked for intended location and application.

G. Fittings and Accessories: Include covers, couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.

PART 3 EXECUTION

3.1 INSTALLATION OF ELECTRICAL BOXES AND FITTINGS

A. General: Install electrical boxes and fittings where indicated, complying with manufacturer's written instructions, applicable requirements of NEC and NECA's "Standard of Installation", and in compliance with recognized industry practices to ensure that products fulfill requirements.

H. Coordinate installation of electrical boxes and fittings with wire/cable and raceway installation work.

I. Provide weathertight outlet boxes for interior and exterior locations exposed to weather or moisture.

J. Provide knockout closures to cap unused knockout holes where blanks have been removed.

K. Install boxes and conduit bodies in those locations which ensure ready accessibility of electrical wiring.
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L. Avoid installing boxes back-to-back in walls. Provide not less than 6” separation.

M. Position recessed boxes accurately to allow for surface finish thickness.

N. Round boxes are not acceptable where conduit must enter box through side of box, which would result in difficult and insecure connections when fastened with locknut or bushing on rounded surface.

O. Fasten boxes rigidly to substrates or structural surfaces to which attached, or solidly embed electrical boxes in concrete or masonry.

P. Mounting heights are specified on Drawings and in Section 16010.

END OF SECTION 16135
SECTION 16142

ELECTRICAL CONNECTIONS FOR EQUIPMENT

PART 1 GENERAL

1.1 SUMMARY

A. The work of this section consists of providing labor, materials, tools, appliances and miscellaneous accessories associated with the electrical connections for equipment indicated by drawings and schedules.

B. Electrical connections are hereby defined to include, but not necessarily be limited to, connections for providing electrical power to equipment, splices, and taps.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. Control system wiring.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, provide products of one of the following (for each type of product):

1. AMP Products Corp.
3. Burndy Corp.
4. Ideal Industries, Inc.
5. Penn Union
6. Scotch - 3M Division
7. T and B / Thomas and Betts Corp.

B. Materials and Components:

1. General: For each electrical connection indicated, provide complete assembly of materials, including but not necessarily limited to, pressure connectors, terminals (lugs) electrical insulating tape, electrical solder, electrical soldering flux, heat-shrinkable insulating tubing, cable ties, solderless wire nuts, and other items and accessories as needed to complete splices and termination of types indicated.

2. Wire, Cable and Connectors:
   a. Wire: Unless otherwise indicated, provide wires/conductors for electrical connections which match wires/conductors of wiring supplying power.
   b. Connectors and Terminals: Provide electrical connectors and terminals as recommended by connector and terminal manufacturer for intended
3. **Electrical Connection Accessories**: Provide electrical insulating tape, heat-shrinkable insulating tubing and boots, solder, electrical soldering flux, wire nuts and cable ties as recommended for use by accessories manufacturers for type services indicated.

4. **Taps, Splices & Terminations**: All secondary feeder taps shall be made of cast copper, 2-bolt type connector, with insulating covers. Terminals connections shall be made with 2-bolt, clamp type lugs, as manufactured by:
   a. O.Z. Gedney
   b. Penn Union Corp.
   c. Thomas & Betts.

5. **Taps and splices for branch circuit wiring #14 to #6** shall be made with approved solderless pressure spring connectors with insulating covers as manufactured by:
   a. Minnesota Mining & Manufacturing Company
   b. Ideal Industries, Inc.
   c. NEER/OZ Gedney
   d. Buchanan Electrical Products Corporation

6. **Tape** shall be Scotch #33 and shall be applied so that the insulation is not less than that of the wire.

7. **Cable supports** shall consist of composition cable clamps as manufactured by:
   a. O.Z. Gedney
   b. Burndy Corporation

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**Part 3  EXECUTION**

3.1 **INSTALLATION OF ELECTRICAL CONNECTIONS**

A. Install electrical connections as indicated, in accordance with connector manufacturer's written instructions and with recognized industry practices, and complying with requirements of NEC and NECA's "Standard of Installation" to ensure that products fulfill requirements.

B. Connect electrical power supply conductors to equipment conductors in accordance with equipment manufacturer's written instructions and wiring diagrams. Wherever possible, mate and match conductors of electrical connections for proper interface between electrical power supplies and installed equipment.

C. Coordinate installation of electrical connections for equipment with equipment installation work.

D. Cover splices with electrical insulation equivalent to, or of higher rating, than
E. Prepare cables and wires, by cutting and stripping, covering armor, jacket, and insulation properly to ensure uniform and neat appearance where cables and wires are terminated. All exposed copper conductors/terminations shall be coated with a UL listed oxide/corrosion inhibitor.

F. Trim cables and wires as short as practicable and arrange routing to facilitate inspection, testing and maintenance.

G. Tighten wire-binding connector screws firmly.

H. Refer to "Electrical Identification" Section 16195 for identification of electrical power supply and control wiring conductor terminations with markers approved as to types, colors, letter and marker sizes, by Architect/Engineer. Affix markers at each point of termination, as close as possible to each point of connection.

END OF SECTION 16142
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SECTION 16143

WIRING DEVICES

1.0 GENERAL

1.01 SUMMARY

A. The work of this section consists of providing labor, materials, tools, appliances and miscellaneous accessories for wiring device work indicated by Drawings and schedules. Wiring devices are defined as single discrete units of electrical distribution systems which are intended to carry but not utilize electric energy.

B. Types of electrical wiring devices in this section include the following:

1. Receptacles.
2. Ground-fault circuit interrupters.
4. Wallplates.
5. Plugs and connectors.

2.0 PRODUCTS

2.01 MANUFACTURERS

A. Available Manufacturer: Subject to compliance with requirements,

2.02 WIRING DEVICES

A. General: Provide factory-fabricated wiring devices, in types, colors, and electrical ratings for applications indicated and complying with NEMA Stds. Pub. No. WD 1. Where types and grades are not indicated, provide proper selection as determined by Installer to fulfill wiring requirements, and color devices and wallplates except as otherwise selected.

B. Receptacles:

1. Duplex: Provide duplex "specification grade" receptacles, 2-pole, 3-wire grounding, with green hexagonal equipment ground screw, ground terminals and poles internally connected to mounting yoke and mounting yoke provided with automatic grounding feature between mounting screws and yoke, 20-ampere, 125-volts, with metal plaster ears, back and side wiring, NEMA configuration 5-20R unless otherwise indicated. Pass & Seymour #5362-G or approved equivalent.

2. Ground-Fault Interrupter: Provide "specification grade" duplex receptacles, ground-fault circuit interrupters (GFCI), feed-thru type, capable of protecting connected downstream receptacles on single-circuit, grounding type UL-rated
Class A, 20-ampere rating, 120-volts, 60 Hz, with solid-state ground-fault sensing and signaling, with 5 milliamperes ground-fault trip level; equip with 20-ampere plug configuration, NEMA 5-20R and with local test/reset buttons. Pass & Seymour #2091-S or approved equivalent.

C. Plugs and Connectors:
   1. Plugs: Refer to drawings.
   2. Connectors: Refer to drawings.

D. Switches:
   1. Provide " specification grade" flush, quiet, AC-type. Pass & Seymour #20ACI or approved equivalent

2.03 WIRING DEVICE ACCESSORIES

A. Wall Plates: Provide wall plates for wiring devices, of types, sizes, and with ganging and cutouts as indicated on drawings (or schedules). Construct with metal screws with tamperproof heads for securing plates to devices, screw heads colored to match finish of plates.

B. Provide flush weather proof while in-use enclosures UV stabilized lexan, with lockable hasp for all exterior receptacles.

3.0 EXECUTION

3.01 INSTALLATION OF WIRING DEVICES/PLATES

A. Install wiring devices as indicated, in compliance with manufacturer’s written instructions, applicable requirements of NEC and NECA’s "Standard of Installation", and in accordance with recognized industry practices to fulfill project requirements.

B. Coordinate with other work, including painting, electrical box and wiring work, as necessary to interface installation of wiring devices with other work, furniture locations, and door swings.

C. Verify location of all devices with Architect before beginning construction.

D. Install wiring devices only in electrical boxes which are clean, free from excess building materials, dirt, and debris.

E. Install weatherproof covers at all damp or exposed locations, and as indicated on...
drawings.

F. Delay installation of wiring devices until wiring work is completed.

G. Delay installation of wall plates until after painting work is completed.

H. Protect wiring devices during painting.

I. Plates shall be installed with all four edges in continuous contact with finished wall surfaces without the use of mats or similar devices. Plaster fillings will not be permitted. Plates shall be installed with an alignment tolerance of 1/16” from the vertical or horizontal.

3.02 GROUNDING

Provide electrically continuous, tight grounding connections for wiring devices, unless otherwise indicated.

END OF SECTION
SECTION 16190

SUPPORTING DEVICES

PART 1 GENERAL

1.1 SUMMARY

A. The work of this section consists of providing labor, materials, tools, appliances and miscellaneous accessories associated with supports, anchors, sleeves and seals indicated herein and on Drawings and schedules.

B. Types of supports, anchors, sleeves and seals specified in this section include the following:

1. Clevis hangers.
2. Riser clamps.
3. C-clamps.
4. I-beam clamps.
5. One-hole rigid conduit straps with bases.
6. Round 316 stainless steel rods.
7. 316 Stainless steel expansion anchors.
8. Wall and floor seals.
9. 316 Stainless steel Uni-strut for all locations.

C. Supports, anchors, sleeves and seals furnished as part of factory-fabricated equipment, are specified as part of equipment assembly in other Divisions-16 sections.

1.2 QUALITY ASSURANCE

A. Manufacturers: Firms regularly engaged in manufacture of supporting devices, of types, sizes, and ratings required, whose products have been in satisfactory use in similar service for not less than 3 years.

B. Installer: Qualified with at least 3 years of successful installation experience on projects with electrical installation work similar to that required for project.

C. NEC Compliance: Comply with NEC as applicable to construction and installation of electrical supporting devices.

D. ANSI/NEMA Compliance: Comply with applicable requirements of ANSI/NEMA Std Pub No. FB1, "Fittings and Supports for Conduit and Cable Assemblies".

E. MSS Compliance: Comply with applicable MSS standard requirements pertaining to fabrication and installation practices for pipe hangers and supports.

F. NECA Compliance: Comply with National Electrical Contractors Association's...
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"Standard of Installation" pertaining to anchors, fasteners, hangers, supports, and equipment mounting.

G. UL Compliance: Provide electrical components which are UL-listed and labeled.

H. FS Compliance: Comply with Federal Specification FF-S-760 pertaining to retaining strap for conduit, pipe and cable.

1.3 SUBMITTALS

A. Product Data: Submit catalog cuts, specifications, installation instructions, for each type of support, anchor, sleeve and seal.

PART 2 PRODUCTS

2.1 MANUFACTURED SUPPORTING DEVICES

A. General: Provide supporting devices complying with manufacturer's standard materials, design and construction in accordance with published product information, and as required for a complete installation, and as herein specified. Where more than one type of device meets indicated requirements, selection is Installer's option.

B. Supporting devices shall be manufactured with materials compatible with the devices and raceway supported. Strut and clamps shall be 316 stainless steel.

C. Anchors, all thread rod, nuts, washers, bolts, etc. shall be 316 stainless steel.

D. Where dissimilar metals come in contact they shall be isolated by a suitable insulating material.

PART 3 EXECUTION

3.1 INSTALLATION OF SUPPORTING DEVICES

A. Install hangers, anchors, sleeves and seals in accordance with manufacturer's written instructions and with recognized industry practices to insure supporting devices comply with requirements of NECA, NEC and ANSI/NEMA for installation of supporting devices.

B. Coordinate with other electrical work, including raceway and wiring work, as necessary to interface installation of supporting devices with other work.

C. Install hangers, supports, clamps and attachments to support piping properly from building structure. Arrange for grouping of parallel runs of horizontal conduits to be supported together on trapeze type hangers where possible. Install supports with maximum spacings indicated.

D. Aluminum shall not be used in direct contact with concrete. Stainless steel shall
be used for all anchors, supports, clamps, etc. that come in contact with concrete.

E. Tighten sleeve seal nuts until sealing grommets have expanded to form watertight seal.

F. Coordinate all conduit penetrations, below grade, into building from the exterior with Division 1.

END OF SECTION 16190
SECTION 16195

ELECTRICAL IDENTIFICATION

PART 1  GENERAL

1.1  SUMMARY

A. The work of this section consists of providing labor, materials, tools, appliances and miscellaneous accessories associated with electrical identification as indicated herein and on the Drawings.

B. Types of electrical identification specified in this section include the following:

1. Exposed conduit color banding.
2. Cable/Conductor identification.
3. Operational instructions and warnings.
4. Danger signs.
5. Equipment/system identification signs.
6. Arc flash hazard labels

PART 2  PRODUCTS

2.1  MANUFACTURERS

A. Acceptable Manufacturers: Subject to compliance with requirements.

2.2  ELECTRICAL IDENTIFICATION MATERIALS

A. General: Except as otherwise indicated, provide manufacturer's standard products of categories and types required for each application. Where more than single type is specified for an application, selection is Installer's option, but provide single selection for each application.

