

CITY OF FLINT, MICHIGAN
WATER POLLUTION CONTROL
ELECTRICAL DISTRIBUTION IMPROVEMENTS
Contract Number 200-156238-23001

Bidding Documents

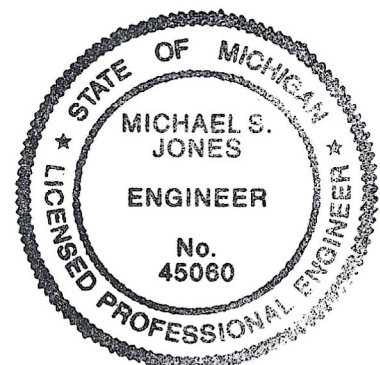
Specifications

Prepared by



Ann Arbor, Michigan

July 7, 2023



Michael S. Jones
7-7-23

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DIVISION 0

BIDDING AND CONTRACT REQUIREMENTS

ADVERTISEMENT FOR BIDS

CITY OF FLINT WPC ELECTRICAL DISTRIBUTION IMPROVEMENTS Contract 200-156238-23001

Sealed Bids will be received by the City of Flint, Michigan at the office of the City of Flint Finance Department – Division of Purchases and Supplies, 1101 S Saginaw St, Room 203, Flint MI 48502 up to 3:00 p.m., prevailing local time, on July 24, 2023, and then publicly opened and read aloud for the construction of ELECTRICAL DISTRIBUTION IMPROVEMENTS, Contract 200-156238-23001. One fully completed digital copy and hard copy of the Bid, including all necessary support forms shall be submitted at time of bid. The digital copy of bid shall be submitted to City of Flint Finance Department – Division of Purchases and Supplies at purchasingbids@cityofflint.com.

The Work consists of electrical improvements and related work to the treatment plant and third street pumping station and is generally described as

1. Replacement of following medium voltage main switchgear.
 - a. Switchgear S1 North
 - b. Switchgear S1 South
 - c. Switchgear S2
 - d. Switchgear S3
2. Installation of new duct banks, conduit, and wire for refeeding the treatment plant switchgear.
3. Replace primary wire from Consumers equipment to S2 switchgear...
4. Concrete work to repair & enhance the two outdoor switchgear S1 North and S1 South utility vaults.
5. Supply and install two pre-engineered buildings for S1 North and S1 South switchgear.
6. Installation and repair of related concrete housekeeping pads, foundations, and floor repairs as needed.
7. Replacement of the following transformers as indicated on the contract drawings:
 - a) Sludge Thickener
 - b) Oil Barn Transformer
 - c) Incinerator Complex Transformers (2)
 - d) Northwest Pump Station Transformers (2)
 - e) Digester Transformer
 - f) East Pumping Station Transformers (2)
 - g) Third Avenue Pumping Station Transformers (2)
 - h) Transformers related to Switchgear S3 (2)
8. Execution of electrical coordination study, short circuit and arc-flash analysis as indicated on drawing and with specifications.
9. Replace the existing Third Ave. Pumping Station primary distribution transformers.
10. Provide 3-year maintenance contract for entire facility's electrical distribution equipment to include recommended quarterly, 6-month, yearly and 3-year procedures to properly maintain equipment.
11. Supply, install and maintain backup (diesel generators) power during switchover of equipment including separate units for main treatment plant and digester building.
12. Consumers Transformer Yard related work.

Bids shall be on a lump sum basis for the Work.

The Drawings and Project Manual under which the Work is to be done are on file and may be examined at the office of the City of Flint Water Pollution Control Facility.

Bidding Documents may be obtained on or after Monday, July 10, 2023, through the City of Flint, Finance Department Division of Purchases and Supplies. Plans will be available to view, purchase or download from the City's Purchasing page of the City of Flint's web site at <https://www.cityofflint.com/finance/purchasing/bids-2/> under "open bids" and the specific bid or proposal number assigned.

A Bid Security in the form of a certified check, bank check, or Bid Bond for a sum not less than five percent (5%) of the amount of the Bid will be required with each Bid.

The right is reserved by OWNER to accept any Bid, to reject any Bid, and to waive irregularities in Bids.

A mandatory Pre-Bid Conference will be held at 9:00 a.m. on July 17, 2023 at the City of Flint Water Pollution Control Facility, 4652 Beecher Road, Flint, MI 48532. Representatives of OWNER and ENGINEER will be present to discuss the Project. Bidders are required to attend and participate in the conference.

Prospective Bidders who fail to attend and register at the meeting will be disqualified from bidding for the Work. ENGINEER will transmit to all prospective Bidders of record such Addenda as ENGINEER considers necessary in response to questions arising at the conference. Oral statements may not be relied upon and will not be binding or legally effective.

CONTRACTOR will not engage in unlawful discrimination on the basis of race, color, religion, national origin, age, sex, height, weight, marital status, or unrelated disability. Bids from minority- and female-owned organizations are encouraged.

This Contract requires the use of prevailing wage rates. Other specific funding requirements are included in the Project Manual.

No Bids may be withdrawn after the above date and time for receiving Bids for a period of ninety (90) days.

Christopher Mumby
City of Flint Division of Purchases and Supplies

SECTION 00110 - CONTRACTOR'S QUALIFICATION STATEMENT

This Section shall be completed and submitted with the bid to demonstrate Bidder's qualifications to enter into Contract with and to perform the Work for OWNER.

1. Project Information:

OWNER: _____

Address: _____

Project: _____

Contract No. _____

2. Bidder Information:

Name of Organization: _____

Address: _____

Telephone: _____

Facsimile: _____

3. Surety company:

Name of Surety: _____

Agent's Name: _____

Surety Rating: A.M. Best's Rating _____

Address: _____

Telephone: _____

Facsimile: _____

4. Type of Organization, check if:

☐ Corporation ☐ Partnership ☐ Joint Venture ☐ Sole Proprietorship

If Corporation:

Date and State of Incorporation _____

List of Executive Officers

Name

Title

If Partnership:

Date and State of Organization: _____

Names of Current General Partners

Type of Partnership

☐ General

☐ Publicly Traded

☐ Limited

☐ Other (describe): _____

If Joint Venture:

Date and State of Organization: _____

Name, Address and Form of Organization of Joint Venture Partners: (Indicate managing partner by an asterisk *)

If Sole Proprietorship:

Date and State of Organization: _____

Name and Address of Owner or Owners

5. Completed Projects: In Schedule A, provide the following for projects completed within the past five years (If joint venture, list each participant's projects separately):
- A. List major engineered construction projects completed by this organization.
 - B. Has your organization ever failed to complete any work awarded to it?
 - C. Has your organization ever failed to substantially complete a project in a timely manner?

- D. Are there any judgments, claims, arbitration proceedings or suits pending or outstanding against your organization or its officers?
- E. Has your organization filed any lawsuits or requested arbitration with regard to construction contracts?
- F. Has any Corporate officer, partner, joint venture participant or proprietor ever failed to complete a construction contract awarded to him or her in their own name or when acting as a principal of another organization?
- G. Is your organization a member of a controlled group of corporations as defined in I.R.C. Sec. 1563?
- ☐ Yes ☐ No

If yes, show names and addresses of affiliated companies.

6. Current Projects: In Schedule B, provide the following (If joint venture, list each participant's projects separately):

- A. List major engineered construction projects under current contract by this organization.
- B. Are there any projects that are beyond final completion date?
- C. Are there any projects that have liquidated damages presently being assessed?
- D. Are there any judgments, claims, arbitration proceedings or suits pending or outstanding against your organization or its officers?
- E. Has your organization filed any lawsuits or requested arbitration on any of these projects?

7. Financial Resources:

- A. Provide complete financial statement for firm.
- B. Provide in Schedule C, equipment owned by firm. Include manufacturer's name, description, size and or capacity, and age.
- C. Provide the following information with respect to an accredited banking institution familiar with your organization.

Name of Bank: _____

Address: _____

Account Manager: _____

Telephone: _____

Facsimile: _____

D. What is your approximate total bonding capacity (circle one)?

\$30,000,000 to \$50,000,000

\$50,000,000 to \$100,000,000

\$100,000,000 or more

8. Experience Record: In Schedule D, provide:

A. Details of the construction experience of the principal individuals of your organization directly involved in construction operations.

B. Indicate general types of work performed with your own work force.

9. Safety: Describe the permanent safety program you maintain within your organization (use attachment if necessary).

A. Submit a copy of the Bidder's current Experience Modification Rates (EMR).

B. Submit Bidder's OSHA Form 200 recordable incidence rate for the last calendar year, per 200,000 man-hours, for:

1. Total cases.
2. Lost workday cases.
3. Non-fatal cases per number of lost workdays.

I hereby certify that the information submitted herewith, including any attachment is true to the best of my knowledge and belief.

Subscribed and sworn to
before me on _____

County, Michigan

By: _____
Title: _____

Dated: _____

Signature _____

Printed: _____

Notary Public

COMPLETED PROJECTS

SCHEDULE A

Name, Location, and Description of Project	Owner	Design Engineer	Date Completed	Contract Price	5.B. Yes / No	5.C. Yes / No	5.D. Yes / No	5.E. Yes / No	5.F. Yes / No	Reference/Contact Include Address & Phone

If any of questions 5.B. through F is yes, then attach written explanation.

CURRENT PROJECTS

SCHEDULE B

Name, Location, and Description of Project	Owner	Design Engineer	Date Completed	Contract Price	6.B. Yes / No	6.C. Yes / No	6.D. Yes / No	6.E. Yes / No	Reference/Contact Include Address & Phone

If any of questions 6.B. through E is yes, then attach written explanation.

FINANCIAL RESOURCES

SCHEDULE C

Owned Equipment Description	Manufacturer's Name	Size or Capacity	Age	Condition	Location Stored

EXPERIENCE RECORD

SCHEDULE D

Person's Name	Position	Date started with this Firm	Year started in Construction	Prior positions and experience in Construction

General Types of Work Performed by Own Work Force: _____

SECTION 00200 - INSTRUCTION TO BIDDERS

ARTICLE 1 - DEFINED TERMS

- 1.01 Terms used in these Instructions to Bidders will have the meanings indicated in the General Conditions and Supplementary Conditions. Additional terms used in these Instructions to Bidders have the meanings indicated below which are applicable to both the singular and plural thereof:
- A. *Bidder*: The individual or entity who submits a Bid directly to OWNER.
 - B. *Issuing Office*: The office from which the Bidding Documents are to be issued and where the bidding procedures are to be administered.
 - C. *Successful Bidder*: The lowest responsible Bidder submitting a responsive Bid to whom OWNER (on the basis of OWNER's evaluation as hereinafter provided) makes an award.

ARTICLE 2 - COPIES OF BIDDING DOCUMENTS

- 2.01 Complete sets of the Bidding Documents for the purchase sum, if any, stated in the Advertisement or Invitation to Bid may be obtained from the Issuing Office.
- A. Upon written request, copies of the Bidding Drawings, in their entirety or by individual Drawing, may be obtained in electronic format from the Issuing Office for the purchase sum of \$30 per Drawing. Upon receipt of payment, Drawings will be made available in the latest version of AutoCAD and transmitted to Bidder on a CD or DVD. E-mail transfer of Bidding Drawings will not be permitted.
- 2.02 Complete sets of Bidding Documents must be used in preparing Bids; neither OWNER nor ENGINEER assumes any responsibility for errors or misinterpretations resulting from the use of incomplete sets of Bidding Documents.
- 2.03 OWNER and ENGINEER in making copies of Bidding Documents available on the above terms do so only for the purpose of obtaining Bids for the Work and do not confer a license or grant for any other use.

ARTICLE 3 - QUALIFICATIONS OF BIDDERS

- A. Each Bidder shall submit to ENGINEER the following information pertaining to its financial resources, adequacy of plant and equipment, organization, prior experience and other facts, as their qualification to enter into contract with and to perform the Work for OWNER.
 - 1. Section 00110 - Contractor's Qualification Statement, including Schedules A, B, C, and D.
 - 2. Bidders must demonstrate in Schedule A, a minimum of two project experiences that are similar to or larger than this Project. Projects must be similar in nature to this Project description. Bidders who cannot demonstrate project experience of this type or size must demonstrate an experience in other types of construction projects of comparable complexity.

- a. Subcontractors, when required to be identified in the Bid, may be required to complete the Contractor's Qualification Statement for Engineered Construction, including Schedules A, B, C, and D. Subcontractor's may be required to demonstrate a project experience record as required in this Paragraph.

ARTICLE 4 - EXAMINATION OF BIDDING DOCUMENTS, OTHER RELATED DATA, AND SITE

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

- A. To examine and carefully study the Bidding Documents, including any Addenda and other related data identified in the Bidding Documents (including "technical data" referred to in Paragraphs 4.02 through 4.05, inclusive);
- B. To 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. To become familiar with and satisfy Bidder as to all Federal, State, and local Laws and Regulations that may affect cost, progress, and performance of the Work;
- D. To promptly notify ENGINEER of all conflicts, errors, ambiguities, or discrepancies which Bidder has discovered in or between the Contract Documents and such other related documents;
- E. To carefully study all reports of explorations and tests of subsurface conditions at or contiguous to the Site and all drawings of physical conditions in or relating to existing surface or subsurface structures at or contiguous to the Site (except Underground Facilities) which have been identified in the Supplementary Conditions as provided in Paragraph 4.02 of the General Conditions, and carefully study all reports and drawings of a Hazardous Environmental Condition, if any, at the Site which have been identified in the Supplementary Conditions as provided in Paragraph 4.06 of the General Conditions;
- F. To obtain and carefully study (or assume responsibility for doing so) all additional or supplementary examinations, investigations, explorations, tests, studies, and data concerning conditions (surface, subsurface, and Underground Facilities) at or contiguous to the Site which may affect cost, progress, or performance of the Work or which relate to any aspect of the means, methods, techniques, sequences, and procedures of construction to be employed by Bidder, including any specific means, methods, techniques, sequences, and procedures of construction expressly required by the Bidding Documents, and safety precautions and programs incident thereto;
- G. To agree at the time of submitting its Bid that no further examinations, investigations, explorations, tests, studies, or data are necessary for the determination of its Bid for performance of the Work at the price bid and within the times and in accordance with the other terms and conditions of the Bidding Documents;
- H. To correlate the information known to Bidder, information and observations obtained from visits to the Site, reports and drawings identified in the Bidding Documents, and all additional examinations, investigations, explorations, tests, studies, and data with the Bidding Documents;
- I. To determine that the Bidding Documents are generally sufficient to indicate and convey understanding of all terms and conditions for the performance of the Work;

4.02 Subsurface and Physical Conditions

A. The Supplementary Conditions identify:

1. Those reports of explorations and tests of subsurface conditions at or contiguous to the Site that ENGINEER has used in preparing the Bidding Documents.
2. Those drawings of physical conditions in or relating to existing surface and subsurface structures at or contiguous to the Site (except Underground Facilities) that ENGINEER has used in preparing the Bidding Documents.

B. Provisions concerning responsibilities for the adequacy of data furnished to prospective Bidders with respect to subsurface conditions, other physical conditions, and Underground Facilities, and possible changes in the Bidding Documents due to differing or unanticipated conditions appear in Paragraphs 4.02, 4.03, and 4.04 of the General Conditions.

4.03 Underground Facilities

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.

4.04 Hazardous Environmental Condition(s)

A. The Supplementary Conditions identify:

1. Those reports and drawings relating to Hazardous Environmental Condition(s) identified at the Site, if any, that ENGINEER has used in preparing the Bidding Documents are identified in Paragraph 4.06.

B. Copies of reports and drawings referenced in Paragraph 4.04.A, that are not included with Bidding Documents, may be examined City of Flint Water Pollution Control Facility, 4652 Beecher Road, Flint MI 48532 during regular business hours. Those reports and drawings are not part of the Contract Documents, but the "technical data" contained therein upon which Bidder is entitled to rely as provided in Paragraph 4.06 of the General Conditions has been identified and established in Paragraph 4.06 of the Supplementary Conditions. Bidder is responsible for any interpretation or conclusion Bidder draws from any "technical data" or any other data, interpretations, opinions, or information contained in such reports or shown or indicated on such drawings.

C. 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 Drawings or Specifications or identified in the Contract Documents to be within the scope of the Work appear in Paragraph 4.06 of the General Conditions.

4.05 The submission of a Bid will constitute an incontrovertible representation by Bidder that Bidder has complied with every requirement of this Article 4, that without exception the Bid is premised upon performing and furnishing the Work required by the Bidding Documents and applying any specific means, methods, techniques, sequences, and 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 and furnishing the Work.

ARTICLE 5 - PRE-BID CONFERENCE

A mandatory Pre-Bid Conference will be held at 9:00 a.m. on July 17, 2023 at the City of Flint Water Pollution Control Facility, 4652 Beecher Road, Flint, MI 48532. Representatives of OWNER and ENGINEER will be present to discuss the Project. Bidders are required to attend and participate in the conference.

Representatives of OWNER and ENGINEER will be present to discuss the Project. Prospective Bidders who fail to attend and register at the meeting will be disqualified from bidding for the Work. ENGINEER will transmit to all prospective Bidders of record such Addenda as ENGINEER considers necessary in response to questions arising at the conference. Oral statements may not be relied upon and will not be binding or legally effective.

ARTICLE 6 - SITE AND OTHER AREAS

6.01 The Site is identified 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 in Work are to be obtained and paid for by CONTRACTOR. Easements for permanent structures or permanent changes in existing facilities are to be obtained and paid for by OWNER unless otherwise provided in the Bidding Documents.

ARTICLE 7 - INTERPRETATIONS AND ADDENDA

7.01 All questions about the meaning or intent of the Bidding Documents are to be submitted to ENGINEER in writing. Interpretations or clarifications considered necessary by ENGINEER in response to such questions will be issued by Addenda mailed or delivered to all parties recorded by ENGINEER as having received the Bidding Documents. Questions received less than ten days prior to the date for opening of Bids may not be answered. Only questions answered by Addenda will be binding. Oral and other interpretations or clarifications will be without legal effect.

7.02 Addenda may be issued to clarify, correct, or change the Bidding Documents as deemed advisable by OWNER or ENGINEER.

ARTICLE 8 - BID SECURITY

8.01 A Bid must be accompanied by Bid Security made payable to OWNER in an amount of five percent of Bidder's maximum Bid price and in the form of a certified check, bank check, or a Bid Bond on the form attached in Section 00430, issued by a surety meeting the requirements of Paragraphs 5.01 and 5.02 of the General Conditions.

8.02 The Bid Security of the Successful Bidder will be retained until such Bidder has executed the Contract Documents, furnished the required Contract Security and met the other conditions of the Notice of Award, whereupon the Bid Security will be returned. If the Successful Bidder fails to execute and deliver the Contract Documents and furnish the required Contract Security within 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. The Bid Security of other Bidders whom OWNER believes to have a reasonable chance of receiving the award

may be retained by OWNER until the earlier of seven (7) days after the Effective Date of the Agreement or 91 days after the Bid opening, whereupon Bid Security furnished by such Bidders will be returned.

- 8.03 Bid Security of other Bidders whom OWNER believes do not have a reasonable chance of receiving the award will be returned within seven (7) days after the Bid opening.

ARTICLE 9 - CONTRACT TIMES

- 9.01 The number of days within which, or the dates by which, the Work is to be (a) Substantially Completed, (b) Milestones (if any), and (c) also completed and ready for final payment are set forth in the Agreement.

ARTICLE 10 - LIQUIDATED DAMAGES

- 10.01 Provisions for liquidated damages, if any, are set forth in the Agreement.

ARTICLE 11 - SUBSTITUTE AND "OR-EQUAL" ITEMS

- 11.01 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 acceptable to ENGINEER, application for such acceptance will not be considered by ENGINEER until after the Effective Date of the Agreement. The procedure for submission of any such application by CONTRACTOR and consideration by ENGINEER is set forth in the General Conditions and may be supplemented in the General Requirements.

ARTICLE 12 - SUBCONTRACTORS, SUPPLIERS, AND OTHERS

- 12.01 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 (5) days after Bid opening, submit to OWNER a list of all such Subcontractors, Suppliers, individuals, or 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 qualification for each such Subcontractor, Supplier, individual, or 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 apparent Successful Bidder to submit a substitute, in which case apparent Successful Bidder shall submit an acceptable substitute. Bidder's Bid price will be increased (or decreased) by the difference in cost occasioned by such substitution, and OWNER may consider such price adjustment in evaluating Bids and making the contract award.
- 12.02 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, 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 the 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.

- 12.03 CONTRACTOR shall not be required to employ any Subcontractor, Supplier, individual, or entity against whom CONTRACTOR has reasonable objection.
- 12.04 The manufacturers of certain equipment items are required to submit Equipment Data Sheets to ENGINEER prior to the time Bids are received. Equipment items requiring such submittals are identified in the Specifications. Failure on the part of the manufacturer to provide this information in the form and at the time prescribed in the individual Specification Sections where the equipment is described will make their equipment subject to rejection by OWNER.

ARTICLE 13 - PREPARATION OF BID

- 13.01 The Bid Form is included with the Bidding Documents. Additional copies may be obtained from ENGINEER or Issuing Office.
- 13.02 All blanks on Bid Form shall be completed by printing in ink or by typewriter and the Bid signed. Changes on Bid Form shall be lined-out with Bidder's initials next to the change to signify and validate change on Bid Form.
- 13.03 A Bid by a corporation shall be executed in the corporate name by the president or a vice-president or other corporate officer accompanied by evidence of authority to sign. The corporate seal shall be affixed and attested by the secretary or an assistant secretary. The corporate address and state of incorporation shall be shown below the signature.
- 13.04 A Bid by a partnership shall be executed in the partnership name and signed by a partner (whose title must appear under the signature), accompanied by evidence of authority to sign. The official address of the partnership shall be shown below the signature.
- 13.05 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 must be shown below the signature.
- 13.06 A Bid by an individual shall show the Bidder's name and official address.
- 13.07 A Bid by a joint venture shall be executed by each joint venturer in the manner indicated on Bid Form. The official address of the joint venture must be shown below the signature.
- 13.08 Evidence of authority to conduct business as an out-of-state corporation in the state where the Work is to be performed shall be provided in accordance with Paragraph 13.03 above. State contractor license number, if any, must be shown.
- 13.09 All names shall be typed or printed in black ink below the signatures.
- 13.10 The Bid shall contain an acknowledgment of receipt of all Addenda, the numbers of which shall be filled in on Bid Form.
- 13.11 The address and telephone number for communications regarding the Bid shall be shown.
- 13.12 The Bid shall contain evidence of Bidder's authority and qualification to do business in the state where the Project is located or covenant to obtain such qualification prior to award of the Contract. Bidder's state contractor license number for the state of the Project, if any, shall also be shown on Bid Form.

ARTICLE 14 - BASIS OF BID; EVALUATION OF BIDS

14.01 Lump Sum

- A. Bidders shall submit a Bid on a Lump Sum basis as set forth on Bid Form.

14.02 The Bidder will complete the "EQUIPMENT EVALUATION" portion of the Bid. OWNER reserves the right to evaluate the data and prices received for the products listed. Based on the information listed on "Equipment Data Sheet" included in the appropriate Specification Section and the prices listed on Bid Form, OWNER will evaluate the product as to its long-term value. If OWNER determines that another product is desirable to OWNER, a Change Order, in accordance with Articles 10, 11, and 12 of the General Conditions, will be issued for providing the product at the differential price listed on Bid Form after the award of the Contract.

ARTICLE 15 - SUBMITTAL OF BID

15.01 Each prospective Bidder is furnished one copy of the Bidding Documents. An unbound copy of Bid Form is to be completed and submitted with the following data:

- A. Evidence of Bidder's qualification to do business in the state where the Project is located or covenant to obtain such qualification prior to award of the Contract; and
- B. Required Bid Security in the form of a certified check, bank check, or a Bid Bond; and
- C. Section 00435 - A tabulation of Subcontractors, Suppliers and other individuals and entities required to be identified in this Bid.

15.02 A Bid shall be submitted no later than the date and time prescribed and at the place indicated in the Advertisement or Invitation to Bid and shall be enclosed in an opaque sealed envelope plainly marked with the Project title (and, if applicable, the designated portion of the Project for which the Bid is submitted), the name and address of Bidder, and shall be accompanied by the Bid Security and other required documents. If a Bid is sent by mail or other delivery system, the sealed envelope containing the Bid shall be enclosed in a separate envelope plainly marked on the outside with the notation "BID ENCLOSED." A mailed Bid shall be addressed to OWNER's office. A digital copy of the Bid shall also be submitted at the same time to the City of Flint Finance Department – Division of Purchases and Supplies at purchasingbids@cityofflint.com.

ARTICLE 16 - MODIFICATION AND WITHDRAWAL OF BID

16.01 A Bid may be modified or withdrawn by an appropriate document duly executed in the manner that a Bid must be executed and delivered to the place where Bids are to be submitted prior to the date and time for the opening of Bids.

16.02 No Bidder may withdraw any Bid after the time stated in the Advertisement or Invitation to Bid.

ARTICLE 17 - OPENING OF BIDS

- 17.01 Bids will be opened at the time and place indicated in the Advertisement or Invitation to Bid and, unless obviously non-responsive, read aloud publicly. An abstract of the amounts of the base Bids and major alternates, if any, will be made available to Bidders after the opening of Bids.

ARTICLE 18 - BIDS TO REMAIN SUBJECT TO ACCEPTANCE

- 18.01 All Bids will remain subject to acceptance for the period of time stated on Bid Form, but OWNER may, in its sole discretion, release any Bid and return the Bid Security prior to the end of this period.

ARTICLE 19 - AWARD OF CONTRACT

- 19.01 OWNER reserves the right to reject any or all Bids, including without limitation, nonconforming, nonresponsive, unbalanced, or conditional Bids. OWNER further reserves the right to reject the Bid of any Bidder whom it finds, after reasonable inquiry and evaluation, to be non-responsible. OWNER may also reject the Bid of any Bidder if OWNER believes that it would not be in the best interest of the Project to make an award to that Bidder. OWNER also reserves the right to waive all informalities not involving price, time, or changes in the Work and to negotiate Contract terms with the Successful Bidder.
- 19.02 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 an interest.
- 19.03 In evaluating Bids, OWNER will consider whether or not the Bids comply with the prescribed requirements, and such alternates, unit prices and other data, as may be requested on Bid Form or prior to the Notice of Award.
- 19.04 In evaluating Bidders, OWNER will consider the qualifications of Bidders, in accordance with Article 3 of this Section, and 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.
- 19.05 OWNER may conduct such investigations as OWNER deems necessary to establish the responsibility, qualifications, and financial ability of Bidders, proposed Subcontractors, Suppliers, individuals, or entities to perform the Work in accordance with the Contract Documents.
- 19.06 If the Contract is to be awarded, OWNER will award the Contract to the Bidder whose Bid is in the best interests of the Project.