B. Color-Coded Conduit Markers: Provide manufacturer's standard pre-printed, flexible or semi-rigid, permanent, plastic-sheet conduit markers, extending 360 degrees around conduits, designed for attachment to conduit by adhesive, adhesive lap joint of marker, or matching adhesive plastic tape at each end of marker, or pretensioned snap-on.

C. Except as otherwise indicated, provide lettering which indicates voltage of conductor(s) in conduit. Prove 8" minimum length for 2" and smaller conduit, 12" length for larger conduit. Unless otherwise indicated or required by governing regulation, provide orange markers with black letters.

D. Cable/Conductor Identification Bands: General: Provide manufacturer's standard vinyl-cloth self-adhesive cable/conductor wire markers or wrap-around type, either pre-numbered plastic coated type, or write on type with clear plastic self-adhesive
E. Self-adhesive Plastic Signs: Provide manufacturer's standard, self-adhesive or pressure-sensitive, pre-printed, flexible vinyl signs for operational instructions or warnings, of sizes suitable for application areas and adequate for visibility, with proper wording for each application (as examples: "208V", "EXHAUST FAN", "RECTIFIER"). Unless otherwise indicated or required by governing regulations, provide orange signs with black lettering.

F. Danger Signs: Provide Manufacturer's standard "DANGER" signs of baked enamel finish on 20-gage steel, of standard red, black and white graphics, 14" x 10" size except where 10" x 7" is the largest size which can be applied where needed and except where larger size is needed for adequate vision, and with recognized standard explanation wording (as examples: "HIGH VOLTAGE", "KEEP AWAY", "BURIED CABLE", "DO NOT TOUCH SWITCH").

G. Engraved Plastic-Laminate Signs: Provide engraved stock melamine plastic-laminate, complying with FS L-P-387, in sizes and thicknesses indicated, engraved with engraver's standard letter style of sizes and wording indicated, black and white core (letter color) except as otherwise indicated, punched for mechanical fastening except where adhesive mounting is necessary because of substrate.

1. Thickness: 1/16", for units up to 20 sq. in. or 8" length, 1/8" for larger units.

2. Fasteners: Self-tapping stainless steel screws, except contact-type permanent adhesive where screws cannot or should not penetrate substrate.

2.3 LETTERING AND GRAPHICS

A. Coordinate names, abbreviations and other designations used in electrical identification work, with corresponding designations shown, specified for scheduled. Provide numbers, lettering and wording as indicated or, if not otherwise indicated, as recommended by manufacturers or as required for proper identification and operation/maintenance of electrical system and equipment.
B. Conduit Identification:

1. General: Where electrical conduit is exposed in spaces with exposed mechanical piping which is identified by a color-coded method, apply color-coded identification on electrical conduit in a manner similar to piping identification. Except as otherwise indicated, use orange as coded color for conduit.

C. Cable/Conductor Identification:

1. Apply cable/conductor identification on each box/enclosure/cabinet where wires are present. Match identification with marking system used in panelboards, shop drawings, contract documents, and similar previously established identification for project electrical work.

2. Conductors shall be clearly and permanently identified.

3. All conductors shall be clearly and permanently identified, and color coded per NEC. All control circuit and instrument circuit terminations shall be identified. For conductors #6 and smaller, conductor color coding shall be colored insulation. For conductor color coding of wire larger than #6, use self-adhesive wrap around tape markers. Use markers at all panelboards, boxes, outlets, switches, circuit breakers and control centers.

   a. All ground conductors and these only: Green.

   b. 208Y/120V:
      - Phase A: Black
      - Phase B: Red
      - Phase C: Blue
      - Neutral: White.

   c. 480Y/277V:
      - Phase A: Brown
      - Phase B: Orange
      - Phase C: Yellow
      - Neutral: Gray

4. Operational Instructions and Warnings: Wherever reasonably required to ensure safe and efficient operation and maintenance of electrical systems, and electrically connected mechanical systems and general systems and equipment, including prevention of misuse of electrical facilities by unauthorized personnel, install self-adhesive plastic signs or similar equivalent identification, instruction or warnings on switches, outlets and other controls devices and covers of electrical enclosures. Where detailed instructions or explanations are needed, provide plasticized tags with clearly written messages adequate for intended purposes.
5. Equipment/System Identification:

a. Install engraved plastic-laminate sign on each major unit of electrical equipment in building unless unit is specified with its own self-explanatory identification. Except as otherwise indicated, provide single line of text, 1/2" high lettering on 1-1/2" high sign (2" high where 2 lines are required), white lettering in black field. Provide text matching terminology and numbering of the contract documents and shop drawings. Provide signs for the following categories of electrical work:

   (1) Panelboards, electrical cabinets and enclosures.
   (2) Access panel/doors to electrical facilities.
   (3) Major electrical switchboard.
   (4) Generator and Accessories.
   (5) Motor control centers.
   (6) Power transfer equipment.
   (7) Disconnect Switches.

b. Install signs at locations indicated or, where not otherwise indicated, at location for best convenience of viewing without interference with operation and maintenance of equipment. Secure to substrate with fasteners, except use adhesive where fasteners should not or cannot penetrate the substrate.

END OF SECTION 16195
SECTION 16269 - VARIABLE FREQUENCY CONTROLLERS

PART 1 - GENERAL

1.1 SUMMARY
A. Section includes separately enclosed, pre-assembled, combination VFCs, rated 600 V and less, for speed control of three-phase, squirrel-cage induction motors.

1.2 DEFINITIONS
A. BAS: Building automation system.
B. CE: Conformite Europeene (European Compliance).
C. CPT: Control power transformer.
D. EMI: Electromagnetic interference.
E. IGBT: Insulated-gate bipolar transistor.
F. LAN: Local area network.
G. LED: Light-emitting diode.
H. MCP: Motor-circuit protector.
I. NC: Normally closed.
J. NO: Normally open.
K. OCPD: Overcurrent protective device.
L. PID: Control action, proportional plus integral plus derivative.
M. PWM: Pulse-width modulated.
N. RFI: Radio-frequency interference.
O. VFC: Variable-frequency motor controller.

1.3 PERFORMANCE REQUIREMENTS
A. Seismic Performance: VFCs shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
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 and the unit will be fully operational after the seismic event."

1.4 ACTION SUBMITTALS

A. Product Data: For each type and rating of VFC indicated.

B. Shop Drawings: For each VFC indicated. Include dimensioned plans, elevations, and sections; and conduit entry locations and sizes, mounting arrangements, and details, including required clearances and service space around equipment.
   1. Show tabulations of installed devices, equipment features, and ratings.
   2. Schematic and Connection Wiring Diagrams: For power, signal, and control wiring.

1.5 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Floor plans, drawn to scale, showing dimensioned layout, required working clearances, and required area above and around VFCs. Show VFC layout and relationships between electrical components and adjacent structural and mechanical elements. Show support locations, type of support, and weight on each support. Indicate field measurements.

B. Seismic Qualification Certificates: For VFCs, accessories, and components, from manufacturer.
   1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
   2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
   3. Detailed description of equipment anchorage devices on which the certification is based, and their installation requirements.

C. Product certificates.

D. Source quality-control reports.

E. Field quality-control reports.

1.6 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.
1.7 QUALITY ASSURANCE

A. Testing Agency Qualifications: Member company of NETA or an NRTL.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. Comply with NFPA 70.

D. IEEE Compliance: Fabricate and test VFC according to IEEE 344 to withstand seismic forces defined in Division 16 Section "Vibration and Seismic Controls for Electrical Systems."

1.8 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace VFCs that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURED UNITS

A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings:
   1. Toshiba International Corporation AS3.

B. General Requirements for VFCs: Comply with NEMA ICS 7, NEMA ICS 61800-2, and UL 508C.

C. Application: Variable torque.

D. VFC Description: Variable-frequency power converter (rectifier, dc bus, and IGBT, PWM inverter) factory packaged in an enclosure, with integral disconnecting means and overcurrent and overload protection; listed and labeled by an NRTL as a complete unit; arranged to provide self-protection, protection, and variable-speed control of one or more three-phase induction motors by adjusting output voltage and frequency.

1. Units suitable for operation of NEMA MG 1, Design A and Design B motors as defined by NEMA MG 1, Section IV, Part 30, "Application Considerations for Constant Speed Motors Used on a Sinusoidal Bus with Harmonic Content and General Purpose Motors Used with Adjustable-Voltage or Adjustable-Frequency Controls or Both."
2. Units suitable for operation of inverter-duty motors as defined by NEMA MG 1, Section IV, Part 31, "Definite-Purpose Inverter-Fed Polyphase Motors."

3. Listed and labeled for integrated short-circuit current (withstand) rating by an NRTL acceptable to authorities having jurisdiction.

E. Design and Rating: Match load type, such as fans, blowers, and pumps; and type of connection used between motor and load such as direct or through a power-transmission connection.

F. Output Rating: Three-phase; 10 to 60 Hz, with voltage proportional to frequency throughout voltage range; maximum voltage equals input voltage.

G. Unit Operating Requirements:
   1. Input AC Voltage Tolerance: Plus 10 and minus 10 percent of VFC input voltage rating.
   2. Input AC Voltage Unbalance: Not exceeding 5 percent.
   3. Input Frequency Tolerance: Plus or minus 3 percent of VFC frequency rating.
   4. Minimum Efficiency: 97 percent at 60 Hz, full load.
   5. Minimum Displacement Primary-Side Power Factor: 98 percent under any load or speed condition.
   7. Ambient Temperature Rating: Not less than 14 deg F (minus 10 deg C) and not exceeding 140 deg F (60 deg C).
   8. Ambient Storage Temperature Rating: Not less than minus 4 deg F (minus 20 deg C) and not exceeding 140 deg F (60 deg C)
   10. Altitude Rating: Not exceeding 3300 feet (1005 m).
   12. Overload Capability: 1.5 times the base load current for 60 seconds; minimum of 1.8 times the base load current for three seconds.
   13. Starting Torque: Minimum 100 percent of rated torque from 3 to 60 Hz.
   14. Speed Regulation: Plus or minus 5 percent.
   15. Output Carrier Frequency: Selectable; 0.5 to 15 kHz.
   16. Stop Modes: Programmable; includes fast, free-wheel, and dc injection braking.

H. Inverter Logic: Microprocessor based, 32 bit, isolated from all power circuits.

I. Isolated Control Interface: Allows VFCs to follow remote-control electrical signal over a minimum 40:1 speed range.

J. Internal Adjustability Capabilities:
   1. Minimum Speed: 5 to 25 percent of maximum rpm.
   2. Maximum Speed: 80 to 100 percent of maximum rpm.
   3. Acceleration: 0.1 to 999.9 seconds.
   4. Deceleration: 0.1 to 999.9 seconds.
   5. Current Limit: 30 to minimum of 150 percent of maximum rating.

K. Self-Protection and Reliability Features:
1. Input transient protection by means of surge suppressors to provide three-phase protection against damage from supply voltage surges 10 percent or more above nominal line voltage.
2. Loss of Input Signal Protection: Selectable response strategy, including speed default to a percent of the most recent speed, a preset speed, or stop; with alarm.
4. Inverter overcurrent trips.
5. VFC and Motor Overload/Overt temperature Protection: Microprocessor-based thermal protection system for monitoring VFCs and motor thermal characteristics, and for providing VFC over temperature and motor overload alarm and trip; settings selectable via the keypad; NRTL approved.
6. Critical frequency rejection, with three selectable, adjustable deadbands.
7. Instantaneous line-to-line and line-to-ground overcurrent trips.
10. Short-circuit protection.
11. Motor overtemperature fault.

L. Automatic Reset/Restart: Attempt three restarts after drive fault or on return of power after an interruption and before shutting down for manual reset or fault correction; adjustable delay time between restart attempts.

M. Power- Interruption Protection: To prevent motor from re-energizing after a power interruption until motor has stopped, unless "Bidirectional Autospeed Search" feature is available and engaged.

N. Bidirectional Autospeed Search: Capable of starting VFC into rotating loads spinning in either direction and returning motor to set speed in proper direction, without causing damage to drive, motor, or load.

O. Torque Boost: Automatically varies starting and continuous torque to at least 1.5 times the minimum torque to ensure high-starting torque and increased torque at slow speeds.

P. Motor Temperature Compensation at Slow Speeds: Adjustable current fall-back based on output frequency for temperature protection of self-cooled, fan-ventilated motors at slow speeds.

Q. Integral Input Disconnecting Means and OCPD: NEMA AB 1, circuit breaker with padlockable, door-mounted handle mechanism.

1. Disconnect Rating: Not less than 115 percent of VFC input current rating.
2. Disconnect Rating: Not less than 115 percent of NFPA 70 motor full-load current rating or VFC input current rating, whichever is larger.

2.2 CONTROLS AND INDICATION

A. Status Lights: Door-mounted LED indicators displaying the following conditions:
1. Power on.
2. Run.
3. Overvoltage.
4. Line fault.
5. Overcurrent.

B. Panel-Mounted Operator Station: Manufacturer's standard front-accessible, sealed keypad and plain-English language digital display; allows complete programming, program copying, operating, monitoring, and diagnostic capability.

1. Keypad: In addition to required programming and control keys, include keys for HAND, OFF, and AUTO modes.
2. Security Access: Provide electronic security access to controls through identification and password with at least three levels of access: View only; view and operate; and view, operate, and service.
   a. Control Authority: Supports at least four conditions: Off, local manual control at VFC, remote manual control (Remote control panel for Start, Stop, speed control, and speed display), and automatic control through a remote source (SCADA/PLC system).