ARTICLE 20 - CONTRACT SECURITY AND INSURANCE

- 20.01 Article 5 of the General Conditions, as may be modified by the Supplementary Conditions, sets forth OWNER's requirements as to performance and payment Bonds and insurance. When the Successful Bidder delivers the executed Agreement to OWNER, it must be accompanied by such Bonds and insurance.

ARTICLE 21 - SIGNING OF AGREEMENT

21.01 When OWNER gives a Notice of Award to the Successful Bidder, it shall be accompanied by the required number of unsigned counterparts of the Agreement with the other Contract Documents which are identified in the Agreement as attached thereto. Within ten (10) days thereafter, Successful Bidder shall sign and deliver the required number of counterparts of the Agreement and attached documents to OWNER. Within ten (10) days thereafter, OWNER shall deliver one fully signed counterpart to Successful Bidder with a complete set of Drawings with appropriate identification.

ARTICLE 22 - SALES AND USE TAXES

22.01 Bidder shall pay all State Sales, Use, and other Taxes that are lawfully assessed against OWNER or Bidder on materials and equipment to be incorporated in Work. Said taxes shall be included in the Contract Price. Refer to General Conditions GC 6.10.

ARTICLE 23 - RETAINAGE

23.01 Provisions concerning CONTRACTOR's retainage are set forth in Article 6 of the Agreement.

END OF SECTION

SECTION 00400 - BID FORM

City of Flint
Water Pollution Control
Electrical Distribution Improvements

Contract 200-156238-23001

THIS BID IS SUBMITTED TO:

City of Flint – Finance Department Division of Purchase and Supplies
Owner
1101 S. Saginaw St., Room 203, 2nd Floor
Address
Flint, MI 48502
City, State, Zip

- 1.01 The undersigned Bidder proposes and agrees, if this Bid is accepted, to enter into an Agreement with OWNER in the form included in the Bidding Documents to perform all Work as specified or indicated in the Bidding Documents for the prices and within the times indicated in this Bid and in accordance with the other terms and conditions of the Bidding Documents.
- 2.01 Bidder accepts all of the terms and conditions of the Advertisement or Invitation to Bid and Instructions to Bidders, including without limitation those dealing with the disposition of Bid security. The Bid will remain subject to acceptance for 90 days after the Bid opening, or for such longer period of time that Bidder may agree to in writing upon request of OWNER.
- 3.01 In submitting this Bid, Bidder represents, as set forth in the Agreement, that:
- A. Bidder has examined and carefully studied the Bidding Documents, the other related data identified in the Bidding Documents, and the following Addenda, receipt of all which is hereby acknowledged.
- | <u>Addendum No.</u> | <u>Addendum Date</u> |
|---------------------|----------------------|
| _____ | _____ |
| _____ | _____ |
| _____ | _____ |
- B. Bidder has visited the Site and become familiar with and is satisfied as to the general, local, and Site conditions that may affect cost, progress, and performance of the Work.
- C. Bidder is familiar with and is satisfied as to all Federal, State, and local Laws and Regulations that may affect cost, progress, and performance of the Work.

D. Bidder has carefully studied all:

1. Reports of explorations and tests of subsurface conditions at or contiguous to the Site and all drawings of physical conditions in or relating to existing surface or subsurface structures at or contiguous to the Site (except Underground Facilities) which have been identified in the Supplementary Conditions as provided in Paragraph 4.02 of the General Conditions, and
2. Reports and drawings of a Hazardous Environmental Condition, if any, which has been identified in the Supplementary Conditions as provided in Paragraph 4.06 of the General Conditions.

E. Bidder has obtained and carefully studied (or assumes responsibility for having done so) all additional or supplementary examinations, investigations, explorations, tests, studies and data concerning conditions (surface, subsurface and Underground Facilities) at or contiguous to the Site which may affect cost, progress, or performance of the Work or which relate to any aspect of the means, methods, techniques, sequences, and procedures of construction to be employed by Bidder, including applying the specific means, methods, techniques, sequences, and procedures of construction expressly required by the Bidding Documents to be employed by Bidder, and safety precautions and programs incident thereto.

F. Bidder does not consider that any further examinations, investigations, explorations, tests, studies, or data are necessary for the determination of this Bid for performance of the Work at the price(s) bid and within the times and in accordance with the other terms and conditions of the Bidding Documents.

G. Bidder has correlated the information known to Bidder, information and observations obtained from visits to the Site, reports and drawings identified in the Bidding Documents, and all additional examinations, investigations, explorations, tests, studies, and data with the Bidding Documents.

H. Bidder has given ENGINEER written notice of all conflicts, errors, ambiguities, or discrepancies that Bidder has discovered in the Bidding Documents, and the written resolution thereof by ENGINEER is acceptable to Bidder.

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

J. In preparation of this Bid, Bidder acknowledges that it will not discriminate against any employee or applicant for employment with respect to hire, tenure, conditions, or privileges of employment, or a matter directly or indirectly related to employment, because of race, color, religion, national origin, age, sex, height, weight, marital status, or a disability that can be reasonable accommodated. OWNER will require this covenant be placed in the Contract with any subcontractor employed in the performance of this Contract.

K. All claims and disputes arising from related Work at Site by other contractors shall be settled in accordance with Paragraph 7.03 of the Supplementary Conditions.

4.01 Bidder further represents that this Bid is genuine and not made in the interest of or on behalf of any undisclosed individual or entity and is not submitted in conformity with any agreement or rules of any group, association, organization or corporation; Bidder has not directly or indirectly induced or solicited any other Bidder to submit a false or sham Bid; Bidder has not solicited or induced any individual or entity to refrain from bidding; and Bidder has not sought by collusion to obtain for itself any advantage over any other Bidder or over OWNER.

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

- A. BASE BID PRICE _____ (\$ _____)
(use words) (figures)
- B. All specific allowances are included in the price(s) set forth above and have been computed in accordance with Paragraph 11.02 of the General Conditions.
1. Included in the Bid Price is a Lump Sum Allowance for Consumers Energy services related to turning off each source of power in the amount of \$75,000.
 2. Included in the Bid Price is a Lump Sum Allowance for Unforeseen Conditions in the amount of \$500,000.

6.01 CONTRACTOR shall list subcontractors proposed for the following Work.

<u>Discipline</u>	<u>Subcontractor Name</u>
Demolition	_____
Concrete	_____
Concrete Repair	_____
Painting	_____
Process Piping and Equipment	_____
HVAC	_____
Electrical	_____
Instrumentation	_____
Other	_____

7.01 Bidder agrees that the Work will be substantially completed and completed and ready for final payment in accordance with Paragraph 14.07.B of the General Conditions on or before the dates or within the number of calendar days indicated in the Agreement.

8.01 Bidder accepts the provisions of the Agreement as to liquidated damages in the event of failure to complete the Work within the times specified above, which shall be stated in the Agreement.

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

- A. Evidence of Bidder's qualification to do business in the state where the Project is located or covenant to obtain such qualification prior to award of the Contract; and
- B. Required Bid Security in the form of a certified check, bank check, or a Bid Bond; and

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

SUBMITTED on _____, 20____.

State Contractor License No. _____ (If applicable)

If Bidder is:

An Individual

Name (typed or printed): _____

By: _____ (SEAL)

(Individual's signature)

Doing business as: _____

Business address: _____

Phone No.: _____ FAX No.: _____

A Partnership

Partnership Name: _____ (SEAL)

By: _____

(Signature of general partner -- attach evidence of authority to sign)

Name (typed or printed): _____

Business address: _____

Phone No.: _____ FAX No.: _____

A Corporation

Corporation Name: _____ (SEAL)

State of Incorporation: _____

Type (General Business, Professional, Service, Limited Liability): _____

By: _____

(Signature -- attach evidence of authority to sign)

Name (typed or printed): _____

Title: _____

(CORPORATE SEAL)

Attest _____

(Signature of Corporate Secretary)

Business address: _____

Phone No.: _____ FAX No.: _____

Date of Qualification to do business is _____

A Joint Venture

Joint Venturer Name: _____ (SEAL)

By: _____
(Signature of joint venture partner -- attach evidence of authority to sign)

Name (typed or printed): _____

Title: _____

Business address: _____

Phone No.: _____ FAX No.: _____

Joint Venturer Name: _____ (SEAL)

By: _____
(Signature -- attach evidence of authority to sign)

Name (typed or printed): _____

Title: _____

Business address: _____

Phone No.: _____ FAX No.: _____

Phone and FAX Number, and Address for receipt of official communications:

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

END OF SECTION

SECTION 00430 - 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

SURETY

(Seal)

(Seal)

Bidder's Name and Corporate Seal

Surety's Name and Corporate Seal

By:

Signature

By:

Signature (Attach Power of Attorney)

Print Name

Print Name

Title

Title

Attest:

Signature

Attest:

Signature

Title

Title

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

Flint WPC

Electrical Distribution Improvements

200-156238-23001

00430-1

July 7, 2023

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.

REQUIRED STANDARD CONTRACT LANGUAGE: CLEAN WATER STATE REVOLVING FUND AND DRINKING WATER REVOLVING FUND

- **Davis-Bacon/Prevailing Federal Wages, Including Labor Standards Provisions**
- **Disadvantaged Business Enterprise (DBE) Requirements***
- **Debarment/Suspension Certification***

*** Bidders should note these sections contain instructions regarding forms/information that must be completed/included with any submitted bid.**

Davis-Bacon/Prevailing Federal Wage Rates

P.L. 111-88 requires compliance with the Davis Bacon Act and adherence to the current U.S. Department of Labor Wage Decision. Attention is called to the fact that not less than the minimum salaries and wages as set forth in the Contract Documents (see Wage Decision included herein) must be paid on this project. The Wage Decision, including modifications, must be posted by the Contractor on the job site. A copy of the Federal Labor Standards Provisions is included and is hereby a part of this contract.

Superseded General Decision Number: MI20220083

State: Michigan

Construction Type: Building

County: Genesee County in Michigan.

BUILDING CONSTRUCTION PROJECTS (does not include single family homes or apartments up to and including 4 stories).

Note: Contracts subject to the Davis-Bacon Act are generally required to pay at least the applicable minimum wage rate required under Executive Order 14026 or Executive Order 13658. Please note that these Executive Orders apply to covered contracts entered into by the federal government that are subject to the Davis-Bacon Act itself, but do not apply to contracts subject only to the Davis-Bacon Related Acts, including those set forth at 29 CFR 5.1(a)(2)-(60).

If the contract is entered into on or after January 30, 2022, or the contract is renewed or extended (e.g., an option is exercised) on or after January 30, 2022:	<ul style="list-style-type: none">. Executive Order 14026 generally applies to the contract.. The contractor must pay all covered workers at least \$16.20 per hour (or the applicable wage rate listed on this wage determination, if it is higher) for all hours spent performing on the contract in 2023.
If the contract was awarded on or between January 1, 2015 and January 29, 2022, and the contract is not renewed or extended on or after January 30, 2022:	<ul style="list-style-type: none">. Executive Order 13658 generally applies to the contract.. The contractor must pay all covered workers at least \$12.15 per hour (or the applicable wage rate listed on this wage determination, if it is higher) for all hours spent performing on that contract in 2023.

The applicable Executive Order minimum wage rate will be adjusted annually. If this contract is covered by one of the Executive Orders and a classification considered necessary for performance of work on the contract does not appear on this wage determination, the contractor must still submit a conformance request.

Additional information on contractor requirements and worker protections under the Executive Orders is available at <http://www.dol.gov/whd/govcontracts>.

Modification Number	Publication Date
0	01/06/2023
1	02/03/2023
2	04/07/2023
3	04/14/2023
4	05/05/2023

	Rates	Fringes
ASBESTOS WORKER/HEAT & FROST INSULATOR.....	\$ 34.62	18.58

BOIL0169-001 01/01/2021

	Rates	Fringes
BOILERMAKER.....	\$ 35.95	34.52

BRMI0009-014 08/01/2022

	Rates	Fringes
BRICKLAYER.....	\$ 35.43	23.83
TILE FINISHER.....	\$ 29.93	18.02
TILE SETTER.....	\$ 29.93	18.02

FOOTNOTE:

 Paid Holiday: Fourth of July, if the worker was employed by the contractor in any period of seven working days before said holiday within the current calendar year.

CARP0706-001 06/01/2021

	Rates	Fringes
CARPENTER, Includes Acoustical Ceiling Installation, Drywall Hanging, Form Work, and Metal Stud Installation.....	\$ 29.48	22.00

ELEC0948-001 05/30/2022

	Rates	Fringes
ELECTRICIAN Excludes Low Voltage Wiring.	\$ 39.17	23.51
Low Voltage Wiring.....	\$ 40.71	9.36+36.76%

ENGI0324-011 06/01/2022

	Rates	Fringes
OPERATOR: Power Equipment GROUP 1.....	\$ 44.13	24.85
GROUP 2.....	\$ 40.83	24.85
GROUP 3.....	\$ 38.18	24.85
GROUP 4.....	\$ 36.47	24.85
GROUP 5.....	\$ 36.47	24.85
GROUP 6.....	\$ 30.61	24.85
GROUP 7.....	\$ 28.13	24.85

FOOTNOTES:

 Crane operator with main boom and jib 300' or longer: \$1.50 per hour above the group 1 rate. Crane operator with main boom and jib 400' or longer: \$3.00 per hour above the group 1 rate.

 PAID HOLIDAYS: New Year's Day, Memorial Day, Fourth of July, Labor Day, Thanksgiving Day and Christmas Day.

POWER EQUIPMENT OPERATOR CLASSIFICATIONS

GROUP 1: Crane operator with main boom and jib 400', 300', or 220' or longer.

GROUP 2: Crane operator with main boom and jib 140' or longer, tower crane, gantry crane, whirley derrick

GROUP 3: Backhoe/Excavator/Trackhoe; Bulldozer; Concrete Pump; Crane; Grader/Blade; Highlift; Hoist; Loader; Roller; Scraper; Stiff Leg Derrick; Tractor; Trencher

GROUP 4: Bobcat/Skid Loader; Broom/Sweeper; Fork Truck (over 20' lift)

GROUP 5: Boom Truck (non-swinging)

GROUP 6: Fork Truck (20' lift and under for masonry work)

GROUP 7: Oiler

IRON0025-019 06/01/2022		
	Rates	Fringes
IRONWORKER		
REINFORCING.....	\$ 31.43	34.77
STRUCTURAL.....	\$ 34.50	38.44

LAB00334-005 06/01/2022		
	Rates	Fringes
LABORER: Landscape & Irrigation		
GROUP 1.....	\$ 23.82	7.60
GROUP 2.....	\$ 21.60	7.60

CLASSIFICATIONS

GROUP 1: Landscape specialist, including air, gas and diesel equipment operator, lawn sprinkler installer, skidsteer (or equivalent)

GROUP 2: Landscape laborer: small power tool operator, material mover, truck driver and lawn sprinkler installer tender

LAB01075-002 06/01/2022		
	Rates	Fringes
LABORER		
Common or General; Grade Checker; Mason Tender - Brick/Cement/Concrete, Pipelayer; Sandblaster.....	\$ 26.41	14.05

PAIN1052-001 05/01/2022		
	Rates	Fringes
PAINTER		
Brush & Roler.....	\$ 27.87	14.15
Spray.....	\$ 29.22	14.15

PAIN1052-004 06/01/2020		
	Rates	Fringes

DRYWALL FINISHER/TAPER		
Drywall sanding.....	\$ 27.15	15.00
Hand work.....	\$ 27.15	15.00
Machine work.....	\$ 27.15	15.00

PLAS0016-005 04/01/2014		
	Rates	Fringes
CEMENT MASON/CONCRETE FINISHER...	\$ 25.58	12.88

PLUM0370-002 06/01/2022		
	Rates	Fringes
PIPEFITTER (Includes HVAC Pipe Installation; Excludes HVAC System Installation).....	\$ 42.21	22.35
PLUMBER, Excludes HVAC Pipe Installation.....	\$ 42.21	22.35

ROOF0149-005 06/01/2020		
	Rates	Fringes
ROOFER.....	\$ 29.58	23.25

SFMI0669-001 04/01/2023		
	Rates	Fringes
SPRINKLER FITTER (Fire Sprinklers).....	\$ 40.48	25.22

* SHEE0007-008 05/01/2023		
	Rates	Fringes
SHEET METAL WORKER, Includes HVAC Duct and Unit Installation.....	\$ 35.19	23.57

* SUMI2011-008 02/01/2011		
	Rates	Fringes
IRONWORKER, ORNAMENTAL.....	\$ 18.48	7.93
TRUCK DRIVER: Tractor Haul Truck.....	\$ 13.57 **	1.18

WELDERS - Receive rate prescribed for craft performing operation to which welding is incidental.

=====

** Workers in this classification may be entitled to a higher minimum wage under Executive Order 14026 (\$16.20) or 13658 (\$12.15). Please see the Note at the top of the wage determination for more information.

Note: Executive Order (EO) 13706, Establishing Paid Sick Leave for Federal Contractors applies to all contracts subject to the Davis-Bacon Act for which the contract is awarded (and any solicitation was issued) on or after January 1, 2017. If this contract is covered by the EO, the contractor must provide employees with 1 hour of paid sick leave for every 30 hours they work, up to 56 hours of paid sick leave each year. Employees must be permitted to use paid sick leave for their

own illness, injury or other health-related needs, including preventive care; to assist a family member (or person who is like family to the employee) who is ill, injured, or has other health-related needs, including preventive care; or for reasons resulting from, or to assist a family member (or person who is like family to the employee) who is a victim of, domestic violence, sexual assault, or stalking. Additional information on contractor requirements and worker protections under the EO is available at <https://www.dol.gov/agencies/whd/government-contracts>.

Unlisted classifications needed for work not included within the scope of the classifications listed may be added after award only as provided in the labor standards contract clauses (29CFR 5.5 (a) (1) (ii)).

The body of each wage determination lists the classification and wage rates that have been found to be prevailing for the cited type(s) of construction in the area covered by the wage determination. The classifications are listed in alphabetical order of ""identifiers"" that indicate whether the particular rate is a union rate (current union negotiated rate for local), a survey rate (weighted average rate) or a union average rate (weighted union average rate).

Union Rate Identifiers

A four letter classification abbreviation identifier enclosed in dotted lines beginning with characters other than ""SU"" or ""UAVG"" denotes that the union classification and rate were prevailing for that classification in the survey. Example: PLUM0198-005 07/01/2014. PLUM is an abbreviation identifier of the union which prevailed in the survey for this classification, which in this example would be Plumbers. 0198 indicates the local union number or district council number where applicable, i.e., Plumbers Local 0198. The next number, 005 in the example, is an internal number used in processing the wage determination. 07/01/2014 is the effective date of the most current negotiated rate, which in this example is July 1, 2014.

Union prevailing wage rates are updated to reflect all rate changes in the collective bargaining agreement (CBA) governing this classification and rate.

Survey Rate Identifiers

Classifications listed under the ""SU"" identifier indicate that no one rate prevailed for this classification in the survey and the published rate is derived by computing a weighted average rate based on all the rates reported in the survey for that classification. As this weighted average rate includes all rates reported in the survey, it may include both union and non-union rates. Example: SULA2012-007 5/13/2014. SU indicates the rates are survey rates based on a weighted average calculation of rates and are not majority rates. LA indicates the State of Louisiana. 2012 is the year of survey on which these classifications and rates are based. The next number, 007 in the example, is an internal number used in producing the wage determination. 5/13/2014 indicates the survey completion date for the classifications and rates under that identifier.

Survey wage rates are not updated and remain in effect until a new survey is conducted.

Union Average Rate Identifiers

Classification(s) listed under the UAVG identifier indicate that no single majority rate prevailed for those classifications; however, 100% of the data reported for the classifications was union data. EXAMPLE: UAVG-OH-0010 08/29/2014. UAVG indicates that the rate is a weighted union average rate. OH indicates the state. The next number, 0010 in the example, is an internal number used in producing the wage determination. 08/29/2014 indicates the survey completion date for the classifications and rates under that identifier.

A UAVG rate will be updated once a year, usually in January of each year, to reflect a weighted average of the current negotiated/CBA rate of the union locals from which the rate is based.

WAGE DETERMINATION APPEALS PROCESS

1.) Has there been an initial decision in the matter? This can be:

- * an existing published wage determination
- * a survey underlying a wage determination
- * a Wage and Hour Division letter setting forth a position on a wage determination matter
- * a conformance (additional classification and rate) ruling

On survey related matters, initial contact, including requests for summaries of surveys, should be with the Wage and Hour National Office because National Office has responsibility for the Davis-Bacon survey program. If the response from this initial contact is not satisfactory, then the process described in 2.) and 3.) should be followed.

With regard to any other matter not yet ripe for the formal process described here, initial contact should be with the Branch of Construction Wage Determinations. Write to:

Branch of Construction Wage Determinations
Wage and Hour Division
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

2.) If the answer to the question in 1.) is yes, then an interested party (those affected by the action) can request review and reconsideration from the Wage and Hour Administrator (See 29 CFR Part 1.8 and 29 CFR Part 7). Write to:

Wage and Hour Administrator
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

The request should be accompanied by a full statement of the interested party's position and by any information (wage payment data, project description, area practice material, etc.) that the requestor considers relevant to the issue.

3.) If the decision of the Administrator is not favorable, an interested party may appeal directly to the Administrative Review Board (formerly the Wage Appeals Board). Write to:

Administrative Review Board
U.S. Department of Labor
200 Constitution Avenue, N.W.

4.) All decisions by the Administrative Review Board are final.

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END OF GENERAL DECISIO"

29 CFR Part 5 – Labor Standards Provisions for Federally Assisted Projects

§ 5.5 Contract provisions and related matters.

(a) The Agency head shall cause or require the contracting officer to 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 Sec. 5.1, the following clauses (or any modifications thereof to meet the particular needs of the agency, *Provided*, That such modifications are first approved by the Department of Labor):

(1) *Minimum wages.* (i) All laborers and mechanics employed or working upon the site of the work (or under the United States Housing Act of 1937 or under the Housing Act of 1949 in the construction or development of the project), 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 Sec. 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.

(ii)(A) The contracting officer 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 contracting officer 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 contracting officer 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 contracting officer 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 contracting officer or will notify the contracting officer within the 30-day period that additional time is necessary.

(C) In the event the contractor, the laborers or mechanics to be employed in the classification or their representatives, and the contracting officer do not agree on the proposed classification and wage rate (including the amount designated for fringe benefits, where appropriate), the contracting officer shall refer the questions, including the views of all interested parties and the recommendation of the contracting officer, 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.

(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 (write in name of Federal Agency or the loan or grant recipient) shall upon its own action or upon written request of an authorized representative of the Department of Labor withhold or cause to be withheld from 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 (or under the United States Housing Act of 1937 or under the Housing Act of

1949 in the construction or development of the project), 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 (or under the United States Housing Act of 1937, or under the Housing Act of 1949, in the construction or development of the project). 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 (write in name of appropriate federal agency) if the agency is a party to the contract, but if the agency is not such a party, the contractor will submit the payrolls to the applicant, sponsor, or owner, as the case may be, for transmission to the (write in name of agency). The payrolls submitted 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 weekly transmittals. 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/whd/forms/wh347.pdf> 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 (write in name of appropriate federal agency) if the agency is a party to the contract, but if the agency is not such a party, the contractor will submit them to the applicant, sponsor, or owner, as the case may be, for transmission to the (write in name of agency), 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 sponsoring government agency (or the applicant, sponsor, or owner).

(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 Sec. 5.5 (a)(3)(ii) of Regulations, 29 CFR part 5, the appropriate information is being maintained under Sec. 5.5 (a)(3)(i) of Regulations, 29 CFR part 5, and that such information is correct and complete;

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

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

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

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

(iii) The contractor or subcontractor shall make the records required under paragraph (a)(3)(i) of this section available for inspection, copying, or transcription by authorized representatives of the (write the name of the agency) 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 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 (write in the name of the Federal agency) may by appropriate instructions require, and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for the compliance by any subcontractor or lower tier subcontractor with all the contract clauses in 29 CFR 5.5.

(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 the contracting agency, the U.S. Department of Labor, or the employees or their representatives.

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

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

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

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

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

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

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

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

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

Disadvantaged Business Enterprises (DBE)

Prime contractors bidding on this project must follow, document, and maintain documentation of their Good Faith Efforts, as listed below, to ensure that Disadvantaged Business Enterprises (DBEs) have the opportunity to participate in the project by increasing DBE awareness of procurement efforts and outreach. Bidders must make the following Good Faith Efforts for any work that will be subcontracted.

1. Ensure DBEs are made aware of contracting opportunities to the fullest extent practicable through outreach and recruitment activities. Place DBEs on solicitation lists and solicit DBEs whenever they are potential sources.
2. Make information on forthcoming opportunities available to DBEs. 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. Whenever possible, post solicitation for bids or proposals for a minimum of 30 calendar days before the bid or proposal closing date. The DBEs should be given a minimum of 5 days to respond to the posting.
3. Consider in the contracting process whether firms competing for large contracts can be subcontracted with DBEs. Divide total requirements, when economically feasible, into smaller tasks or quantities to permit maximum participation by DBEs in the competitive process.
4. Encourage contracting with a consortium of DBEs when a contract is too large for one DBE firm to handle individually.
5. Use the services and assistance of the Small Business Administration and the Minority Business Development Agency of the U.S. Department of Commerce.

Subsequent to compliance with the Good Faith Efforts, the following conditions also apply under the DBE requirements. Completed Good Faith Efforts Worksheets (Attachment 1), along with the required supporting documentation outlined in the instructions, must be submitted with your bid proposal. EPA form 6100-2 must also be provided at the pre-bid meeting. A copy of this form is available on the Forms and Guidance page of the Revolving Loan website.

1. The prime contractor must pay its subcontractor for work that has been satisfactorily completed no more than 30 days from the prime contractor's receipt of payment from the owner.
2. The prime contractor must notify the owner in writing prior to the termination of any DBE subcontractor for convenience by the prime contractor and employ the Good Faith Efforts if soliciting a replacement contractor.
3. If a DBE contractor fails to complete work under the subcontract for any reason, the prime contractor must employ the Good Faith Efforts if soliciting a replacement contractor.
4. The prime contractor must employ the Good Faith Efforts.