C. Historical Logging Information and Displays:

1. Running log of total power versus time.
2. Total run time.
3. Fault log, maintaining last four faults with time and date stamp for each.

D. Indicating Devices: Digital display mounted flush in VFC door and connected to display VFC parameters including, but not limited to:

1. Output frequency (Hz).
5. Motor torque (percent).
6. Fault or alarming status (code).
7. PID feedback signal (percent).
8. DC-link voltage (V dc).
9. Set point frequency (Hz).
10. Motor output voltage (V ac).

E. Control Signal Interfaces:

1. Electric Input Signal Interface: A minimum of two programmable analog inputs: 4- to 20-mA dc.
2. A minimum of six multifunction programmable digital inputs.
2. Remote Signal Inputs: Capability to accept any of the following speed-setting input signals from the BAS or other control systems:
   a. 0- to 10-V dc.
   b. 4- to 20-mA dc.
   c. Potentiometer using up/down digital inputs.
   d. Fixed frequencies using digital inputs.

3. Output Signal Interface: A minimum of one programmable analog output signal(s) 4- to 20-mA dc, which can be configured for any of the following:
   a. Output frequency (Hz).
   b. Output current (load).
   c. DC-link voltage (V dc).
   d. Motor torque (percent).
   e. Motor speed (rpm).
   f. Set point frequency (Hz).

4. Remote Indication Interface: A minimum of three programmable dry-circuit relay outputs (120-V ac, 1 A) for remote indication of the following:
   a. Motor running.
   b. Motor stopped.
   c. Fault and warning indication (overtemperature or overcurrent).
   d. PID high- or low-speed limits reached.

F. PID Control Interface: Provides closed-loop set point, differential feedback control in response to dual feedback signals. Allows for closed-loop control of fans and pumps for pressure, flow, or temperature regulation.

G. BAS (SCADA/PLC) Interface: Factory-installed hardware and software to enable the BAS to monitor, control, and display VFC status and alarms and energy usage. Allows VFC to be used with an external system within a multidrop LAN configuration; settings retained within VFC's nonvolatile memory.

1. Network Communications Ports: Ethernet and RS-422/485.
2. Embedded BAS Protocols for Network Communications: Modbus RTU and Ethernet TCP/IP; protocols accessible via the communications ports.

2.3 LINE CONDITIONING AND FILTERING

A. Input Line Conditioning: 5%.

B. EMI/RFI Filtering: CE marked; certify compliance with IEC 61800-3 for Category C2.
2.4 OPTIONAL FEATURES

A. Damper control circuit with end of travel feedback capability.

B. Communication Port: RS-232 port, USB 2.0 port, or equivalent connection capable of connecting a printer and a notebook computer.

2.5 ENCLOSURES

A. VFC Enclosures: NEMA 250, to comply with environmental conditions at installed location.
   1. Enclosure: NEMA Type 3R Outdoor.

2.6 ACCESSORIES

A. General Requirements for Control-Circuit and Pilot Devices: NEMA ICS 5; factory installed in VFC enclosure cover unless otherwise indicated.
      a. Push Buttons: Covered; momentary.
      b. Pilot Lights: LED types; push to test.
      c. Selector Switches: Rotary type.

B. Control Relays: Auxiliary and adjustable solid-state time-delay relays.


D. Supplemental Digital Meters:
   1. Elapsed time meter.
   2. Kilowatt meter.

E. Breather and drain assemblies, to maintain interior pressure and release condensation in NEMA 250, Type 3R enclosures installed outdoors or in unconditioned interior spaces subject to humidity and temperature swings.

F. Space heaters, with NC auxiliary contacts, to mitigate condensation in NEMA 250, Type 3R enclosures installed outdoors or in unconditioned interior spaces subject to humidity and temperature swings.
G. Cooling Fan and Exhaust System: For NEMA 250, Type 3R; UL 508 component recognized: Supply fan, with stainless steel intake and exhaust grills and filters; 120 V ac; obtained from integral CPT.

2.7 SOURCE QUALITY CONTROL
A. Testing: Test and inspect VFCs according to requirements in NEMA ICS 61800-2.
   1. Test each VFC while connected to a motor that is comparable to that for which the VFC is rated.
   2. Verification of Performance: Rate VFCs according to operation of functions and features specified.
B. VFCs will be considered defective if they do not pass tests and inspections.
C. Prepare test and inspection reports.

PART 3 - EXECUTION
3.1 INSTALLATION
A. Floor Mounted Controllers: Install VFCs with tops at uniform height and with disconnect operating handles not higher than 79 inches (2000 mm) above finished floor unless otherwise indicated, and by bolting units to floor using ½" x 6" expansion anchors, 316 stainless steel. Provide factory furnished or freestanding racks complying with Division 16 Section "Hangers and Supports for Electrical Systems."
B. Seismic Bracing: Comply with requirements specified in Division 16 Section "Vibration and Seismic Controls for Electrical Systems."
C. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from enclosures and components.
D. Install fuses in each fusible-switch VFC.
E. Install fuses in control circuits if not factory installed. Comply with requirements in Division 16 Section "Fuses."
F. Install heaters in thermal-overload relays. Select heaters based on actual nameplate full-load amperes after motors have been installed.
G. Install, connect, and fuse thermal-protector monitoring relays furnished with motor-driven equipment.
H. Comply with NECA 1.
3.2 IDENTIFICATION

A. Identify VFCs, components, and control wiring. Comply with requirements for identification specified in Division 16 Section "Electrical Identification."

1. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs.
2. Label each VFC with engraved nameplate.
3. Label each enclosure-mounted control and pilot device.

3.3 CONTROL WIRING INSTALLATION

A. Install wiring between VFCs and remote devices and facility's central-control system. Comply with requirements in Division 16 Section "Control-Voltage Electrical Power Cables."

B. Bundle, train, and support wiring in enclosures.

C. Connect selector switches and other automatic control devices where applicable.

   1. Connect selector switches to bypass only those manual- and automatic control devices that have no safety functions when switches are in manual-control position.
   2. Connect selector switches with control circuit in both manual and automatic positions for safety-type control devices such as low- and high-pressure cutouts, high-temperature cutouts, and motor overload protectors.

3.4 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Perform tests and inspections.

C. Acceptance Testing Preparation:

   1. Test insulation resistance for each VFC element, bus, component, connecting supply, feeder, and control circuit.
   2. Test continuity of each circuit.

D. Tests and Inspections:

   1. Inspect VFC, wiring, components, connections, and equipment installation. Test and adjust controllers, components, and equipment.
   2. Test insulation resistance for each VFC element, component, connecting motor supply, feeder, and control circuits.
   3. Test continuity of each circuit.
4. Verify that voltages at VFC locations are within 10 percent of motor nameplate rated voltages. If outside this range for any motor, notify Construction Manager/Owner before starting the motor(s).

5. Test each motor for proper phase rotation.


7. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.

8. Test and adjust controls, remote monitoring, and safeties. Replace damaged and malfunctioning controls and equipment.

E. VFCs will be considered defective if they do not pass tests and inspections.

F. Prepare test and inspection reports, including a certified report that identifies the VFC and describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations made after remedial action.

3.5 ADJUSTING

A. Program microprocessors for required operational sequences, status indications, alarms, event recording, and display features. Clear events memory after final acceptance testing and prior to Substantial Completion.

B. Set field-adjustable switches, auxiliary relays, time-delay relays, timers, and overload-relay pickup and trip ranges.

C. Adjust the trip settings of MCPs and thermal-magnetic circuit breakers with adjustable, instantaneous trip elements. Initially adjust to six times the motor nameplate full-load amperes and attempt to start motors several times, allowing for motor cool-down between starts. If tripping occurs on motor inrush, adjust settings in increments until motors start without tripping. Do not exceed eight times the motor full-load amperes (or 11 times for NEMA Premium Efficient motors if required). Where these maximum settings do not allow starting of a motor, notify Construction Manager/Owner before increasing settings.

D. Set field-adjustable circuit-breaker trip ranges as specified in Division 16 Section "Overcurrent Protective Device Coordination" and/or “Arc Flash Hazard Analysis and Labeling”.

3.6 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, reprogram, and maintain VFCs.

END OF SECTION 16269
SECTION 16289

TRANSIENT VOLTAGE SUPPRESSION

PART 1 - GENERAL

1.1 SUMMARY
   A. Section includes field-mounted TVSS for low-voltage (120 to 600 V) power distribution
      and control equipment.

1.2 ACTION SUBMITTALS
   A. Product Data: For each type of product indicated. Include rated capacities, operating
      weights, electrical characteristics, furnished specialties, and accessories.

1.3 INFORMATIONAL SUBMITTALS
   A. Field quality-control reports.
   B. Warranties: Sample of special warranties.

1.4 CLOSEOUT SUBMITTALS
   A. Operation and maintenance data.

1.5 QUALITY ASSURANCE
   A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in
      NFPA 70, by a testing agency, and marked for intended location and application.
   B. Comply with IEEE C62.41.2 and test devices according to IEEE C62.45.
   C. Comply with NEMA LS 1.
   D. Comply with UL 1283 and UL 1449.
   E. Comply with NFPA 70.
1.6 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of surge suppressors that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Five years from date of Substantial Completion.

1.7 MEASUREMENT AND PAYMENT

A. Measurement and payment for transient-voltage suppression for low-voltage electrical power circuits for electrical systems shall be paid at the lump sum contract price bid for "Electrical Distribution Equipment", which price shall be full compensation for all labor, material, equipment, and all other miscellaneous and incidental work as specified and shown on drawings. Payment shall be paid based on percent of work completed/installed according to the schedule of values to be submitted by contractor with each pay application.

PART 2 - PRODUCTS

2.1 SERVICE ENTRANCE SUPPRESSORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

2. Liebert Corporation; a division of Emerson Network Power.
3. Square D; a brand of Schneider Electric.

B. Surge Protection Devices:

1. Modular.
2. LED indicator lights for power and protection status.
3. Comply with UL 1449.
4. Fuses, rated at 200-kA interrupting capacity.
5. Fabrication using bolted compression lugs for internal wiring.
6. Integral disconnect switch.
7. Redundant suppression circuits.
8. Arrangement with copper bus bars and for bolted connections to phase buses, neutral bus, and ground bus.
9. Arrangement with wire connections to phase buses, neutral bus, and ground bus.
10. LED indicator lights for power and protection status.
11. Internal thermal protection that disconnects the SPD before damaging internal suppressor components.
12. Form-C contacts rated at [5 A and 250-V ac], one normally open and one normally closed, for remote monitoring of protection status. Contacts shall reverse on failure of any surge diversion module or on opening of any current-limiting device. Coordinate with building power monitoring and control system.
13. Surge counter.

C. Peak Single-Impulse Surge Current Rating: 160 kA per mode/320 kA per phase.

D. Minimum single impulse current ratings, using 8-by-20-mic.sec waveform described in IEEE C62.41.2

1. Line to Neutral: 70,000A.
2. Line to Ground: 70,000A.
3. Neutral to Ground: 50,000A.

E. Protection modes and UL 1449 SVR for grounded wye circuits with 480Y/277 V, 3-phase, 4-wire circuits shall be as follows:

1. Line to Neutral: 800 V for 480Y/277 V
2. Line to Ground: 800 V for 480Y/277 V
3. Neutral to Ground: 800 V for 480Y/277 V

F. Protection modes and UL 1449 SVR for 240/120 V, single-phase, 3-wire circuits shall be as follows:

1. Line to Neutral: 400 V.
2. Line to Ground: 400 V.
3. Neutral to Ground: 400 V.

G. Protection modes and UL 1449 SVR for 240/120-V, 3-phase, 4-wire circuits with high leg shall be as follows:

1. Line to Neutral: 400 V, 800 V from high leg.
2. Line to Ground: 400 V.
3. Neutral to Ground: 400 V.

H. Protection modes and UL 1449 SVR for 240 V, 480 V, or 600 V, 3-phase, 3-wire, delta circuits shall be as follows:

1. Line to Line: 2000 V for 480 V.
2. Line to Ground: 2000 V for 480 V.

2.2 PANELBOARD SUPPRESSORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

2. Liebert Corporation; a division of Emerson Network Power.
3. Square D; a brand of Schneider Electric.

B. Surge Protection Devices:
1. Non-modular.
2. LED indicator lights for power and protection status.
3. Fuses, rated at 200-kA interrupting capacity.
4. Fabrication using bolted compression lugs for internal wiring.
5. Integral disconnect switch.
6. Redundant suppression circuits.
7. Arrangement with wire connections to phase buses, neutral bus, and ground bus.
8. LED indicator lights for power and protection status.

C. Peak Single-Impulse Surge Current Rating: 160 kA per mode/320 kA per phase.

D. Minimum single impulse current ratings, using 8-by-20-mic.sec waveform described in IEEE C62.41.2:
   1. Line to Neutral: 70,000A.
   2. Line to Ground: 70,000A.
   3. Neutral to Ground: 50,000A.

E. Protection modes and UL 1449 SVR for grounded wye circuits with 208Y/120 V, 3-phase, 4-wire circuits shall be as follows:
   1. Line to Neutral: 400 V for 208Y/120 V.
   2. Line to Ground: 400 V for 208Y/120 V.
   3. Neutral to Ground: 400 V for 208Y/120 V.