Debarment Certification

The prime contractor must provide a completed **Certification Regarding Debarment, Suspension, and Other Responsibility Matters Form** with its bid or proposal package to the owner (Attachment 2).

Attachment 1

**Disadvantaged Business Enterprise (DBE) Utilization
GOOD FAITH EFFORTS WORKSHEET**

**Michigan Department of Environmental Quality
Office of Drinking Water and Municipal Assistance– Revolving Loan Section
Disadvantaged Business Enterprise (DBE) Utilization
State Revolving Fund/Drinking Water Revolving Fund
GOOD FAITH EFFORTS WORKSHEET**

Bidder: _____

Subcontract Area of Work (one per worksheet): _____

Outreach Goal: Solicit a minimum of three (3) DBEs via email/letter/fax. It is recommended that various sources be used to locate the minimum number of DBEs. The Michigan Department of Transportation (MDOT) website and www.sam.gov registries may be two resources used to find a minimum of three DBEs.

List the DBEs contacted for the above area of work and complete the following information for each DBE.

Company Name	Type of Contact	Date of Contact	Price Quote Received	Accepted/ Rejected	Please Explain if Rejected
				<input type="checkbox"/> A <input type="checkbox"/> R	
				<input type="checkbox"/> A <input type="checkbox"/> R	
				<input type="checkbox"/> A <input type="checkbox"/> R	
				<input type="checkbox"/> A <input type="checkbox"/> R	
				<input type="checkbox"/> A <input type="checkbox"/> R	
				<input type="checkbox"/> A <input type="checkbox"/> R	

Explanation for Not Achieving a Minimum of Three Contacts; you may include a printout of the MDOT and www.sam.gov search results (attach extra sheets if necessary):

MITA DBE Posting Date (if applicable): _____
(attach a copy of the DBE advertisement)

Other Efforts (attach extra sheets if necessary):

Please include the completed worksheet and supporting documentation with the bid proposal.

Rev.3-2015

Rick Snyder, Governor



Dan Wyant, Director

**Michigan Department of Environmental Quality
Office of Drinking Water and Municipal Assistance– Revolving Loan Section
Disadvantaged Business Enterprise (DBE) Utilization
State Revolving Fund/Drinking Water Revolving Fund
GOOD FAITH EFFORTS WORKSHEET**

Instructions to Bidders for the Completion of the Good Faith Efforts Worksheet

1. Separate worksheets must be provided for each area of work to be subcontracted out. This includes both major and minor subcontracts.
2. A minimum of three (3) DBEs must be contacted by a verifiable means of communication such as e-mail, letter, or fax for each area of work to be subcontracted out. Copies of the solicitation letters/e-mails and fax confirmation sheets must be provided with the worksheet.
3. If less than three (3) DBEs exist statewide for the area of work, then provide documentation that other DBE resources were consulted. This may include the MDOT and www.sam.gov registries and an advertisement in a publication. A printout of the website searched (conducted prior to the end of the bid period) must be submitted.
4. Posting solicitations for quotes/proposals from DBEs on the MITA website (www.mitadbe.com) is highly recommended to facilitate participation in the competitive process whenever possible. The solicitation needs to identify the project and the areas of work to be subcontracted out. A copy of the MITA DBE advertisement must be submitted with the Good Faith Efforts worksheet, if used, or a printout of the resulting quotes posted to the MITA website can be submitted with this form as supporting documentation.
5. If the area of work is so specialized that no DBEs exist, then an explanation is required to support that conclusion, including the documentation required in No. 3 above.
6. The date of the DBE contact must be identified, as it is important to document that the DBE solicitation was made during the bid period and that sufficient time was given for the DBE to return a quote.
7. Each DBE firm's price quote must be identified if one was received or N/A entered on the worksheet if a quote was not received. Copies of all quotes must be submitted with the worksheet.
8. If a quote was received, indicate if it was accepted or rejected. Justification for not accepting a quote and not using the DBE subcontractor must be provided.
9. Under Other Efforts, please indicate additional steps you have taken to obtain DBE contractors and provide the appropriate supporting documentation such as:
 - Follow-up e-mails, faxes, or letters.
 - Copies of announcements/postings in newspapers, trade publications, or minority media that target DBE firms.

Rev. 3-2015

Attachment 2

***Certification Regarding
Debarment, Suspension, and Other Responsibility Matters***

**Certification Regarding
Debarment, Suspension, and Other Responsibility Matters**

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

- (1) Are not presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from participation in transactions under federal nonprocurement programs by any federal department or agency;
- (2) Have not, within the three year period preceding the proposal, had one or more public transactions (federal, state, or local) terminated for cause or default; and
- (3) Are not presently indicted or otherwise criminally or civilly charged by a government entity (federal, state, or local) and have not, within the three year period preceding the proposal, been convicted of or had a civil judgment rendered against it:
 - (a) For the commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a public transaction (federal, state, or local) or a procurement contract under such a public transaction;
 - (b) For the violation of federal or state antitrust statutes, including those proscribing price fixing between competitors, the allocation of customers between competitors, or bid rigging; or
 - (c) For the commission of embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements, or receiving stolen property.

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

Name and Title of Authorized Representative

Name of Participant Agency or Firm

Signature of Authorized Representative

Date

☐ I am unable to certify to the above statement. Attached is my explanation.

Attachment 3

***Frequently Asked Questions About
Disadvantaged Business Enterprise (DBE) Solicitation***

Disadvantaged Business Enterprise (DBE) Requirements Frequently Asked Questions Regarding Contractor Compliance

Q: What is the Good Faith Efforts Worksheet form and how is it to be completed?

A: This form captures efforts by the prime contractor to solicit DBEs for each area of work type that will be subcontracted out. A separate Good Faith Efforts Worksheet must be provided by the prime contractor for each area of work type to be subcontracted out. There are specific instructions that accompany this form that prescribe minimum efforts which bidders must make in order to be in compliance with the DBE requirements.

Q: Can non-certified DBEs be used?

A: While non-certified DBEs can be used, only DBEs, MBEs, and WBEs that are certified by EPA, SBA, or MDOT (or by tribal, state and local governments, as long as their standards for certification meet or exceed the standards in EPA policy) can be counted toward the fair share goal. Proof of certification by one of these recognized and approved agencies should be sought from each DBE.

Q: How does a DBE get certified?

A: Applications for certification under MDOT can be found at <http://mdotiboss.state.mi.us/UCP/LearnHowServlet>.

Applications for certification under EPA can be found on EPA's Small Business Programs website at http://www.epa.gov/osbp/dbe_firm.htm under Certification Forms.

Q: If a bidder follows the MDOT DBE requirements, will the bidder be in compliance with the SRF/DWRF DBE requirements?

A: No. Federally funded highway projects utilize DBE goals, which require that a certain percentage of work be performed by DBE subcontractors. For SRF/DWRF projects, there is no financial goal. However, there is a solicitation effort goal. Bidders must use Good Faith Efforts for each and every area of work to be subcontracted out to obtain DBEs. The bidders are not required to use DBEs if the quotes are higher than non-DBE subcontractors.

There is no required DBE participation percentage contract goal for the SRF/DWRF. However, if the SRF/DWRF project is part of a joint project with MDOT, the project can be excluded from SRF/DWRF DBE requirements (i.e., the Good Faith Efforts Worksheet is not required) as it would be difficult to comply with both programs' requirements.

Q: Must the Good Faith Efforts Worksheet and supporting documentation be turned in with the bid proposals?

A: Yes. This is a requirement to document that the contractor has complied with the DBE requirements and the Good Faith Efforts. These compliance efforts must be done during the bidding phase and not after-the-fact. It is highly recommended that the need for these efforts and the submittal of the forms with the bid proposals be emphasized at the pre-bid meetings. Failure to show that the Good Faith Efforts were complied with during the bidding process can lead to a prime contractor being found non-responsive.

Q: Does EPA form 6100-2 need to be provided at the pre-bid meeting?

A: Yes. The form must be made available at the pre-bid meeting.

Q: What kinds of documentation should a contractor provide to document solicitation efforts?

A: Documentation can include fax confirmation sheets, copies of solicitation letters/e-mails, printouts of online solicitations, printouts of online search results, affidavits of publication in newspapers, etc.

Q: How much time will compliance with the Good Faith Efforts require in terms of structuring an adequate bidding period?

A: Due to the extent of the efforts required, a minimum of 30 calendar days is recommended between bid posting and bid opening to ensure adequate time for contractors to locate certified DBEs and solicit quotes.

Q: How does a contractor locate certified DBEs?

A: The Michigan Department of Transportation has a directory of all Michigan certified entities located at <http://mdotjboss.state.mi.us/UCP/>. Additionally, the federal System for Award Management (SAM) is another place to search and can be found at www.sam.gov. SAM contains information from the former Central Contractor Registration (CCR) database.

Q: If the bidder does not intend to subcontract any work, what forms, if any, must be provided with the bid proposal?

A: The bidder should complete the Good Faith Efforts Worksheet with a notation that no subcontracting will be done. However, if the bidder is awarded the contract and then decides to subcontract work at any point, then the Good Faith Efforts must be made to solicit DBEs.

Q: In the perfect world, the Good Faith Efforts Worksheet is required to be turned in with the proposal. What if no forms are turned in with the bid proposal or forms are blank or incomplete? Should this be cause to determine that the bidder is non-responsive?

A: While the Good Faith Efforts Worksheet is important, it is more critical to confirm that the contractor complied with the DBE requirements prior to bid opening. The owner should contact the bidder as soon as deficiencies are noted for a determination/documentation of efforts taken to comply with the DBE requirements. Immediate submittal of the completed forms will be acceptable provided the Good Faith Efforts were made and it is just a matter of transferring information to the forms.

Q: If the prime contractor is a DBE, does he have to solicit DBE subcontractors?

A: Yes, the DBE requirements still apply if the prime intends to subcontract work out. Good Faith Efforts must be used to solicit DBEs.

Q: If the area of work is one where there are less than three DBE contractors, how is the contractor to document this?

A: Copies of printouts from MDOT and SAM showing no DBEs and advertisements soliciting quotes for all subcontract areas, including the questionable areas, will be adequate if the dates on the printouts are prior to the bid or proposal closing date.

SECTION 00500 – STANDARD CONSTRUCTION AGREEMENT

This Agreement is by and between City of Flint (“Owner”) and _____ (“Contractor”).

Terms used in this Agreement have the meanings stated in the General Conditions and other Contract Documents.

Owner and Contractor hereby agree as follows:

ARTICLE 1—WORK

- 1.01 Contractor shall complete all Work as specified or indicated in the Contract Documents. The Work is generally described within specification section 0110 Summary of Work.

ARTICLE 2—THE PROJECT

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

CITY OF FLINT, MICHIGAN
WATER POLLUTION CONTROL FACILITY
Contract 200-156238-23001

ARTICLE 3—ENGINEER

- 3.01 The Owner has retained Tetra Tech, Inc., whose address is 1136 Oak Valley, Ann Arbor, MI 48108 (“Engineer”) to act as Owner’s Engineer, assume all duties and responsibilities of Engineer, and have the rights and authority assigned to Engineer in the Contract Documents.
- 3.02 The Project has been designed by Engineer.
- 3.03 Engineer shall work closely and cooperatively with the Owner’s representative, who the Owner has designated to be the WPC SCADA Supervisor, John Florshinger. The Owner’s representative is authorized to act on behalf of the Owner with respect to the Project, subject to applicable laws and parameters of authority expressly established by the City of Flint. Engineer shall routinely and accurately inform the Owner’s representative on matters related to the Project.

ARTICLE 4—CONTRACT TIMES

- 4.01 *Time is of the Essence*
- A. All time limits for Milestones, if any, Substantial Completion, and completion and readiness for final payment as stated in the Contract Documents are of the essence of the Contract.
- 4.02 *Not Used*
- 4.03 *Contract Times: Dates*
- B. The Work will be substantially complete within 22-months from notice to proceed and ready for final payment in accordance with Paragraph 15.06 of the General Conditions within 24-months.

4.04 *Not Used*

4.05 *Liquidated Damages*

- A. Contractor and Owner recognize that time is of the essence as stated in Paragraph 4.01 above and that Owner will suffer financial and other losses if the Work is not completed and Milestones not achieved within the Contract Times, as duly modified. The parties also recognize the delays, expense, and difficulties involved in proving, in a legal or arbitration proceeding, the actual loss suffered by Owner if the Work is not completed on time. Accordingly, instead of requiring any such proof, Owner and Contractor agree that as liquidated damages for delay (but not as a penalty):
1. *Substantial Completion:* Contractor shall pay Owner One Thousand and 00/100 Dollars (\$1,000.00) for each calendar day that expires after the time (as duly adjusted pursuant to the Contract) specified above for Substantial Completion, until the Work is substantially complete.
 2. *Completion of Remaining Work:* After Substantial Completion, if Contractor shall neglect, refuse, or fail to complete the remaining Work within the Contract Times (as duly adjusted pursuant to the Contract) for completion and readiness for final payment, Contractor shall pay Owner One Thousand and 00/100 Dollars (\$1,000.00) for each calendar day that expires after such time until the Work is completed and ready for final payment.
- B. If Owner recovers liquidated damages for a delay in completion by Contractor, then such liquidated damages are Owner's sole and exclusive remedy for such delay, and Owner is precluded from recovering any other damages, whether actual, direct, excess, or consequential, that are solely attributable to such delay, except for special damages specified in this Agreement. The Contractor acknowledges and agrees that the foregoing sentence does not preclude its responsibility for damages that are not solely attributable to delay.

4.06 *Special Damages*

- A. Contractor shall reimburse Owner (1) for any fines or penalties, including but not limited to revocation of grant award or funding, imposed on Owner as a direct result of the Contractor's failure to attain Substantial Completion according to the Contract Times, and (2) for the actual costs reasonably incurred by Owner for engineering, construction observation, inspection, and administrative services needed after the time specified in Paragraph 4.05 for Substantial Completion (as duly adjusted pursuant to the Contract), until the Work is substantially complete.
- B. After Contractor achieves Substantial Completion, if Contractor shall neglect, refuse, or fail to complete the remaining Work within the Contract Times, Contractor shall reimburse Owner for the actual costs reasonably incurred by Owner for engineering, construction observation, inspection, and administrative services needed after the time specified in Paragraph 4.03 for Work to be completed and ready for final payment (as duly adjusted pursuant to the Contract), until the Work is completed and ready for final payment.
- C. The special damages imposed in this paragraph are supplemental to the liquidated damages for delayed completion established in this Agreement at Paragraph 4.05.

ARTICLE 5—CONTRACT PRICE

- 5.01 Owner shall pay Contractor for completion of the Work in accordance with the Contract Documents, the amounts shown on the bid/proposal form, subject to adjustment under the Contract.

ARTICLE 6—PAYMENT PROCEDURES

6.01 *Submittal and Processing of Payments*

- A. Contractor shall submit Applications for Payment in accordance with Article 15 of the General Conditions. Applications for Payment will be processed by Engineer as provided in the General Conditions.

6.02 *Progress Payments; Retainage*

- A. Owner shall make progress payments on the basis of Contractor's Applications for Payment during performance of the Work as provided in Paragraph 6.02.A.1 below, provided that such Applications for Payment have been submitted in a timely manner and otherwise meet the requirements of the Contract. All such payments will be measured by the Schedule of Values established as provided in the General Conditions (and in the case of Unit Price Work based on the number of units completed) or, in the event there is no Schedule of Values, as provided elsewhere in the Contract.
1. Prior to Substantial Completion, progress payments will be made in an amount equal to the percentage indicated below but, in each case, less the aggregate of payments previously made and less such amounts as Owner may withhold, including but not limited to liquidated damages, in accordance with the Contract.
 - a. Ninety percent (90%) of the value of the Work completed (with the balance being retainage).
 - 1) If 50 percent or more of the Work has been completed, as determined by Engineer, and if the character and progress of the Work have been satisfactory to Owner and Engineer, then as long as the character and progress of the Work remain satisfactory to Owner and Engineer, there will be no additional retainage. If the character and progress of the Work have not been satisfactory to the Owner and Engineer, the Owner may continue to withhold retainage of up to ten percent (10%).
 - b. 0 percent of cost of materials and equipment not incorporated in the Work (with the balance being retainage).
- B. Upon Substantial completion, Owner shall pay an amount sufficient to increase total payments to Contractor to 98 percent of the Work completed, less such amounts set off by Owner pursuant to Paragraph 15.01E of the General Conditions, and less 100 percent of Engineer's estimate of the value of Work to be completed or corrected as shown on the punch list of items to be completed or corrected prior to final payment.

6.03 *Final Payment*

- A. Upon final completion and acceptance of the Work, and subject to Paragraph 6.02.C, above, Owner shall pay the remainder of the Contract Price in accordance with Paragraph 15.06 of the General Conditions.

6.04 *Consent of Surety*

- A. Owner will not make final payment, or return or release retainage at Substantial Completion or any other time, unless Contractor submits written consent of the surety to such payment, return, or release.

6.05 *Interest*

- A. All amounts not paid when due will bear interest at the rate of zero percent (0%) per annum.

ARTICLE 7—CONTRACT DOCUMENTS

7.01 *Contents*

- A. The Contract consists of the Contract Documents, which include the following:
 - 1. This Agreement, which includes any Addenda that may be issued, change orders, or amendments to this Agreement.
 - 2. Drawings consisting of all sheets
 - 3. General and Supplementary Conditions.
 - 4. Specifications as listed in the table of contents of the project manual.
 - 5. Bonds:
 - a. Performance bond (together with power of attorney).
 - b. Payment bond (together with power of attorney).
 - 6. Contractor's Bid Response and other submissions.
 - 7. City notice inviting sealed bids.
- B. There are no Contract Documents other than those listed above in this Article 7.
- C. The Contract Documents may only be amended, modified, or supplemented as provided in the Contract.
- D. In the event of any inconsistency or ambiguity within, between, or among any Contract Document(s) as set forth in Article 7, the more restrictive requirement will apply.

ARTICLE 8—REPRESENTATIONS, CERTIFICATIONS, AND STIPULATIONS

8.01 *Contractor's Representations*

- A. In order to induce Owner to enter into this Contract, Contractor makes the following representations:
 - 1. Contractor has examined and carefully studied the Contract Documents, including Addenda, and all other related information, data, and requirements in the Bidding Documents.

2. Contractor has visited the Site, conducted a thorough visual examination of the Site and adjacent areas, and become familiar with the general, local, and Site conditions that may affect cost, progress, and performance of the Work.
3. Contractor is familiar with and agrees to comply with all Laws and Regulations that may affect cost, progress, and performance of the Work.
4. Contractor has carefully studied the reports of explorations and tests of subsurface conditions at or adjacent to the Site and the drawings of physical conditions relating to existing surface or subsurface structures at the Site that have been identified in the Contract Documents, including with respect to the Technical Data in such reports and drawings.
5. Contractor has carefully studied the reports and drawings relating to Hazardous Environmental Conditions, if any, at or adjacent to the Site that have been identified in the Contract Documents, including with respect to Technical Data in such reports and drawings.
6. Contractor has considered the information known to Contractor itself; information commonly known to contractors doing business in the locality of the Site; information and observations obtained from visits to the Site; the Contract Documents; and the Technical Data identified in the Contract Documents or by definition, with respect to the effect of such information, observations, and Technical Data on (a) the cost, progress, and performance of the Work; (b) the means, methods, techniques, sequences, and procedures of construction to be employed by Contractor; and (c) Contractor's safety precautions and programs.
7. Contractor has obtained and carefully studied (or assumes responsibility for having done so) all additional or supplementary examinations, investigations, explorations, tests, studies, and data concerning conditions (surface, subsurface, and Underground Facilities) at or contiguous to the Site which may affect cost, progress, or performance of the Work or which relate to any aspect of the means, methods, techniques, sequences, and procedures of construction to be employed by CONTRACTOR, including applying the specific means, methods, techniques, sequences, and procedures of construction, if any, expressly required by the Contract Documents to be employed by Contractor, and safety precautions and programs incident thereto.
8. Based on the information and observations referred to in this Article 8, Contractor agrees that no further examinations, investigations, explorations, tests, studies, or data are necessary for the performance of the Work at the Contract Price, within the Contract Times, and in accordance with the other terms and conditions of the Contract.
9. Contractor is aware of the general nature of work to be performed by Owner and others at the Site that relates to the Work as indicated in the Contract Documents.
10. All claims and disputes arising from related Work at Site by other contractors shall be settled in accordance with the Contract Documents.
11. Contractor has correlated the information known to Contractor, information and observations obtained from visits to the Site, reports and drawings identified in the Contract Documents, and all additional examinations, investigations, explorations, tests, studies, and data with the Contract Documents.

12. Contractor has given Engineer written notice of all conflicts, errors, ambiguities, or discrepancies that Contractor has discovered in the Contract Documents, and of discrepancies between Site conditions and the Contract Documents, and the written resolution thereof by Engineer is acceptable to Contractor.
13. The Contract Documents are generally sufficient to indicate and convey understanding of all terms and conditions for performance and furnishing of the Work.
14. Contractor acknowledges that it shall not discriminate against any employee or applicant for employment with respect to hire, tenure, conditions, or privileges of employment, or a matter directly or indirectly related to employment, because of race, color, religion, national origin, age, sex, height, weight, marital status, or a disability that can be reasonable accommodated. Contractor must include this covenant in any agreement with any subcontractor employed in the performance of this Contract. A breach of this covenant shall be regarded as a material breach of the Contract.
5. Owner will require the use of prevailing wage rates on this Project. Section 00450 – Prevailing Wage Rates, General Decision Number MI20230083, dated 5-5-2023.
15. Contractor's entry into this Contract constitutes an incontrovertible representation by Contractor that without exception all prices in the Agreement are premised upon performing and furnishing the Work required by the Contract Documents.

8.02 *Contractor's Certifications*

- A. Contractor certifies that it has not engaged in corrupt, fraudulent, collusive, or coercive practices in competing for or in executing the Contract. For the purposes of this Paragraph 8.02:
 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 an intentional misrepresentation of facts made (a) to influence the bidding process or the execution of the Contract to the detriment of Owner, (b) to establish Bid or Contract prices at artificial non-competitive levels, or (c) to deprive Owner of the benefits of free and open competition;
 3. "collusive practice" means a scheme or arrangement between two or more Bidders, with or without the knowledge of Owner, a purpose of which is to establish Bid prices at artificial, non-competitive levels; and
 4. "coercive practice" means harming or threatening to harm, directly or indirectly, persons or their property to influence their participation in the bidding process or affect the execution of the Contract.

8.03 *Standard General Conditions and Contract Requirements*

- A. Owner and Contractor acknowledge that a modified version of the General Conditions applies to this Project and is hereby incorporated by reference as if fully restated. Contractor acknowledges having received and reviewed the modified General Conditions and agrees to be bound by the terms therein.
- B. Contractor acknowledges and agrees that all the following apply to this Contract and are incorporated herein by reference as if fully restated:

- Notice to Proceed (see Specifications Section 00550)

ARTICLE 9 – MISCELLANEOUS

9.01 Terms.

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

9.02 Assignment of Contract

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

9.03 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.

9.04 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.

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

This Agreement will be effective on **[indicate date on which Contract becomes effective]** (which is the Effective Date of the Contract).

Owner:

(typed or printed name of organization)

By: _____
(individual's signature)

Date: _____
(date signed)

Name: _____
(typed or printed)

Title: _____
(typed or printed)

Attest: _____
(individual's signature)

Title: _____
(typed or printed)

Address for giving notices:

Designated Representative:

Name: _____
(typed or printed)

Title: _____
(typed or printed)

Address:

Phone: _____

Email: _____

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

Contractor:

(typed or printed name of organization)

By: _____
(individual's signature)

Date: _____
(date signed)

Name: _____
(typed or printed)

Title: _____
(typed or printed)

(If **[Type of Entity]** is a corporation, a partnership, or a joint venture, attach evidence of authority to sign.)

Attest: _____
(individual's signature)

Title: _____
(typed or printed)

Address for giving notices:

Designated Representative:

Name: _____
(typed or printed)

Title: _____
(typed or printed)

Address:

Phone: _____

Email: _____

License No.: _____
(where applicable)

State: _____

SECTION 00510 - NOTICE OF AWARD

Dated _____

TO: _____
(BIDDER)

ADDRESS: _____

Contract: _____
(Insert name of Contract as it appears in the Bidding Documents)

Contract No. _____

You are notified that your Bid dated _____, 2023 for the above Contract has been considered responsive and responsible by OWNER. You are the apparent Successful Bidder and have been awarded a Contract for _____
(Project Description)

For all Unit Price Work, an amount equal to the sum of the established unit price for each separately identified item of Unit Price Work times the estimated quantity of that item as indicated in the Unit Price Table located in Section 00400, Bid Form:

The total for all unit prices establishes your Contract Price as _____
dollars (\$ _____).

The Contract Price of your lump sum Contract is _____
dollars (\$ _____).

___ Copies of each of the proposed Contract Documents (except Drawings) will be delivered within ___ days, under separate cover. ___ sets of the Drawings will be delivered separately or otherwise made available to you immediately.

You must comply with the following conditions precedent within ten days of the date you receive this Notice of Award.

1. Deliver to the ENGINEER five (5) fully executed counterparts of the Contract Documents. (Each of the Contract Documents must bear your signature on Page 9 of Section 00500, Agreement.)

2. Deliver with the executed Contract Documents the Contract security (Bonds) and ten copies of all insurance certificates as specified in the Instructions to Bidders (Article 20), and General Conditions (Article 6 – Bonds and Insurance).
3. Deliver to OWNER with copy to ENGINEER an acknowledged copy of this Notice of Award.
4. (List other conditions precedent).

Failure to comply with these conditions within the time specified will entitle OWNER to consider your Bid in default, to annul this Notice of Award and to declare your Bid security forfeited. OWNER will be entitled to such other rights as may be granted by law.

Within ten days after you comply with the above conditions, OWNER will return to you one fully executed counterpart of the Contract Documents.

(OWNER)

By:

(AUTHORIZED SIGNATURE)

(TITLE)

ACKNOWLEDGEMENT OF ACCEPTANCE OF NOTICE OF AWARD

CONTRACTOR acknowledges receipt of this Notice of Award this _____ day of _____, 2023.

(CONTRACTOR)

By:

(AUTHORIZED SIGNATURE)

(TITLE)

cc: OWNER w/1
CONTRACTOR w/1
Tt (ENGINEER) w/1
File w/1

SECTION 00550 - NOTICE TO PROCEED

Dated _____

TO: _____
(CONTRACTOR)

ADDRESS: _____

Contract: _____
(Insert name of Contract as it appears in the Contract Documents)

Contract No. _____

You are notified that the Contract Times under the above Contract will commence to run on _____. By that date, you are to start performing your obligations under the Contract Documents. In accordance with Article 4 of the Agreement, the date of Substantial Completion is _____ and the date of readiness for final payment is _____.