F. Protection modes and UL 1449 SVR for 240/120-V, single-phase, 3-wire circuits shall be as follows:
   1. Line to Neutral: 400 V.
   2. Line to Ground: 400 V.
   3. Neutral to Ground: 400 V.

G. Protection modes and UL 1449 SVR for 240 V, 480 V, or 600 V, 3-phase, 3-wire, delta circuits shall be as follows:
   1. Line to Line: 2000 V for 480 V.
   2. Line to Ground: 1500 V for 480 V.

2.3 ENCLOSURES

A. Indoor Enclosures: NEMA 250 Type 12.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install TVSS devices at service entrance on load side, with ground lead bonded to service entrance ground.
B. Install TVSS devices for panelboards and auxiliary panels with conductors or buses between suppressor and points of attachment as short and straight as possible. Do not exceed manufacturer's recommended lead length. Do not bond neutral and ground.

1. Provide multiple, 30A minimum circuit breaker as a dedicated disconnecting means for TVSS unless otherwise indicated or directed by TVSS manufacturer.

3.2 FIELD QUALITY CONTROL
A. Perform tests and inspections.
   1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.
B. Tests and Inspections:
   1. Perform each visual and mechanical inspection and electrical test stated in NETA ATS, "Surge Arresters, Low-Voltage Surge Protection Devices" Section. Certify compliance with test parameters.
   2. After installing TVSS devices but before electrical circuitry has been energized, test for compliance with requirements.
   3. Complete startup checks according to manufacturer's written instructions.
C. TVSS device will be considered defective if it does not pass tests and inspections.
D. Prepare test and inspection reports.

3.3 STARTUP SERVICE
A. Do not energize or connect service entrance equipment or panelboards to their sources until TVSS devices are installed and connected.
B. Do not perform insulation resistance tests of the distribution wiring equipment with the TVSS installed. Disconnect before conducting insulation resistance tests, and reconnect immediately after the testing is over.

3.4 DEMONSTRATION
A. Engage a factory-authorized service representative to train Owner's maintenance personnel to maintain TVSS devices.

END OF SECTION 16289
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SECTION 16415 - TRANSFER SWITCHES

PART 1 - GENERAL

1.1 SUMMARY
A. Section includes nonautomatic transfer switches rated 600 V and less.

1.2 ACTION SUBMITTALS
A. Product Data: For each type of product.
B. Shop Drawings:
   1. Include plans, elevations, sections, details showing minimum clearances, conductor entry provisions, gutter space, and installed features and devices.
   2. Single-Line Diagram: Show connections between transfer switch, power sources, and load.

1.3 INFORMATIONAL SUBMITTALS
A. Seismic Qualification Data: Certificates, for transfer switches, accessories, and components, from manufacturer.
B. Source quality control reports.
C. Field quality-control reports.

1.4 CLOSEOUT SUBMITTALS
A. Operation and maintenance data.

1.5 WARRANTY
A. Manufacturer's Warranty: Manufacturer agrees to repair or replace components of transfer switch or transfer switch components that fail in materials or workmanship within specified warranty period.
   1. Warranty Period: Two years from date of Substantial Completion.
PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Comply with NEMA ICS 1.

C. Comply with NFPA 99.

D. Comply with NFPA 110.

E. Comply with UL 1008 unless requirements of these Specifications are stricter.

F. Indicated Current Ratings: Apply as defined in UL 1008 for continuous loading and total system transfer, including tungsten filament lamp loads not exceeding 30 percent of switch ampere rating, unless otherwise indicated.

G. Tested Fault-Current Closing and Short-Circuit Ratings: Adequate for duty imposed by protective devices at installation locations in Project under the fault conditions indicated, based on testing according to UL 1008.

1. Where transfer switch includes internal fault-current protection, rating of switch and trip unit combination shall exceed indicated fault-current value at installation location.

2. Short-time withstand capability for 30 cycles.

H. Repetitive Accuracy of Solid-State Controls: All settings shall be plus or minus 2 percent or better over an operating temperature range of minus 20 to plus 70 deg C.

I. Resistance to Damage by Voltage Transients: Components shall meet or exceed voltage-surge withstand capability requirements when tested according to IEEE C62.62. Components shall meet or exceed voltage-impulse withstand test of NEMA ICS 1.

J. Electrical Operation: Accomplish by a non-fused, momentarily energized solenoid or electric-motor-operated mechanism. Switches for emergency or standby purposes shall be mechanically and electrically interlocked in both directions to prevent simultaneous connection to both power sources unless closed transition.

K. Service-Rated Transfer Switch:

1. Comply with UL 869A and UL 489.

2. Provide terminals for bonding the grounding electrode conductor to the grounded service conductor.

3. In systems with a neutral, the bonding connection shall be on the neutral bus.
4. Provide removable link for temporary separation of the service and load grounded conductors.
5. Surge Protective Device: Service rated.

L. Neutral Switching: Where four-pole switches are indicated, provide neutral pole switched simultaneously with phase poles.

M. Neutral Terminal: Solid and fully rated unless otherwise indicated.

N. Oversize Neutral: Ampacity and switch rating of neutral path through units indicated for oversize neutral shall be double the nominal rating of circuit in which switch is installed.

O. Battery Charger: For generator starting batteries.
   1. Float type, rated 10 A.
   2. Ammeter to display charging current.
   3. Fused ac inputs and dc outputs.

P. Factory Wiring: Train and bundle factory wiring and label, consistent with Shop Drawings, by color-code or by numbered or lettered wire and cable with printed shrinkable sleeve markers at terminations. Color-coding and wire and cable markers are specified in Section 260553 "Identification for Electrical Systems."
   1. Designated Terminals: Pressure type, suitable for types and sizes of field wiring indicated.
   2. Power-Terminal Arrangement and Field-Wiring Space: Suitable for top, side, or bottom entrance of feeder conductors as indicated.
   3. Control Wiring: Equipped with lugs suitable for connection to terminal strips.
   4. Accessible via front access.

Q. Enclosures: General-purpose NEMA 250, Type 12, complying with NEMA ICS 6 and UL 508, unless otherwise indicated.

2.2 NONAUTOMATIC TRANSFER SWITCHES

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. Contactor Transfer Switches:
   a. Emerson; ASCO Power Technologies, LP.
   b. GE Zenith Controls.
   c. Russelectric, Inc.
C. Electrically Operated: Electrically actuated by push buttons designated "Normal Source" and "Alternative Source." Switch shall be capable of transferring load in either direction with either or both sources energized.


E. Double-Throw Switching Arrangement: Incapable of pauses or intermediate position stops during switching sequence.

F. Pilot Lights: Indicate source to which load is connected.

   1. Normal Power Supervision: Green light with nameplate engraved "Normal Source Available."

H. Unassigned Auxiliary Contacts: Switch shall have one set of normally closed contacts for each switch position, rated 10 A at 240-V ac.

I. Switch Characteristics: Designed for continuous-duty repetitive transfer of full-rated current between active power sources.
   1. Switch Action: Double throw; mechanically held in both directions.
   2. Contacts: Silver composition or silver alloy for load-current switching.
   3. Conductor Connectors: Suitable for use with conductor material and sizes.
   5. Main and Neutral Lugs: Mechanical type.
   7. Ground bar.
   8. Connectors shall be marked for conductor size and type according to UL 1008.

2.3 SOURCE QUALITY CONTROL

A. Factory Tests: Test and inspect components, assembled switches, and associated equipment according to UL 1008. Ensure proper operation. Check transfer time and voltage, frequency, and time-delay settings for compliance with specified requirements. Perform dielectric strength test complying with NEMA ICS 1.

B. Prepare test and inspection reports.
   1. For each of the tests required by UL 1008, performed on representative devices, for emergency systems. Include results of test for the following conditions:
a. Overvoltage.
b. Undervoltage.
c. Loss of supply voltage.
d. Reduction of supply voltage.
e. Alternative supply voltage or frequency is at minimum acceptable values.
f. Temperature rise.
g. Dielectric voltage-withstand; before and after short-circuit test.
h. Overload.
i. Contact opening.
j. Endurance.
k. Short circuit.
l. Short-time current capability.
m. Receptacle withstand capability.
n. Insulating base and supports damage.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Floor-Mounting Switch: Anchor to floor by bolting.

1. Install transfer switches on cast-in-place concrete equipment base(s). Comply with requirements for equipment bases and foundations specified in Section "Cast-in-Place Concrete." or "Miscellaneous Cast-in-Place Concrete."
2. Comply with requirements for seismic control devices specified in Section "Seismic Controls for Electrical Systems."
4. Provide workspace and clearances required by NFPA 70.

B. Annunciator and Control Panel Mounting: Flush in wall unless otherwise indicated.

C. Identify components according to Section 16195 "Identification for Electrical Systems."

D. Set field-adjustable intervals and delays, relays, and engine exerciser clock.

E. Comply with NECA 1.

3.2 CONNECTIONS

A. Wiring to Remote Components: Match type and number of cables and conductors to generator sets, motor controls, control, and communication requirements of transfer switches as recommended by manufacturer. Increase raceway sizes at no additional cost to Owner if necessary to accommodate required wiring.

1. Comply with requirements for raceways and boxes specified in Section 260533 "Raceways and Boxes for Electrical Systems."

C. Wiring within Enclosures: Bundle, lace, and train conductors to terminal points with no excess and without exceeding manufacturer's limitations on bending radii.

D. Ground equipment according to Section 16452 "Grounding and Bonding for Electrical Systems."

E. Route and brace conductors according to manufacturer's written instructions and Section 16190 "Supporting Devices." Do not obscure manufacturer's markings and labels.

F. Brace and support equipment according to ASCE/SEI 7. Transfer switch shall withstand the effects of earthquake motions determined according to ASCE/SEI 7. 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 unit will be fully operational after the seismic event."

G. Final connections to equipment shall be made with liquid-tight, flexible metallic conduit no more than 18 inches (457 mm) in length.

3.3 FIELD QUALITY CONTROL

A. Perform the following tests and inspections with the assistance of a factory-authorized service representative:

1. Visual and Mechanical Inspection:

   a. Compare equipment nameplate data with Drawings and Specifications.
   b. Inspect physical and mechanical condition.
   c. Inspect anchorage, alignment, grounding, and required clearances.
   d. Verify that the unit is clean.
   e. Verify appropriate lubrication on moving current-carrying parts and on moving and sliding surfaces.
   f. Verify that manual transfer warnings are attached and visible.
   g. Verify tightness of all control connections.
   h. Inspect bolted electrical connections for high resistance using one of the following methods, or both:

      1) Use of low-resistance ohmmeter.
      2) Verify tightness of accessible bolted electrical connections by calibrated torque-wrench method according to manufacturer's published data.

   i. Perform manual transfer operation.
   j. Verify positive mechanical interlocking between normal and alternate sources.
   k. Perform visual and mechanical inspection of surge arresters.
I. Inspect control power transformers.
   1) Inspect for physical damage, cracked insulation, broken leads, tightness of connections, defective wiring, and overall general condition.
   2) Verify that primary and secondary fuse or circuit-breaker ratings match Drawings.
   3) Verify correct functioning of draw-out disconnecting contacts, grounding contacts, and interlocks.

2. Electrical Tests:
   a. Perform insulation-resistance tests on all control wiring with respect to ground.
   b. Perform a contact/pole-resistance test. Compare measured values with manufacturer's acceptable values.
   c. Verify settings and operation of control devices.
   d. Calibrate and set all relays and timers.
   e. Verify phase rotation, phasing, and synchronized operation.
   f. Perform automatic transfer tests.
   g. Verify correct operation and timing of the following functions:
      1) Normal source voltage-sensing and frequency-sensing relays.
      2) Engine start sequence.
      3) Time delay on transfer.
      4) Alternative source voltage-sensing and frequency-sensing relays.
      5) Automatic transfer operation.
      6) Interlocks and limit switch function.
      7) Time delay and retransfer on normal power restoration.
      8) Engine cool-down and shutdown feature.

   a. Check for electrical continuity of circuits and for short circuits.
   b. Inspect for physical damage, proper installation and connection, and integrity of barriers, covers, and safety features.
   c. Verify that manual transfer warnings are properly placed.
   d. Perform manual transfer operation.

4. After energizing circuits, perform each electrical test for transfer switches stated in NETA ATS and demonstrate interlocking sequence and operational function for each switch at least three times.
   a. Simulate power failures of normal source to automatic transfer switches and retransfer from emergency source with normal source available.
   b. Simulate loss of phase-to-ground voltage for each phase of normal source.
   c. Verify time-delay settings.
d. Verify pickup and dropout voltages by data readout or inspection of control settings.

e. Perform contact-resistance test across main contacts and correct values exceeding 500 micro-ohms and values for one pole deviating by more than 50 percent from other poles.

f. Verify proper sequence and correct timing of automatic engine starting, transfer time delay, retransfer time delay on restoration of normal power, and engine cool-down and shutdown.

5. Ground-Fault Tests: Coordinate with testing of ground-fault protective devices for power delivery from both sources.

a. Verify grounding connections and locations and ratings of sensors.