Deliver to OWNER with copy to ENGINEER an acknowledged copy of this Notice to Proceed.

(OWNER)

By: _____
(AUTHORIZED SIGNATURE)

(TITLE)

ACKNOWLEDGEMENT OF ACCEPTANCE OF NOTICE TO PROCEED

CONTRACTOR acknowledges receipt of this Notice to Proceed this _____ day of _____, 2023.

(CONTRACTOR)

By: _____
(AUTHORIZED SIGNATURE)

(TITLE)

cc: OWNER w/1
CONTRACTOR w/1
Tt (ENGINEER) w/1
File w/1

SECTION 00613 - 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

By: _____
Signature (attach power of attorney)

Print Name

Print Name

Title

Attest: _____
Signature

Attest: _____
Signature

Title

Title

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

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

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

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

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

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

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

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

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

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

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

5.3 Obtain bids or negotiated proposals from qualified contractors acceptable to the Owner for a contract for performance and completion of the Construction Contract, arrange for a contract to be prepared for execution by the Owner

and a contractor selected with the Owners concurrence, to be secured with performance and payment bonds executed by a qualified surety equivalent to the bonds issued on the Construction Contract, and pay to the Owner the amount of damages as described in Paragraph 7 in excess of the Balance of the Contract Price incurred by the Owner as a result of the Contractor Default; or

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

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

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

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

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

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

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

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

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

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

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

11. Any proceeding, legal or equitable, under this Bond may be instituted in any court of competent jurisdiction in the location in which the work or part of the work is located and shall be instituted within the period specified by Michigan law for contract actions. If the provisions of this paragraph are void or prohibited by law, the maximum 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 waived as provided in the Construction Contract, 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:

16.1 Contractual limitations period has been removed from Paragraph 11;

16.2 Contractor Default includes all Contractor non-performance or failures to comply with a material term of the Construction Contract unless waived by Owner in accordance with the provisions of the Construction Contract;

16.3 The Surety, Owner, and Contractor acknowledge and agree that this bond is furnished to comply with Public Act 213 of 1963 and, accordingly, is a statutory bond and shall be interpreted in accordance with Michigan law regarding statutory bonds

SECTION 00614 - 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

SURETY

Contractor's Name and Corporate Seal

Surety's Name and Corporate Seal

By: _____
Signature

By: _____
Signature (attach power of attorney)

Print Name

Print Name

Title

Title

Attest: _____
Signature

Attest: _____
Signature

Title

Title

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

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

11. The Surety hereby waives notice of any change, including changes of time, to the Construction Contract or to related subcontracts, purchase orders, and other obligations.
12. No suit or action shall be commenced by a Claimant under this Bond other than in a court of competent jurisdiction in the state in which the project that is the subject of the Construction Contract is located or after the expiration of one year from the date (1) on which the Claimant sent a Claim to the Surety pursuant to Paragraph 5.1.2 or 5.2, or (2) on which the last labor or service was performed by anyone or the last materials or equipment were furnished by anyone under the Construction Contract, whichever of (1) or (2) first occurs. If the provisions of this paragraph are void or prohibited by law, the minimum period of limitation available to sureties as a defense in the jurisdiction of the suit shall be applicable.
13. Notice and Claims to the Surety, the Owner, or the Contractor shall be mailed or delivered to the address shown on the page on which their signature appears. Actual receipt of notice or Claims, however accomplished, shall be sufficient compliance as of the date received.
14. When this Bond has been furnished to comply with a statutory or other legal requirement in the location where the construction was to be performed, any provision in this Bond conflicting with said statutory or legal requirement shall be deemed deleted herefrom and provisions conforming to such statutory or other legal requirement shall be deemed incorporated herein. When so furnished, the intent is that this Bond shall be construed as a statutory bond and not as a common law bond.
15. Upon requests by any person or entity appearing to be a potential beneficiary of this Bond, the Contractor and Owner shall promptly furnish a copy of this Bond or shall permit a copy to be made.

16. Definitions

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

1. The name of the Claimant;
2. The name of the person for whom the labor was done, or materials or equipment furnished;
3. A copy of the agreement or purchase order pursuant to which labor, materials, or equipment was furnished for use in the performance of the Construction Contract;
4. A brief description of the labor, materials, or equipment furnished;
5. The date on which the Claimant last performed labor or last furnished materials or equipment

for use in the performance of the Construction Contract;

6. The total amount earned by the Claimant for labor, materials, or equipment furnished as of the date of the Claim;
7. The total amount of previous payments received by the Claimant; and
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:

18.1 Paragraph 9 has been modified to require amounts owed to the Contractor by Owner under the Construction Contract to only be used for the performance of the Construction Contract and to allow the Owner priority to use funds earned by the Contractor under the Construction Contract for the completion and correction of the Work.

18.2 The Surety, Owner, and Contractor acknowledge and agree that this bond is furnished to comply with Public Act 213 of 1963 and, accordingly, is a statutory bond and shall be interpreted in accordance with Michigan law regarding statutory bonds, including but not limited to a statute of limitations period consistent with Michigan law and not as limited by Section 12 hereof.

CONSTRUCTION CONTRACTS WITH CERTAIN PUBLIC AGENCIES
Act 524 of 1980

AN ACT to provide for the terms of certain construction contracts with certain public agencies; to regulate the payment and retainage of payments on construction contracts with certain public agencies; and to provide for the resolution of certain disputes.

History: 1980, Act 524, Eff. Jan. 1, 1983.

The People of the State of Michigan enact:

125.1561 Definitions. [M.S.A. 5.2949(101)]

Sec. 1. As used in this act:

- (a) “Agent” means the person or persons agreed to or selected by the contractor and the public agency pursuant to section 4(2).
- (b) “Architect or professional engineer” means an architect or professional engineer licensed under Act No. 299 of the Public Acts of 1980, being sections 339.101 to 339.2601 of the Michigan Compiled Laws, and designated by a public agency in a construction contract to recommend progress payments.
- (c) “Construction contract” or “contract” means a written agreement between a contractor and a public agency for the construction, alteration, demolition, or repair of a facility, other than a contract having a dollar value of less than \$30,000.00 or a contract that provides for 3 or fewer payments.
- (d) “Contract documents” means the construction contract; instructions to bidders; proposal; conditions of the contract; performance bond; labor and material bond; drawings; specifications; all addenda issued before execution of the construction contract and all modifications issued subsequently.
- (e) “Contractor” means an individual, sole proprietorship, partnership, corporation, or joint venture, that is a party to a construction contract with a public agency.
- (f) “Facility” means a building, utility, road, street, boulevard, parkway, bridge, ditch, drain, levee, dike, sewer, park, playground, or other structure or work that is paid for with public funds or a special assessment.
- (g) “Progress payment” means a payment by a public agency to a contractor for work in place under the terms of a construction contract.
- (h) “Public agency” means this state, or a county, city, township, village, assessment district, or other political subdivision, corporation, commission, agency, or authority created by law. However, public agency does not include the state transportation department, a school district, junior or community college, the Michigan state housing development authority created in Act No. 346 of the Public Acts of 1966, as amended, being sections 125.1401 to 125.1496 of the Michigan Compiled Laws, and a municipal electric utility or agency. “Assessment district” means the real property within a distinct area upon which special assessments are levied or imposed for the construction, reconstruction, betterment, replacement, or repair of a facility to be paid for by funds derived from those special assessments imposed or levied on the benefited real property.
- (i) “Retainage” or “retained funds” means the amount withheld from a progress payment to a contractor pursuant to section 3.

History: 1980, Act 524, Eff. Jan. 1, 1983.

125.1562 Construction contract; designation of person to submit written requests for progress payments; designation of person to whom requests for progress payments to be submitted; manner and times of submissions; deferring the processing of progress payments; payment of requested

progress payment; failure of public agency to make timely progress payment; interest. [M.S.A. 5.2949(102)]

Sec. 2. (1) The construction contract shall designate a person representing the contractor who will submit written requests for progress payments, and a person representing the public agency to whom request for progress payments are to be submitted. The written requests for progress payments shall be submitted to the designated person in a manner and at such times as provided in the construction contract.

(2) The processing of progress payments by the public agency may be deferred by the public agency until work having a prior sequence, as provided in the contract documents, is in place and is approved.

(3) Each progress payment requested, including reasonable interest if requested under subsection (4), shall be paid within 1 of the following time periods, whichever is later:

(a) Thirty days after the architect or professional engineer has certified to the public agency that work is in place in the portion of the facility covered by the applicable request for payment in accordance with the contract documents.

(b) Fifteen days after the public agency has received the funds with which to make the progress payment from a department or agency of the federal or state government, if any funds are to come from either of those sources.

(4) Upon failure of a public agency to make a timely progress payment pursuant to this section, the person designated to submit requests for progress payments may include reasonable interest on amounts past due in the next request for payment.

History: 1980, Act 524, Eff. Jan. 1, 1983.

125.1563 Retaining portion of each progress payment to assure proper performance of construction contract; retainage; limitations; exceeding pro rata share of public agency's matching requirement; commingling and deposit of retained funds; releasing to contractor retainage and interest earned on retainage; irrevocable letter of credit. [M.S.A. 5.2949(103)]

Sec. 3. (1) To assure proper performance of a construction contract by the contractor, a public agency may retain a portion of each progress payment otherwise due as provided in this section.

(2) The retainage shall be limited to the following:

(a) Not more than 10% of the dollar value of all work in place until work is 50% in place.

(b) After the work is 50% in place, additional retainage shall not be withheld unless the public agency determines that the contractor is not making satisfactory progress, or for other specific cause relating to the contractor's performance under the contract. If the public agency so determines, the public agency may retain not more than 10% of the dollar value of work more than 50% in place.

(3) The retained funds shall not exceed the pro rata share of the public agency's matching requirement under the construction contract and shall not be commingled with other funds of the public agency and shall be deposited in an interest bearing account in a regulated financial institution in this state wherein all such retained funds are kept by the public agency which shall account for both retainage and interest on each construction contract separately. A public agency is not required to deposit retained funds in an interest bearing account if the retained funds are to be provided under a state or federal grant and the retained funds have not been paid to the public agency.

(4) Except as provided in section 4(7) and (8), retainage and interest earned on retainage shall be released to a contractor together with the final progress payment.

(5) At any time after 94% of work under the contract is in place and at the request of the original contractor, the public agency shall release the retainage plus interest to the original contractor only if the original contractor provides to the public agency an irrevocable letter of credit in the amount of the retainage plus interest, issued by a bank authorized to do business in this state, containing terms mutually acceptable to the contractor and the public agency.

History: 1980, Act 524, Eff. Jan. 1, 1983.

125.1564 Construction contract; agreement to submit matters described in subsection (3) to decision of agent; designation of agent; dispute resolution process; use; agent to receive pertinent information and provide opportunity for informal meeting; decision of agent to be final and binding; vacation of decision by circuit court; dispute resolution resulting in decision; final progress payment to original contractor where public agency contracts with subsequent contractor. [M.S.A. 5.2949(104)]

Sec. 4. (1) The construction contract shall contain an agreement to submit those matters described in subsection (3) to the decision of an agent at the option of the public agency.

(2) If a dispute regarding a matter described in subsection (3) arises, the contractor and the public agency shall designate an agent who has background, training, and experience in the construction of facilities similar to that which is the subject of the contract, as follows:

(a) In an agreement reached within 10 days after a dispute arises.

(b) If an agreement cannot be reached within 10 days after a dispute arises, the public agency shall designate an agent who has background, training, and experience in the construction of facilities similar to that which is the subject of the contract and who is not an employee of the agency.

(3) The public agency may request dispute resolution by the agent regarding the following:

(a) At any time during the term of the contract, to determine whether there has been a delay for reasons that were within the control of the contractor, and the period of time that delay has been caused, continued, or aggravated by actions of the contractor.

(b) At any time after 94% of work under the contract is in place, whether there has been an unacceptable delay by the contractor in the performance of the remaining 6% of work under the contract. The agent shall consider the terms of the contract and the procedures normally followed in the industry and shall determine whether the delay was for failure to follow reasonable and prudent practices in the industry for completion of the project.

(4) This dispute resolution process shall be used only for the purpose of determining the rights of the parties to retained funds and interest earned on retained funds and is not intended to alter, abrogate, or limit any rights with respect to remedies that are available to enforce or compel performance of the terms of the contract by either party.

(5) The agent may request and shall receive all pertinent information from the parties and shall provide an opportunity for an informal meeting to receive comments, documents, and other relevant information in order to resolve the dispute. The agent shall determine the time, place, and procedure for the informal meeting. A written decision and reasons for the decision shall be given to the parties within 14 days after the meeting.

(6) The decision of the agent shall be final and binding upon all parties. Upon application of either party, the decision of the agent may be vacated by order of the circuit court only upon a finding by the court that the decision was procured by fraud, duress, or other illegal means.

(7) If the dispute resolution results in a decision:

(a) That there has been a delay as described in subsection (3)(a), all interest earned on retained funds during the period of delay shall become the property of the public agency.