B. Coordinate tests with tests of generator and run them concurrently.

C. Report results of tests and inspections in writing. Record adjustable relay settings and measured insulation and contact resistances and time delays. Attach a label or tag to each tested component indicating satisfactory completion of tests.

D. Transfer switches will be considered defective if they do not pass tests and inspections.

E. Remove and replace malfunctioning units and retest as specified above.

F. Prepare test and inspection reports.

G. Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each switch. Remove all access panels so joints and connections are accessible to portable scanner.

1. Instrument: Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.

2. Record of Infrared Scanning: Prepare a certified report that identifies switches checked and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

3. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan of each switch 11 months after date of Substantial Completion.

3.4 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain transfer switches and related equipment.

B. Training shall include testing ground-fault protective devices and instructions to determine when the ground-fault system shall be retested. Include instructions on where ground-fault sensors are located and how to avoid negating the ground-fault protection scheme during testing and circuit modifications.
C. Coordinate this training with that for generator equipment.

END OF SECTION 16415
SECTION 16420

SERVICE ENTRANCE

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK
   A. The work of this section consists of providing labor, materials, tools, appliances and miscellaneous accessories associated with the service-entrance work indicated herein and on the Drawings.

1.2 MAIN SERVICE
   A. Arrange with local power company, if required to provide adequate 3 phase, 4 – wire service of voltage as indicated on drawings. Meet all requirements of local power company. Pay all fees and charges. This includes charges associated with temporary service.

PART 2 - PRODUCTS

2.1 SERVICE-ENTRANCE EQUIPMENT
   A. General: Provide service-entrance equipment and accessories of types, sizes, ratings and electrical characteristics indicated on the drawings and in accordance with other DIVISION 16 Specifications, which comply with manufacturer's standard materials, design and construction in accordance with published product information, as required for complete installation, and as herein specified.

PART 3 - EXECUTION

3.1 INSTALLATION OF SERVICE-ENTRANCE EQUIPMENT
   A. Install service-entrance equipment as indicated, in accordance with equipment manufacturer's written instructions, and with recognized industry practices, to ensure that service-entrance equipment fulfills requirements. Comply with applicable installation requirements of NEC and NEMA standards, and local utility company.

3.2 GROUNDING
   Provide system and equipment grounding and bonding connections for service-entrance equipment and wiring/cabling as required and/or indicated on the Drawings.
3.3 FIELD QUALITY CONTROL

Upon completion of installation of service-entrance equipment and electrical circuitry, energized circuitry and demonstrate capability and compliance with requirements.

- END OF SECTION -
SECTION 16443

MOTOR-CONTROL CENTERS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes MCCs for use with ac circuits rated 600 V and less and having the following factory-installed components:

1. Incoming main lugs and OCPDs.
2. Full-voltage magnetic controllers.
3. Reduced-voltage, solid-state controllers.
4. Feeder-tap units.
5. Instrumentation.
6. Auxiliary devices.
7. TVSS

B. Refer to electrical one-line diagram for additional information and motor-control center requirements.

1.2 DEFINITIONS

A. BAS: Building automation system.
B. CPT: Control power transformer.
C. LED: Light-emitting diode.
D. MCC: Motor-control center.
E. MCCB: Molded-case circuit breaker.
F. MCP: Motor-circuit protector.
G. NC: Normally closed.
H. NO: Normally open.
I. OCPD: Overcurrent protective device.
J. PT: Potential transformer.
K. SCR: Silicon-controlled rectifier.
1.3 PERFORMANCE REQUIREMENTS

A. Seismic Performance: MCCs shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

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 unit will be fully operational after the seismic event."

1.4 ACTION SUBMITTALS

A. Product Data: For each type of controller and each type of MCC.

B. Shop Drawings: For each MCC, manufacturer's approval drawings as defined in UL 845. In addition to requirements specified in UL 845, include dimensioned plans, elevations, and sections; and conduit entry locations and sizes, mounting arrangements, and details, including required clearances and service space around equipment.

1. Show tabulations of installed devices, equipment features, and ratings.
2. Schematic and Connection Wiring Diagrams: For power, signal, and control wiring for each installed controller.
3. Nameplate legends.
4. Vertical and horizontal bus capacities.
5. Features, characteristics, ratings, and factory settings of each installed unit.

1.5 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Floor plans, drawn to scale, showing dimensioned layout, required working clearances, and required area above and around MCCs where pipe and ducts are prohibited. Show MCC layout and relationships between electrical components and adjacent structural and mechanical elements. Show support locations, type of support, and weight on each support. Indicate field measurements.

B. Seismic Qualification Certificates: For MCCs, accessories, and components, from manufacturer.

C. Product certificates.

D. Source quality-control reports.

E. Field quality-control reports.

1.6 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.
1.7 QUALITY ASSURANCE

A. Testing Agency Qualifications: Member company of NETA or an NRTL.

B. Source Limitations: Obtain MCCs and controllers of a single type from a single source from a single manufacturer.

C. 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.

D. Comply with NFPA 70.

E. IEEE Compliance: Fabricate and test enclosed controllers according to IEEE 344 to withstand seismic forces defined in Division 16 Section "Vibration and Seismic Controls for Electrical Systems."

PART 2 - PRODUCTS

2.1 MANUFACTURED UNITS

A. Basis-of-Design Product: Subject to compliance with requirements, provide a Square D Model 6 Motor Control Center as manufactured by Schneider Electric. Substitution requires pre-approval.

B. General Requirements for MCCs: Comply with NEMA ICS 18 and UL 845.

2.2 FUNCTIONAL FEATURES

A. Description: Modular arrangement of main units, controller units, control devices, feeder-tap units, instruments, metering, auxiliary devices, and other items mounted in vertical sections of MCC.

B. Controller Units: Combination controller units.

1. Install units up to and including Size 3 on draw-out mountings with connectors that automatically line up and connect with vertical-section buses while being racked into their normal, energized positions.

2. Equip units in Type B with pull-apart terminal strips for external control connections.

C. Feeder-Tap Units: Through 225-A rating shall have draw-out mountings with connectors that automatically line up and connect with vertical-section buses while being racked into their normal, energized positions.

D. Future Units: Compartments fully bused and equipped with guide rails or equivalent, ready for insertion of draw-out units.
E. Spare Units: Installed in compartments indicated "spare."

2.3 MAIN DISCONNECT AND OVERCURRENT PROTECTIVE DEVICE(S)

A. MCCB (to 1600 A): Fixed mounted, manually operated air-circuit breaker. Comply with UL 489.
   1. MCCB shall have quick-make, quick-break, over-center switching mechanism that is mechanically trip-free, its position shall be shown by the position of the handle, and manual push-to-trip push button.
   2. Solid-state monitoring and tripping system to show system status monitoring, adjustable time-current protection, and shunt trip.
      a. Interchangeable current sensors and timing circuits for adjustable time-current protection settings and status signals.
      b. Trip-setting dials or interchangeable plugs to establish the continuous trip of the circuit breaker. Plugs shall not be interchangeable between frames, and the breaker may not be closed without the plug. With neutral ground-fault sensor.
      c. Time-current adjustments to achieve protective-device coordination as follows:
         1) Adjustable long-time delay.
         2) Adjustable short-time setting and delay to shape the time-current curve.
         3) Adjustable instantaneous setting.
         4) Individually adjustable ground-fault setting and time delay.
      d. Built-in connector to test the long-time delay, instantaneous, and ground-fault functions of the breaker. Provide one test set for testing the installed circuit breakers 225-A frame and higher.
      e. Built-in digital ammeter display, showing load current and tripping cause.

3. Switch operator power shall be from control power transformer.

B. Surge Suppression: Factory installed as an integral part of the incoming feeder, complying with UL 1449, SPD Type 2.

2.4 COMBINATION CONTROLLERS

A. Full-Voltage Controllers:
   1. General Requirements for Full-Voltage Enclosed Controllers: Comply with NEMA ICS 2, general purpose, Class A.
   2. Magnetic Controllers: Full voltage, across the line, electrically held.
      a. Configuration: Non-reversing
      b. Hand/Off/Auto switch
      c. Run pilot light
      d. Start/Stop push button.
      e. NO & NC auxiliary contacts on contactor.
B. Reduced-Voltage, Solid-State Controllers:

1. General Requirements for Reduced-Voltage, Solid-State Controllers: Comply with UL 508.

2. The soft-starter shall be ATS22 Series or approved equal.

3. Codes and Standards:
   The soft-starter shall be designed, built and tested according to the latest editions of applicable UL and IEC standards. The soft-starter shall have CCC approval.
   
   The soft-starter(s) must be approved and/or certified by the following organizations:
   
   a. Underwriters Laboratories (UL)
   b. Canada Standards Association (CSA)

4. Reduced-Voltage, Solid-State Controllers: An integrated unit with power SCRs, heat sink, microprocessor logic board, door-mounted digital display and keypad, bypass contactor, and overload relay; suitable for use with NEMA MG 1, Design B, polyphase, medium-induction motors.
   
   a. Configuration: Severe duty; nonreversible.
   b. Starting Mode: Voltage ramping and Current limit; field selectable.
   c. Stopping Mode: Coast to stop and Adjustable torque deceleration; field selectable.
   d. Shorting (Bypass) Contactor: Operates automatically when full voltage is applied to motor, and bypasses the SCRs. Solid-state controller protective features shall remain active when the shorting contactor is in the bypass mode.
   e. Shorting and Input Isolation Contactor Coils: Pressure-encapsulated type; manufacturer's standard operating voltage, matching control power or line voltage, depending on contactor size and line-voltage rating. Provide coil transient suppressors.
   f. Logic Board: Identical for all ampere ratings and voltage classes, with environmental protective coating.
   g. Adjustable acceleration-rate control using voltage or current ramp, and adjustable starting torque control with up to 500 percent current limitation for 20 seconds.
   h. SCR bridge shall consist of at least two SCRs per phase, providing stable and smooth acceleration without external feedback from the motor or driven equipment.
   i. Keypad, front accessible; for programming the controller parameters, functions, and features; shall be manufacturer's standard and include not less than the following functions:
      1) Adjusting motor full-load amperes, as a percentage of the controller's rating.
2) Adjusting current limitation on starting, as a percentage of the motor full-load current rating.
3) Adjusting linear acceleration and deceleration ramps, in seconds.
4) Initial torque, as a percentage of the nominal motor torque.
5) Adjusting torque limit, as a percentage of the nominal motor torque.
6) Adjusting maximum start time, in seconds.
7) Adjusting voltage boost, as a percentage of the nominal supply voltage.
8) Selecting stopping mode, and adjusting parameters.
9) Selecting motor thermal-overload protection class between 5 and 30.
10) Activating and de-activating protection modes.
11) Selecting or activating communications modes.

j. Digital display, front accessible; for showing motor, controller, and fault status; shall be manufacturer's standard and include not less than the following:

1) Controller Condition: Ready, starting, running, stopping.
2) Motor Condition: Amperes, voltage, power factor, power, and thermal state.
3) Fault Conditions: Controller thermal fault, motor overload alarm and trip, motor underload, overcurrent, shorted SCRs, line or phase loss, phase reversal, and line frequency over or under normal.

k. Controller Diagnostics and Protection:

1) Microprocessor-based thermal protection system for monitoring SCR and motor thermal characteristics, and providing controller overtemperature and motor overload alarm and trip; settings selectable via the keypad.
2) Protection from line-side reverse phasing; line-side and motor-side phase loss; motor jam, stall, and underload conditions; and line frequency over or under normal.
3) Input isolation contactor that opens when the controller diagnostics detect a faulted solid-state component, or when the motor is stopped.
4) Shunt trip that opens the disconnecting means when the controller diagnostics detect a faulted solid-state component.

l. Remote Output Features:

1) All outputs prewired to terminal blocks.
2) Form C status contacts that change state when controller is running.
3) Form C alarm contacts that change state when a fault condition occurs.

m. Additional Features:

1) Additional field-assignable Form C contacts for alarm outputs.
2) Surge suppressors in solid-state power circuits providing three-phase protection against damage from supply voltage surges 10 percent or more above nominal line voltage.
3) Full-voltage bypass contactor operating manually, with NORMAL/BYPASS selector switch. Power contacts shall be totally enclosed, double break, and silver-cadmium oxide; and assembled to allow inspection and replacement without disturbing line or load wiring.

C. Disconnecting Means and OCPDs:

1. MCCB Disconnecting Means:
   a. UL 489, NEMA AB 1, and NEMA AB 3, with interrupting capacity to comply with available fault currents; thermal-magnetic MCCB, with inverse time-current element for low-level overloads and instantaneous magnetic trip element for short circuits.
   b. Front-mounted, adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.
   c. Lockable Handle: Accepts three padlocks and interlocks with cover in closed position.

D. Control Power:

1. Control Circuits: 120V ac; obtained from integral CPT, with primary and secondary fuses, with CPT of sufficient capacity to operate integral devices and remotely located pilot, indicating, and control devices.
   a. CPT Spare Capacity: 200VA.

2.5 FEEDER-TAP UNITS

A. MCCB: Comply with UL 489, with interrupting capacity to meet available fault currents.

3. Electronic trip circuit breakers with rms sensing; field-replaceable rating plug or field-replicable electronic trip; and the following field-adjustable settings:
   a. Instantaneous trip.
   b. Long- and short-time pickup levels.
   c. Long- and short-time time adjustments.
   d. Ground-fault pickup level, time delay, and I²t response.

4. MCCB Features and Accessories:
   a. Standard frame sizes, trip ratings, and number of poles.
   b. Lugs: Compression style, suitable for number, size, trip ratings, and conductor material.
c. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HID for feeding fluorescent and high-intensity discharge (HID) lighting circuits.
d. Ground-Fault Protection: Integrally mounted relay and trip unit with adjustable pickup and time-delay settings, push-to-test feature, and ground-fault indicator.
e. Shunt Trip: 120-V trip coil energized from separate circuit, set to trip at 75 percent of rated voltage.
f. Auxiliary Contacts: Two SPDT switches with "a" and "b" contacts; "a" contacts mimic circuit-breaker contacts, "b" contacts operate in reverse of circuit-breaker contacts.

2.6 INSTRUMENTATION

A. Instrument Transformers: IEEE C57.13, NEMA EI 21.1, and the following:
   1. PTs: IEEE C57.13; 120 V, 60 Hz, tapped secondary; disconnecting type with integral fuse mountings. Burden and accuracy shall be consistent with connected metering and relay devices.
   2. Current Transformers: IEEE C57.13; 5 A, 60 Hz, secondary; bar or window type; double secondary winding and secondary shorting device. Burden and accuracy shall be consistent with connected metering and relay devices.
   3. CPTs: Dry type, mounted in separate compartments for units larger than 3 kVA.

B. Multifunction Digital-Metering Monitor: Microprocessor-based unit suitable for three- or four-wire systems and with the following features:
   1. Listed or recognized by a nationally recognized testing laboratory.
   2. Inputs from sensors or 5-A current-transformer secondaries, and potential terminals rated to 600 V.
   3. Switch-selectable digital display of the following values with the indicated maximum accuracy tolerances:
      a. Phase Currents, Each Phase: Plus or minus 1 percent.
      b. Phase-to-Phase Voltages, Three Phase: Plus or minus 1 percent.
      c. Phase-to-Neutral Voltages, Three Phase: Plus or minus 1 percent.
      d. Three-Phase Real Power (Megawatts): Plus or minus 2 percent.
      e. Three-Phase Reactive Power (Megavars): Plus or minus 2 percent.
      f. Power Factor: Plus or minus 2 percent.
      g. Frequency: Plus or minus 0.5 percent.
      h. Accumulated Energy, Megawatt Hours: Plus or minus 2 percent; accumulated values unaffected by power outages up to 72 hours.
   4. Mounting: Display and control unit flush or semiflush mounted in instrument compartment door.
2.7 MCC CONTROL POWER

A. Control Circuits: 120-V ac, supplied through secondary disconnecting devices from CPT.

2.8 ENCLOSURES

A. Enclosures: Freestanding steel cabinets unless otherwise indicated. NEMA 250, Type 1A unless otherwise indicated to comply with environmental conditions at installed location.

B. Space Heaters: Factory-installed electric space heaters of sufficient wattage in each vertical section to maintain enclosure temperature above expected dew point.
   1. Space-Heater Control: Thermostats to maintain temperature of each section above expected dew point.
   2. Space-Heater Power Source: Transformer, factory installed in MCC.

C. Enclosure Finish: Factory-applied finish in manufacturer's standard gray finish over a rust-inhibiting primer on treated metal surface.

D. Compartments: Modular; individual lift-off doors with concealed hinges and quick-captive screw fasteners. Interlocks on units requiring disconnecting means in off position before door can be opened or closed, except by operating a permissive release device.

E. Interchangeability: Compartments constructed to allow for removal of units without opening adjacent doors, disconnecting adjacent compartments, or disturbing operation of other units in MCC; same size compartments to permit interchangeability and ready rearrangement of units, such as replacing three single units with a unit requiring three spaces, without cutting or welding.

F. Wiring Spaces:
   1. Vertical wireways in each vertical section for vertical wiring to each unit compartment; supports to hold wiring in place.
   2. Horizontal wireways in bottom and top of each vertical section for horizontal wiring between vertical sections; supports to hold wiring in place.

2.9 AUXILIARY DEVICES

A. General Requirements for Control-Circuit and Pilot Devices: NEMA ICS 5; factory installed in controller enclosure cover unless otherwise indicated.

      a. Push Buttons: Shrouded; momentary contact unless otherwise indicated.
      b. Pilot Lights: LED types; push to test.
c. Selector Switches: Rotary type.

2. Elapsed Time Meters: Heavy duty with digital readout in hours; resettable.

B. Reversible NC/NO contactor auxiliary contact(s).

C. Control Relays: Auxiliary and adjustable solid-state time-delay relays.


E. Space heaters, with NC auxiliary contacts, to mitigate condensation in enclosures installed outdoors or in unconditioned interior spaces subject to humidity and temperature swings.

F. Terminals for connecting power factor correction capacitors to the load side of overload relays.

2.10 CHARACTERISTICS AND RATINGS

A. Wiring: NEMA ICS 18, Class I Type B.

B. Control and Load Wiring: Factory installed, with bundling, lacing, and protection included. Provide flexible conductors for No. 8 AWG and smaller, for conductors across hinges, and for conductors for interconnections between shipping units.

C. Nominal System Voltage: 480Y/277 V, three phase, four wire.

D. Short-Circuit Current Rating for Each Unit: Fully rated 65 kA.

E. Environmental Ratings:
   1. Ambient Temperature Rating: Not less than 0 deg F (minus 18 deg C) and not exceeding 104 deg F (40 deg C), with an average value not exceeding 95 deg F (35 deg C) over a 24-hour period.
   2. Ambient Storage Temperature Rating: Not less than minus 4 deg F (minus 20 deg C) and not exceeding 140 deg F (60 deg C)
   3. Humidity Rating: Less than 95 percent (noncondensing).
   4. Altitude Rating: Not exceeding 6600 feet (2000 m), or 3300 feet (1000 m) if MCC includes solid-state devices.

F. Main-Bus Continuous Rating: As indicated on drawings.


H. Main Horizontal and Equipment Ground Buses: Uniform capacity for entire length of MCC's main and vertical sections.
I. Vertical Phase and Equipment Ground Buses: Uniform capacity for entire usable height of vertical sections, except for sections incorporating single units.


K. Neutral Buses: 100 percent of the ampacity of phase buses unless otherwise indicated, equipped with mechanical connectors for outgoing circuit neutral cables.

L. Ground Bus: Minimum size required by UL 845, hard-drawn copper of 98 percent conductivity, equipped with mechanical connectors for feeder and branch-circuit equipment grounding conductors.

M. Front-Connected, Front-Accessible MCCs:
   4. Sections front and rear aligned.

N. Pull Box on Top of MCC where indicated:
   1. Adequate ventilation to maintain temperature in pull box within same limits as MCC.
   2. Set back from front to clear circuit-breaker removal mechanism.
   4. Insulated bottom of fire-resistive material with separate holes for cable drops into MCC.
   5. Cable supports arranged to facilitate cabling and adequate to support cables, including those for future installation.

O. Future Devices: Equip compartments with mounting brackets, supports, bus connections, and appurtenances at full rating of unit.

2.11 SOURCE QUALITY CONTROL

A. MCC Testing: Inspect and test MCCs according to requirements in NEMA ICS 18.

B. MCCs will be considered defective if they do not pass tests and inspections.

C. Prepare test and inspection reports.
3.1 INSTALLATION

A. Floor-Mounting Controllers: Install MCCs on 4-inch (100-mm) nominal thickness concrete base. Comply with requirements for concrete base specified in Division 3 Section "Cast-in-Place Concrete."

1. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch (450-mm) centers around the full perimeter of concrete base.
2. For supported equipment, install epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete floor.
3. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
4. Install anchor bolts to elevations required for proper attachment to supported equipment.

B. Seismic Bracing: Comply with requirements specified in Division 16 Section "Vibration and Seismic Controls for Electrical Systems."

C. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from enclosures and components.

D. Install fuses in control circuits if not factory installed. Comply with requirements in Division 16 Section "Fuses."

E. Install heaters in thermal-overload relays. Select heaters based on actual nameplate full-load amperes after motors have been installed.

F. Install, connect, and fuse thermal-protector monitoring relays furnished with motor-driven equipment.

G. Comply with NECA 1.

3.2 IDENTIFICATION

A. Comply with requirements in Division 16 Section "Electrical Identification" for identification of MCC, MCC components, and control wiring.

1. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs.
2. Label MCC and each cubicle with engraved nameplate.
3. Label each enclosure-mounted control and pilot device.
3.3 CONTROL WIRING INSTALLATION

A. Install wiring between enclosed controllers, master terminal boards and remote devices and facility's BAS and facility's central-control system. Comply with requirements in Division 16 Section "Control-Voltage Electrical Power Cables."

B. Bundle, train, and support wiring in enclosures.

C. Connect selector switches and other automatic-control selection devices where applicable.
   1. Connect selector switches to bypass only those manual- and automatic-control devices that have no safety functions when switch is in manual-control position.
   2. Connect selector switches within enclosed controller circuit in both manual and automatic positions for safety-type control devices such as low- and high-pressure cutouts, high-temperature cutouts, and motor overload protectors.

3.4 CONNECTIONS

A. Comply with requirements for installation of conduit in Division 16 Section "Raceways and Boxes." Drawings indicate general arrangement of conduit, fittings, and specialties.

B. Comply with requirements in Division 16 Section "Grounding and Bonding."

3.5 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Perform tests and inspections.

C. Acceptance Testing Preparation:
   1. Test insulation resistance for each enclosed controller, component, connecting supply, feeder, and control circuit.
   2. Test continuity of each circuit.

D. Tests and Inspections:
   1. Inspect controllers, wiring, components, connections, and equipment installation. Test and adjust controllers, components, and equipment.
   2. Test insulation resistance for each enclosed controller element, component, connecting motor supply, feeder, and control circuits.
   3. Test continuity of each circuit.
   4. Verify that voltages at controller locations are within 10 percent of motor nameplate rated voltages. If outside this range for any motor, notify Construction Manager before starting the motor(s).
   5. Test each motor for proper phase rotation.

7. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.

8. Test and adjust controls, remote monitoring, and safeties. Replace damaged and malfunctioning controls and equipment.

E. Enclosed controllers will be considered defective if they do not pass tests and inspections.

F. Prepare test and inspection reports, including a certified report that identifies enclosed controllers and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

3.6 ADJUSTING

A. Set field-adjustable switches, auxiliary relays, time-delay relays, timers, and overload-relay pickup and trip ranges.

B. Adjust overload relay heaters or settings if power factor correction capacitors are connected to the load side of the overload relays.

C. Adjust the trip settings of MCPs and thermal-magnetic circuit breakers with adjustable, instantaneous trip elements. Initially adjust to six times the motor nameplate full-load amperes and attempt to start motors several times, allowing for motor cool-down between starts. If tripping occurs on motor inrush, adjust settings in increments until motors start without tripping. Do not exceed eight times the motor full-load amperes (or 11 times for NEMA Premium Efficient motors if required). Where these maximum settings do not allow starting of a motor, notify Construction Manager before increasing settings.

D. Set field-adjustable switches and program microprocessors for required start and stop sequences in reduced-voltage, solid-state controllers.

E. Set field-adjustable circuit-breaker trip ranges.

3.7 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain enclosed controllers, and to use and reprogram microprocessor-based, reduced-voltage, solid-state controllers.

END OF SECTION 16443
SECTION 16452

GROUNDING

PART 1 GENERAL

1.1 SUMMARY

A. The work of this section consists of providing labor, materials, tools, appliances and miscellaneous accessories associated with grounding of the electrical system as required by and as is indicated herein and/or on the Drawings.

B. Main electric service equipment, raceways, motors, panelboards and other electrical equipment shall be effectively and permanently grounded to a grounding electrode. This electrode shall be the nearest available effectively grounded structural metal member of the structure or the nearest available effectively grounded metal water pipe and also a driven rod. Grounding connections and conductor sizes shall be in accordance with requirements of the National Electrical Code, Article 250, and local ordinances, and as described herein.

C. A separate grounding conductor, sized in accordance with NEC Table 250.122 shall be provided in the conduit with the circuit conductors for all feeder and branch circuits. The grounding conductor may be bare or insulated copper; however, if this conductor is insulated, the insulating covering shall be a green color. Conduit runs shall be increased in size where necessary to accommodate the grounding conductor in addition to circuit conductors. The electrical continuity of all conduit runs shall be verified and corrected where necessary.

D. Isolated Ground Connectors shall be insulated. Additional grounding conductors and conduit shall be provided as specified herein or shown on the drawings. All conduit for grounding system conductors, not run in conduit with circuit conductors, shall be rigid steel conduit.

E. All electrical equipment enclosures and conductor enclosures shall be grounded. This includes but is not limited to metal raceways, outlet boxes, cabinets, switch boxes, motor frames, transformer cases and metallic enclosure for all electrical equipment.

F. Under no circumstances shall neutral conductors again be grounded after they have been grounded once at the transformer secondary.

G. Panelboards shall be equipped with a neutral bar which is insulated from the enclosure, and a grounding bar which is bonded to the enclosure. The grounding bar shall provide for terminating the green equipment grounding conductors in the panelboard or motor control center cabinets. The grounding bar shall be bonded to the cabinet. Neutral busses shall be isolated from ground except at the transformer ground connection.

H. Types of grounding in this section includes the following:
1. Underground metal water piping.
2. Grounding electrodes.
3. Service equipment.
4. Enclosures.
5. Systems.

I. Requirements of this section apply to electrical grounding work specified elsewhere in these specifications.

J. Provide Bonding Jumper across water meter.

1.2 RELATED DOCUMENTS

A. Drawings
B. General provisions of Contract, including General and Supplementary Conditions.
C. Division 01 – Specification Section.
D. Section 16010 – Basic Electrical Requirements.

PART 2 PRODUCTS

2.1 GROUNDING

A. Materials and Components:
   1. General: Except as otherwise indicated, provide electrical grounding and bonding systems indicated, with assembly of materials including, but not necessarily limited to, cables/wires, connectors, terminals (solderless lugs), grounding rods/electrodes, bonding jumper braid, surge arrestors and other items and accessories needed for complete installation. Where more than one type meets indicated requirements, selection is Installer's option.

   2. Where materials or components are not otherwise indicated, comply with NEC, UL and IEEE requirements and with established industry standards for applications indicated.

   3. Bonding Jumper Braid: Copper braided tape, constructed of 30-gage bare copper wires and properly sized for indicated applications. Braid shall be tin coated.

5. Grounding Conductors: Unless otherwise indicated, provide electrical grounding conductors for grounding connections matching power supply wiring materials and sized according to NEC. Where grounding conductors are exposed and uninsulated they shall be tin coated copper.

6. Connectors, Terminals and Clamps: Provide electrical bonding plates, connectors terminals and clamps as recommended by bonding plate, connector, terminal and clamp manufacturers for indicated applications. All copper clamps, plates, etc. shall be tin coated.


8. Electrical Grounding Connection Accessories: Provide electrical insulating tape, heat-shrinkable insulating tubing, solder, soldering flux, bonding straps, as recommended by accessories manufacturers for type services indicated.

9. Field Welding: Comply with AWS code for procedures, appearance, and quality of welds and methods used in connecting welding work. Provide welded connections where grounding conductors connect to underground grounding rods/electrodes.

PART 3 EXECUTION

3.1 INSTALLATION OF GROUNDING SYSTEMS

A. Install electrical grounding and bonding systems as indicated, in accordance with manufacturer's written instructions and with recognized industry practices to ensure grounding and ground-fault protection devices comply with requirements. Comply with requirements of NEC, and NECA's "standard of Installation".

B. Coordinate with other electrical work as necessary to interface installation of grounding system and ground fault protection devices with other work.

C. Weld grounding conductors to underground grounding electrodes. The building equipment grounding system shall consist of the ground wire, and electrically continuous metallic conduit system. Every item of equipment served by the electrical system shall be bonded to the building equipment ground. Portions of metallic piping and duct systems which are electrically isolated shall be bonded to the equipment grounding system with a flexible bonding jumper.

D. The neutral shall be grounded to the grounding electrode system at the service entrance only, and shall be kept isolated from the building grounding system throughout the building. The neutral of separately derived systems shall be grounded at one point as specified herein below.

E. Provide bonding and grounding wires run in conduit and sized per the NEC in accordance with the local electrical inspection department and the NEC. Metallic
piping and duct systems which enter the building shall be grounded at the point of entry to the building, in accordance with the NEC.

F. Continuity of the building equipment grounding system shall be maintained throughout the project. Grounding jumpers shall be installed across conduit expansion fittings, all liquid-tight flexible metal and flexible metal conduit, light fixture pigtailed in excess of 6’, and all other non-electrically continuous raceway fittings.

G. All main grounding conductors shall be tin coated stranded copper conductors, sized as shown and/or required, and run in a suitable raceway. All main grounding conductors shall be continuous without joints or splices over their entire length.

H. Bond the case and neutral of each transformer directly to the nearest available effectively grounded structural metal member of the structure, the nearest available effectively grounded metal water pipe, or in accordance with the local electrical inspection department. Flexible conduit shall not be used as a ground path to a transformer.

I. Not used.

J. Carefully and securely ground all fluorescent fixture bodies to the conduit grounding system. Flexible conduit longer than 6’ shall not be considered a ground path.

K. Ground all grounding-type receptacles with a separate ground wire.

L. Grounding of all motors or equipment connected to terminal box with flexible conduit shall be made with separate grounding conductor between motor frame or equipment cabinet and rigid conduit system. Grounding conductor shall be sized in accordance with table 250-122 of the NEC.

M. All grounding conductors shall be amply protected from mechanical injury and shall be supported in an approved manner. Where conductors are located in concrete, they shall be installed in conduit. Where ground conductors enter or emerge from slabs bearing directly on fill or soil, the voids between the conductor and surrounding conduit shall be filled with compound to provide an effective water seal.

N. Grounding conductors shall be not smaller than #12 AWG. Conductors shall be high conductivity copper, and sizes larger than #10 shall be stranded.

O. Insulated grounding bushings shall be installed on all raceways at transformers, switchboards, motor-control centers, dry-type transformers, as well as switches used as service equipment.

P. Install braided type bonding jumpers with clamps on water meter piping to electrically bypass water meter.
Q. Install clamp-on connectors only on thoroughly cleaned metal contact surfaces, to ensure electrical conductivity and circuit integrity.

R. For all motor circuit and all circuits serving multi-outlet assemblies provide a separate grounding conductor in addition to any conduit ground. Conduit runs shall be increased in size where necessary to accommodate the grounding conductor in addition to circuit conductors.

3.2 FIELD QUALITY CONTROL

A. Upon completion of installation of electrical grounding system, test ground resistance with ground resistance tester. Where tests show resistance-to-ground is over 3 ohms, take appropriate action to reduce resistance to 3 ohms or less by driving additional ground rods and/or by chemically treating soil encircling ground rods with sodium chloride, calcium chloride, copper sulphate, or magnesium. Then retest to demonstrate compliance.

END OF SECTION 16452
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SECTION 16470

PANELBOARDS

PART 1 - GENERAL

1.1 SUMMARY
A. Section includes distribution panelboards and lighting and appliance branch-circuit panelboards.

1.2 PERFORMANCE REQUIREMENTS
A. Seismic Performance: Panelboards shall withstand the effects of earthquake motions determined according to SEI/ASCE 7.

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 unit will be fully operational after the seismic event."

1.3 ACTION SUBMITTALS
A. Product Data: For each type of product indicated.
B. Shop Drawings: For each panelboard and related equipment.

1. Include dimensioned plans, elevations, sections, and details. Show tabulations of installed devices, equipment features, and ratings.
2. Detail enclosure types and details for types other than NEMA 250, Type 1.
3. Detail bus configuration, current, and voltage ratings.
4. Short-circuit current rating of panelboards and overcurrent protective devices.
5. Include evidence of NRTL listing for series rating of installed devices.
6. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.
7. Include wiring diagrams for power, signal, and control wiring.
8. Include time-current coordination curves for each type and rating of overcurrent protective device included in panelboards.

1.4 INFORMATIONAL SUBMITTALS
A. Seismic Qualification Certificates: Submit certification that panelboards, overcurrent protective devices, accessories, and components will withstand seismic forces according to SEI/ASCE 7.
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B. Field quality-control reports.
C. Panelboard schedules for installation in panelboards.

1.5 CLOSEOUT SUBMITTALS
A. Operation and maintenance data.

1.6 QUALITY ASSURANCE
A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
B. Comply with NEMA PB 1.
C. Comply with NFPA 70.

1.7 WARRANTY
A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace transient voltage suppression devices that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Five years from date of Substantial Completion.

1.8 MEASUREMENT AND PAYMENT
A. Measurement and payment for panelboards for electrical systems shall be paid at the lump sum contract price bid for “Electrical Distribution Equipment”, which price shall be full compensation for all labor, material, equipment, and all other miscellaneous and incidental work as specified and shown on drawings. Payment shall be paid based on percent of work completed/installed according to the schedule of values to be submitted by contractor with each pay application.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR PANELBOARDS
A. Fabricate and test panelboards according to IEEE 344 to withstand seismic forces defined in Division 16 Section "Vibration and Seismic Controls for Electrical Systems."
B. Enclosures: Surface-mounted cabinets.
   1. Rated for environmental conditions at installed location.
      a. Indoor Locations: NEMA 250, Type 12.
   2. Front: Secured to box with concealed trim clamps. For surface-mounted fronts, match box dimensions; for flush-mounted fronts, overlap box.
   3. Hinged Front Cover: Entire front trim hinged to box and with standard door within hinged trim cover.

C. Incoming Mains Location: Top and bottom.

D. Phase, Neutral, and Ground Buses: Hard-drawn copper, 98 percent conductivity.

E. Conductor Connectors: Suitable for use with conductor material and sizes.
   2. Main and Neutral Lugs: Mechanical type.
   3. Ground Lugs and Bus Configured Terminators: Mechanical type.
   4. Feed-Through Lugs: Mechanical type, suitable for use with conductor material. Locate at opposite end of bus from incoming lugs or main device.
   5. Subfeed (Double) Lugs: Mechanical type suitable for use with conductor material. Locate at same end of bus as incoming lugs or main device.

F. Service Equipment Label: NRTL labeled for use as service equipment for panelboards with one or more main service disconnecting and overcurrent protective devices.

G. Future Devices: Mounting brackets, bus connections, filler plates, and necessary appurtenances required for future installation of devices.

H. Panelboard Short-Circuit Current Rating: Fully rated to interrupt symmetrical short-circuit current available at terminals. Series ratings are not allowed.

2.2 LIGHTING AND APPLIANCE BRANCH-CIRCUIT PANELBOARDS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
   4. Square D; a brand of Schneider Electric.

B. Panelboards: NEMA PB 1, lighting and appliance branch-circuit type.
C. Mains: Circuit breaker.

D. Branch Overcurrent Protective Devices: Bolt-on circuit breakers, replaceable without disturbing adjacent units.

E. Doors: Concealed hinges; secured with flush latch with tumbler lock; keyed alike.

2.3 DISCONNECTING AND OVERCURRENT PROTECTIVE DEVICES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
4. Square D; a brand of Schneider Electric.

B. Molded-Case Circuit Breaker (MCCB): Comply with UL 489, with interrupting capacity to meet available fault currents.

3. Electronic trip circuit breakers with rms sensing; field-replaceable rating plug or field-replicable electronic trip; and the following field-adjustable settings:
   a. Instantaneous trip.
   b. Long- and short-time pickup levels.
   c. Long- and short-time time adjustments.
   d. Ground-fault pickup level, time delay, and I^2t response.
4. Current-Limiting Circuit Breakers: Frame sizes 400 A and smaller; let-through ratings less than NEMA FU 1, RK-5.
5. GFCI Circuit Breakers: Single- and two-pole configurations with Class A ground-fault protection (6-mA trip).
8. Molded-Case Circuit-Breaker (MCCB) Features and Accessories:
   a. Standard frame sizes, trip ratings, and number of poles.
   b. Lugs: Mechanical style, suitable for number, size, trip ratings, and conductor materials.
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c. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HID for feeding fluorescent and high-intensity discharge (HID) lighting circuits.
d. Ground-Fault Protection: Integrally mounted relay and trip unit with adjustable pickup and time-delay settings, push-to-test feature, and ground-fault indicator.
e. Handle Padlocking Device: Fixed attachment, for locking circuit-breaker handle in on or off position.
f. Handle Clamp: Loose attachment, for holding circuit-breaker handle in on position.

C. Fused Switch: NEMA KS 1, Type HD; clips to accommodate specified fuses; lockable handle.
   1. Fuses: Comply with requirements specified in Division 16 Section "Fuses."

2.4 ACCESSORY COMPONENTS AND FEATURES

A. Portable Test Set: For testing functions of solid-state trip devices without removing from panelboard. Include relay and meter test plugs suitable for testing panelboard meters and switchboard class relays.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Receive, inspect, handle, store and install panelboards and accessories according to NECA 407, NEMA PB 1.1.
B. Mount top of trim 90 inches (2286 mm) above finished floor unless otherwise indicated.
C. Mount panelboard cabinet plumb and rigid without distortion of box. Mount recessed panelboards with fronts uniformly flush with wall finish and mating with back box.
D. Install overcurrent protective devices and controllers not already factory installed.
   1. Set field-adjustable, circuit-breaker trip ranges.
E. Install filler plates in unused spaces.
F. Stub four 1-inch (27-GRC) empty conduits from panelboard into accessible ceiling space or space designated to be ceiling space in the future. Stub four 1-inch (27-GRC) empty conduits into raised floor space or below slab not on grade.
G. Arrange conductors in gutters into groups and bundle and wrap with wire ties.
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H. Comply with NECA 1.

3.2 IDENTIFICATION

A. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs complying with Division 16 Section "Identification for Electrical Systems."

B. Create a directory to indicate installed circuit loads and incorporating Owner's final room designations. Obtain approval before installing. Use a computer or typewriter to create directory; handwritten directories are not acceptable.

C. Panelboard Nameplates: Label each panelboard with a nameplate complying with requirements for identification specified in Division 16 Section "Identification for Electrical Systems."

D. Device Nameplates: Label each branch circuit device in distribution panelboards with a nameplate complying with requirements for identification specified in Division 16 Section "Identification for Electrical Systems."

3.3 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Acceptance Testing Preparation:
   1. Test insulation resistance for each panelboard bus, component, connecting supply, feeder, and control circuit.
   2. Test continuity of each circuit.

C. Tests and Inspections:
   1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
   2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.

D. Panelboards will be considered defective if they do not pass tests and inspections.

E. Prepare test and inspection reports, including a certified report that identifies panelboards included and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

END OF SECTION 16470
SECTION 16472
OVERCURRENT PROTECTIVE DEVICES

PART 1  GENERAL

1.1  SUMMARY

A. The work of this section consists of providing labor, materials, tools, appliances and miscellaneous accessories associated with overcurrent protective device work indicated herein and on the Drawings.

B. Types of overcurrent protective devices in this section include the following:

1. Circuit breakers (600 volts and below).
2. Fuses (600 volts and below).

PART 2  PRODUCTS

2.1  MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, provide products of one of the following (for each type and rating of overcurrent protective device):

1. Circuit Breakers:
   a. Square D Co.
   b. Eaton
   c. Siemens.

2. Fuses:
   b. Little Fuse.

2.2  CIRCUIT BREAKERS

A. General: Except as otherwise indicated, provide circuit breakers and ancillary components, of types, sizes, ratings and electrical characteristics indicated, which comply with manufacturer's standard design, materials, components, and construction in accordance with published product information, and as required for a complete installation.

B. Molded-Case Circuit Breakers:

1. Provide bolt-on factory-assembled, molded-case circuit breakers of frame size, trip and interrupting rating as shown on the Panel Schedule and Drawings.
2. Provide 150-ampere frame breakers with non-interchangeable trip units and breakers of 225-ampere frame and larger with interchangeable trip units. Provide thermal and instantaneous magnetic trips in each pole. Breakers in 150-ampere frame size and below shall have permanent trip settings and breakers above 150-ampere frame size shall have permanent thermal trip and adjustable magnetic trips. Construct with over center, trip-free, toggle type operating mechanisms with quick-make, quick-break action and positive handle indication. Construct breakers for mounting and operating, within specified ratings, in any physical position and in an ambient temperature of 40 deg. C. Provide with mechanical screw type removable connector lugs, AL/CU rated, for full frame amperes.

3. All molded case circuit breakers shall be listed per U.L. 489 to continuously carry 80% of its nameplate rating and shall meet the requirements of NEMA AB1 and the NEC-NFPA 70-84.

4. Accessories for molded case breakers shall include (when indicated on drawings and schedules) auxiliary switch, shunt trip, under-voltage release, bell alarm, motor operator, and mechanical interlocks.

C. Fuses:

1. General: Except as otherwise indicated, provide fuses of types, sizes and ratings and electrical characteristics indicated, which comply with manufacturer's standard design, materials, and construction in accordance with published product information, and with industry standards and configurations.

2. Class L Time-Delay Fuses: Provide UL Class L time-delay fuses, 600 V, 60 Hz., with ampere rating as shown on drawings, with 200,000 RMS symmetrical interrupting current rating for protecting transformers, motors, and circuit breakers, service entrance and main feeder circuit breakers.

3. Class L Fast-Acting Fuses: Provide UL Class fast-acting fuses, 600 V, 60 Hz., with ampere rating as shown on drawings, with 200,000 RMS symmetrical interrupting current rating for protecting service entrances and main feeder circuit breakers.

4. Class RK1 Time-Delay Fuses: Provide UL Class RK1 time-delay current limiting fuses rated as shown on drawings, 60 Hz., with 200,000 RMS symmetrical interrupting current rating for protecting motors and circuit breakers.

5. Class RK1 Fast-Acting Fuses: Provide UL Class fast-acting current limiting fuses, 600 V, 60 Hz., with ampere rating as shown on drawings, with 200,000 RMS symmetrical interrupting current rating for protecting panelboards, motor control centers, etc.
PART 3  EXECUTION

3.1 INSTALLATION OF OVERCURRENT PROTECTIVE DEVICES

A. Install overcurrent protective devices as indicated, in accordance with the manufacturer's written instructions and with recognized industry practices to ensure that protective devices comply with requirements. Comply with NEC and NEMA standards for installation of overcurrent protective devices.

B. Coordinate with other work, including electrical wiring work, as necessary to interface installation of overcurrent protective devices with other work.

C. Fasten circuit breakers without mechanical stresses, twisting or misalignment being exerted by clamps, supports, or cables.

D. Install fuses, if any, in fused circuit breakers.

E. Provide spare fuses (3 of each ampere rating used).

F. Provide spare fuse cabinet adjacent to switchboard and motor control center of sufficient size to store spare fuses.

END OF SECTION 16472
SECTION 16475

ARC FLASH HAZARD ANALYSIS AND LABELING

PART 1    GENERAL

1.1    SUMMARY

A. The work of this section consists of providing labor, material, tools, field work, computer analysis, and miscellaneous accessories associated with the execution of an Arc Flash Study as further described herein.

1. Provide an arc flash hazard analysis of each electrical equipment, switchboard, panelboard, transformer and disconnect switch where such is either added, modified, or affected by the work within the distribution system. If the addition or modification affects other parts of the system whether upstream, downstream, or both, then those portions of the system shall also be analysed and labeled accordingly. Determine in the analysis the personal hazard category and the associated flash protection boundary.

2. Refer to drawings for existing and new equipment, wiring, and locations of equipment as well as available fault current to be verified by contractor.

3. The study shall reference existing/previous study(ies) and shall be added to the original study to create a permanent record of the current status of the distribution system.

4. Submit all calculations to the Architect/Engineer for review and comment prior to ordering affected equipment.

5. Provide an Arc Flash and Shock Hazard label on each medium voltage switch, switchboard, panelboard, transformer, and disconnect switch based upon the arc flash hazard analysis with all appropriate information required by NFPA 70E reported on the label.

B. Codes:

1. NFPA 70 (NEC)
2. NFPA 70E

PART 2    PRODUCTS

2.1    LABELS

A. Provide non-paper labels with adhesive which will resist degradation due to both sunlight and moisture.
PART 3  EXECUTION

3.1 ANALYSIS

A. The arc flash hazard analysis shall be performed by a registered professional engineer registered in the state where the project is located. A previous Arc Flash Study was performed June-July 2014 and is available as reference to perform this study as an update/revision. The submittal to the Architect/Engineer shall include the seal and signature of the professional engineer who performed the analysis.

B. The analysis shall include selection and coordination of all overcurrent devices as to operation to minimize both the arc fault level and nuisance tripping.

C. Include in the submittal all time-current curves of breakers and fuses, tabulation of adjustable trip settings and tabulation of current limiting fuses selected.

D. Contractor shall be responsible for determining the available fault current at the facility to be used in the analysis. Contractor shall perform whatever field work is necessary to verify field conditions with regards to the as-built drawings.

E. Labeling shall include required PPE to be used when servicing equipment in accordance with NEC 70E. Contractor shall instruct owner’s maintenance personnel regarding required PPE.

3.2 INSTALLATION

A. Install each label on the front of the equipment, in a prominent visible location and where possible, centered.

END OF SECTION 16475
SECTION 16500

LIGHTING

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

A. Section Includes: The work of this section consists of providing labor, materials, tools, appliances and miscellaneous accessories associated with lighting fixture work as indicated herein and on the Drawings and schedules.

B. Type: The types of lighting fixtures required for the project include the following:
   1. Light Emitting Diode (LED).

C. Applications of lighting fixtures required for project include the following:
   1. General exterior/interior lighting.

1.2 RELATED DOCUMENTS

A. Drawings.

B. General provisions of Contract, including General and Supplementary Conditions.

C. Division 01 - Specification Sections.

D. Section 16010 - Basic Electrical Requirements.

1.3 FIXTURES

A. Furnish, assemble, install, and wire up complete, all lighting fixtures including those for general illumination, exit sign, and emergency lighting, and exterior lighting. Fixtures shall be complete with lamps, lamp holders, and all necessary accessories. Fixtures shall bear the Underwriters' Laboratories, Inc. label of approval and be purchased, wired, and installed in accordance with applicable codes.
PART 2 - PRODUCTS

2.1 FIXTURES

A. General: All fixtures shall be as indicated and scheduled on the Drawings. The omission of a type or quantity in the fixtures schedule shown on the Drawings will not relieve the Contractor of the responsibility for furnishing all fixtures indicated on the Drawings.

B. Provide lighting fixtures, of the size, type, and rating indicated, complete with, but not necessarily limited to, lamps, lamp holders, reflectors, ballasts, starters, and wiring.

C. Fixture Types:

1. LED light Fixtures:
   a. Fixtures shall be designed for 120 volts ac.
   b. The LED driver shall be UL listed and suitable for WET location as shown on the drawings. Lamp, driver, and fixture as a unit shall be suitable for operation from -30°C to 55°C or greater.
   c. All LED fixture housings shall have aluminum heat sinks.
   d. The fixture shall meet LM-79, LM-80 tests and reports as performed in accordance to IESNA standards and shall meet UL 8750 LED equipment in Lighting Products standard.
   e. LED Lamps: Projected lifetime must be reported as per IES-TM-21 calculations and based on IES-LM-80-08 measurements with Lumen maintenance of >85%. Lamp lifetime should be 50,000 hours at minimum. Total luminous flux (lumens) must be measured as per IES-79-08. Lamps with screw-in or plug-in bases are not acceptable. Minimum initial efficacy of >105 lumens per watt. The lamps shall have a Rated Color Rendering Index (CRI) of 70 and a color temperature of at least 3000K and no greater than 5000K. All lamps shall have the same color temperature.
   f. Power Quality: Power Quality shall be maximum total harmonic distortion (THD) of 20% and meet EMI: title 47 CFR 15 class A.
   g. Minimum Power factor shall be 90%.
   h. Power Regulation: Lamp wattage regulation must not exceed ± 10 per cent when operated at voltage variation from 108V/120V to 125V/120V at 60 Hz with ambient temperature of 25°C ± 2°C (77°F ± 3.6°F). 2.3.6.2 Surge Arrester
   i. Each fixture shall be protected with a surge arrester rated 3kV at 3kA per ANSI C62.41-1991.
2. Exit Signs: The exit lighting fixtures shall meet the requirements of Federal, State, and Local codes. Exit signs shall have the word "EXIT" printed in red letters at least 6" in height. The letters and associated arrows shall be of red translucent material placed on an opaque background. Lamps shall be LED.

2.3 LAMPS

A. Lamps shall be of the wattage, type, color, and reflector lamps with type of beams indicated, as shown, and scheduled. Provide extended service lamps that are inside frosted.

PART 3 - EXECUTION

3.1 INSTALLATION OF LIGHTING FIXTURES

A. General: Install lighting fixtures of the types indicated, where shown, and at the indicated heights in accordance with the fixture manufacturer's written instructions and recognized industry practices to ensure that the fixtures comply with the requirements and serve the intended purposes. Fixtures shall exactly fit the type of ceiling system scheduled for the space.

B. Provide adequate and safe protection for fixtures and at completion of the work they shall be made clean and free of all foreign material, dust, etc.

C. Furnish and set all inserts, anchors, studs, and hangers for the support of lighting fixtures and respective equipment, and make all necessary adjustments required therein.

D. Verify location and spacing of fixtures with Plans and other reference data before installation. Coordinate space conditions; including head room clearances, and interferences with ceiling components, such as ducts, openings, beams and piping, prior to installation.

E. Lamping-Up: Furnish and install lamps in all lighting fixtures.

F. Standards: Comply with NEMA standards, applicable requirements of the NEC pertaining to installation of interior lighting fixtures, and with applicable portions of the NECA's "Standard of Installation.

G. Attachment: Fasten fixtures securely to the indicated structural support members of the building. Provide separate supports for all lighting fixtures. Check to ensure that solid pendant fixtures are plumb.

B. The Owner will not accept payment responsibility for fixtures scheduled, and delivered out of construction sequence at an earlier or later time than reasonably required by job progress.
C. Fixtures shall be in first class condition after installation. The lens surface shall be clean, if required. Fixtures with rust or damaged lenses shall be replaced at no cost to the Owner. Louvers for parabolic type fixtures shall be shipped enclosed in polyethylene bag for maximum protection.

3.3 ADJUST AND CLEAN

A. Clean interior lighting fixtures of dirt and debris upon completion of installation.

B. Protect installed fixtures from damage during remainder of construction period.

3.4 FIELD QUALITY CONTROL

A. Upon completion of installation of lighting fixtures, and after building circuitry has been energized, apply electrical energy to demonstrate capability and compliance with requirements. Where possible, correct malfunctioning units at site, then retest to demonstrate compliance; otherwise, remove and replace with new units, and proceed with retesting.

B. Replace defective and burned out lamps for period of 6 months following the date of Substantial Completion of that phase.

C. At the date of Substantial Completion, replace lamps in interior lighting fixtures which are observed to be noticeable dimmed after Contractor’s use and testing, as judged by Architect. Furnish stock or replacement lamps amounting to 15% (but not less than one lamp in each case) of each type and size lamp used in each type fixture. Deliver replacement stock as directed to Owner’s storage space.

3.5 GROUNDING

A. Provide tight equipment grounding connections for each interior lighting fixture installation where indicated.

END OF SECTION 16500