(b) That there has been unacceptable delay as described in subsection (3)(b), the public agency may contract with a subsequent contractor to complete the remaining 6% of work under the contract, and interest earned on retained funds shall become the property of the public agency. A subsequent contractor under this subdivision shall be paid by the public agency from the following sources until each source is depleted, in the order listed below:

(i) The dollar value of the original contract, less the dollar value of funds already paid to the original contractor and the dollar value of work in place for which the original contractor has not received payment.

(ii) Retainage from the original contractor, or funds made available under a letter of credit provided under section 3(5).

(iii) Interest earned on retainage from the original contractor, or funds made available under a letter of credit provided under section 3(5).

(8) If the public agency contracts with a subsequent contractor as provided in subsection (7)(b), the final progress payment shall be payable to the original contractor within the time period specified in section 2(3). The amount of the final progress payment to the original contractor shall not include interest earned on retained funds. The public agency may deduct from the final progress payment all expenses of contracting with the subsequent contractor. This act shall not impair the right of the public agency to bring an action or to otherwise enforce a performance bond to complete work under a construction contract.

History: 1980, Act 524, Eff. Jan. 1, 1983.

125.1565 Construction contracts to which act applicable. [M.S.A. 5.2949(105)]

Sec. 5. (1) Except as provided in subsection (2), this act shall apply only to a construction contract entered into after the effective date of this act.

(2) For a construction contract entered into before the effective date of this act, the provisions of this act may be implemented by a public agency, through a contract amendment, upon the written request of the contractor, with such consideration as the public agency considers adequate.

History: 1980, Act 524, Eff. Jan. 1, 1983.

125.1566 Effective date. [M.S.A. 5.2949(106)]

Sec. 6. This act shall take effect January 1, 1983.

History: 1980, Act 524, Eff. Jan. 1, 1983.

SECTION 00620 - APPLICATION FOR PAYMENT CERTIFICATE

CONTRACTOR'S APPLICATION FOR PAYMENT NO. _____

CONTRACTOR: _____ TITLE: _____

OWNER: _____ CONTRACT NO.: _____

Substantial Completion Date: _____ Final Completion Date: _____

Milestone Completion Date: _____

Application is made for payment for the Work shown below, accomplished through the date of _____

1. Original Contract Sum		\$	_____
2. Net Change by Change Order		\$	_____
3. Current Contract Amount (line 1 + line 2)		\$	_____
4. Work Complete (from summary sheet) _____ %		\$	_____
5. Stored Materials (from summary sheet, if applicable)		\$	_____
6. Less _____ % Retainage	\$	_____	
7. Less 10% Retainage - Stored Materials	\$	_____	
8. Total Retainage (line 6 + 7)		\$	_____
9. Amount Due to Date (line 4 + 5 - 8)		\$	_____
10. Less Previous Payments (from summary sheet)		\$	_____
11. Amount Due This Application (line 9-10)		\$	_____

CONTRACTOR's Certification:

The undersigned CONTRACTOR certifies that: (1) all previous progress payments received from OWNER on account of Work done under the Contract referred to above have been applied to discharge in full all obligations of CONTRACTOR incurred in connection with Work covered by prior Applications for Payment; (2) title to all Work, materials and equipment incorporated in said Work or otherwise listed in or covered by this Application for Payment will pass to OWNER at time of payment free and clear of all liens, claims, security interest and encumbrances (except such as are covered by Bond acceptable to OWNER indemnifying OWNER against any such lien, claim, security interest or encumbrance); and (3) all Work covered by this Application for Payment is in accordance with the Contract Documents and not *defective* as that term is defined in the Contract Documents.

ATTACHMENTS TO THIS CERTIFICATION:

____ Summary Sheet ____ Change Order Summary ____ Stored Material Summary
 ____ Other _____

CONTRACTOR:

By: _____ Date: _____

Payment to CONTRACTOR of the amount shown in line 11 above is recommended by ENGINEER, Tetra Tech, Inc.

By: _____ Date: _____

APPROVED: OWNER

By: _____ Date: _____

Change Order Summary

No.	Date	Additions	Deductions
	Subtotals		
Total Change In Contract Price			

Stored Material Summary

Invoice No.	Stored Material	Material Location	Insurance Certificates on File	Stored Previous		Stored This Month		Incorporated This Month		Materials remaining in storage (\$)
				Date (MO/YR)	Amount (\$)	Date (MO/YR)	Amount (\$)	Date (MO/YR)	Amount (\$)	
		On-Site Off-Site	Yes / No							
		On-Site Off-Site	Yes / No							
		On-Site Off-Site	Yes / No							

SECTION 00627 - CERTIFICATE OF FINAL COMPLETION

Contract _____
Contract No. _____
Date Issued: _____
OWNER _____
CONTRACTOR _____

This Certificate of Final Completion applies to all Work under the Contract Documents or to the following specified parts thereof:

The Work to which this Certificate applies has been inspected by authorized representatives of OWNER, CONTRACTOR and ENGINEER, in accordance with Paragraph 14.06 of the General Conditions, and that Work is hereby declared to be finally complete in accordance with the Contract Documents on

DATE OF FINAL COMPLETION

CONTRACTOR's general warranty and guarantee period commences on _____ and terminates on _____.

CONTRACTOR's special warranty and guarantee are:

_____ warranty and guarantee period commences on _____ and terminates on _____.

_____ warranty and guarantee period commences on _____ and terminates on _____.

This certificate does not constitute an acceptance of Work not in accordance with the Contract Documents nor is it a release of CONTRACTOR's obligation to correct defective Work in accordance with the General Conditions of the Contract Documents.

Executed by ENGINEER on _____
Date

ENGINEER

By: _____
(Authorized Signature)

CONTRACTOR accepts this Certificate of Final Completion on _____
Date

CONTRACTOR

By: _____
(Authorized Signature)

OWNER accepts this Certificate of Final Completion on _____
Date

OWNER

By: _____
(Authorized Signature)

SECTION 00700 - GENERAL CONDITIONS

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ARTICLE 1 – DEFINITIONS AND TERMINOLOGY

1.01 *Defined Terms*

- A. Wherever used in the Bidding Requirements or Contract Documents, a term printed with initial capital letters, including the term's singular and plural forms, will have the meaning indicated in the definitions below. In addition to terms specifically defined, terms with initial capital letters in the Contract Documents include references to identified articles and paragraphs, and the titles of other documents or forms.
1. *Addenda*—Written or graphic instruments issued prior to the opening of Bids which clarify, correct, or change the Bidding Requirements or the proposed Contract Documents.
 2. *Agreement*—The written instrument, executed by Owner and Contractor, that sets forth the Contract Price and Contract Times, identifies the parties and the Engineer, and designates the specific items that are Contract Documents.
 3. *Application for Payment*—The form acceptable to Engineer which is to be used by Contractor during the course of the Work in requesting progress or final payments and which is to be accompanied by such supporting documentation as is required by the Contract Documents.
 4. *Bid*—The offer of a Bidder submitted on the prescribed form setting forth the prices for the Work to be performed.
 5. *Bidder*—An individual or entity that submits a Bid to Owner.
 6. *Bidding Documents*—The Bidding Requirements, the proposed Contract Documents, and all Addenda.
 7. *Bidding Requirements*—The advertisement or invitation to bid, Instructions to Bidders, Bid Bond or other Bid security, if any, the Bid Form, and the Bid with any attachments.
 8. *Change Order*—A document which is signed by Contractor and Owner and authorizes an addition, deletion, or revision in the Work or an adjustment in the Contract Price or the Contract Times, or other revision to the Contract, issued on or after the Effective Date of the Contract.
 9. *Change Proposal*—A written request by Contractor, duly submitted in compliance with the procedural requirements set forth herein, seeking an adjustment in Contract Price or Contract Times, or both; contesting an initial decision by Engineer concerning the requirements of the Contract Documents or the acceptability of Work under the Contract Documents; challenging a set-off against payments due; or seeking other relief with respect to the terms of the Contract.
 10. *Claim*—(a) A demand or assertion by Owner directly to Contractor, duly submitted in compliance with the procedural requirements set forth herein: seeking an adjustment of Contract Price or Contract Times, or both; contesting an initial decision by Engineer concerning the requirements of the Contract Documents or the acceptability of Work under the Contract Documents; contesting Engineer's decision regarding a Change Proposal; seeking resolution of a contractual issue that Engineer has declined to address; or seeking other relief with respect to the terms of the Contract; or (b) a demand or assertion by Contractor directly to Owner, duly submitted in compliance with the procedural requirements set forth herein, contesting Engineer's decision regarding a Change Proposal; or seeking resolution of a contractual issue that Engineer has declined to address. A demand for money or services by a third party is not a Claim.

11. *Constituent of Concern*—Asbestos, petroleum, radioactive materials, polychlorinated biphenyls (PCBs), hazardous waste, and any substance, product, waste, or other material of any nature whatsoever that is or becomes listed, regulated, or addressed pursuant to (a) the Comprehensive Environmental Response, Compensation and Liability Act, 42 U.S.C. §§9601 et seq. (“CERCLA”); (b) the Hazardous Materials Transportation Act, 49 U.S.C. §§5501 et seq.; (c) the Resource Conservation and Recovery Act, 42 U.S.C. §§6901 et seq. (“RCRA”); (d) the Toxic Substances Control Act, 15 U.S.C. §§2601 et seq.; (e) the Clean Water Act, 33 U.S.C. §§1251 et seq.; (f) the Clean Air Act, 42 U.S.C. §§7401 et seq.; or (g) any other federal, state, or local statute, law, rule, regulation, ordinance, resolution, code, order, or decree regulating, relating to, or imposing liability or standards of conduct concerning, any hazardous, toxic, or dangerous waste, substance, or material.
12. *Contract*—The entire and integrated written contract between the Owner and Contractor concerning the Work.
13. *Contract Documents*—Those items so designated in the Agreement, and which together comprise the Contract.
14. *Contract Price*—The money that Owner has agreed to pay Contractor for completion of the Work in accordance with the Contract Documents. .
15. *Contract Times*—The number of days or the dates by which Contractor shall: (a) achieve Milestones, if any; (b) achieve Substantial Completion; and (c) complete the Work.
16. *Contractor*—The individual or entity with which Owner has contracted for performance of the Work.
17. *Cost of the Work*—See Paragraph 13.01 for definition.
18. *Drawings*—The part of the Contract that graphically shows the scope, extent, and character of the Work to be performed by Contractor.
19. *Effective Date of the Contract*—The date, indicated in the Agreement, on which the Contract becomes effective.
20. *Engineer*—The individual or entity named as such in the Agreement.
21. *Field Order*—A written order issued by Engineer which requires minor changes in the Work but does not change the Contract Price or the Contract Times.
22. *Hazardous Environmental Condition*—The presence at the Site of Constituents of Concern in such quantities or circumstances that may present a danger to persons or property exposed thereto. The presence at the Site of materials that are necessary for the execution of the Work, or that are to be incorporated in the Work, and that are controlled and contained pursuant to industry practices, Laws and Regulations, and the requirements of the Contract, does not establish a Hazardous Environmental Condition.
23. *Laws and Regulations; Laws or Regulations*—Any and all applicable laws, statutes, rules, regulations, ordinances, codes, and orders of any and all governmental bodies, agencies, authorities, and courts having jurisdiction.
24. *Liens*—Charges, security interests, or encumbrances upon Contract-related funds, real property, or personal property.
25. *Milestone*—A principal event in the performance of the Work that the Contract requires Contractor to achieve by an intermediate completion date or by a time prior to Substantial Completion of all the Work.

26. *Notice of Award*—The written notice by Owner to a Bidder of Owner’s acceptance of the Bid.
27. *Notice to Proceed*—A written notice by Owner to Contractor fixing the date on which the Contract Times will commence to run and on which Contractor shall start to perform the Work.
28. *Owner*—The individual or entity with which Contractor has contracted regarding the Work, and which has agreed to pay Contractor for the performance of the Work, pursuant to the terms of the Contract.
29. *Progress Schedule*—A schedule, prepared and maintained by Contractor, describing the sequence and duration of the activities comprising the Contractor’s plan to accomplish the Work within the Contract Times.
30. *Project*—The total undertaking to be accomplished for Owner by engineers, contractors, and others, including planning, study, design, construction, testing, commissioning, and start-up, and of which the Work to be performed under the Contract Documents is a part.
31. *Project Manual*—The written documents prepared for, or made available for, procuring and constructing the Work, including but not limited to the Bidding Documents or other construction procurement documents, geotechnical and existing conditions information, the Agreement, bond forms, General Conditions, Supplementary Conditions, and Specifications. The contents of the Project Manual may be bound in one or more volumes.
32. *Resident Project Representative*—The authorized representative of Engineer assigned to assist Engineer at the Site. As used herein, the term Resident Project Representative or “RPR” includes any assistants or field staff of Resident Project Representative.
33. *Samples*—Physical examples of materials, equipment, or workmanship that are representative of some portion of the Work and that establish the standards by which such portion of the Work will be judged.
34. *Schedule of Submittals*—A schedule, prepared and maintained by Contractor, of required submittals and the time requirements for Engineer’s review of the submittals and the performance of related construction activities.
35. *Schedule of Values*—A schedule, prepared and maintained by Contractor, allocating portions of the Contract Price to various portions of the Work and used as the basis for reviewing Contractor’s Applications for Payment.
36. *Shop Drawings*—All drawings, diagrams, illustrations, schedules, and other data or information that are specifically prepared or assembled by or for Contractor and submitted by Contractor to illustrate some portion of the Work. Shop Drawings, whether approved or not, are not Drawings and are not Contract Documents.
37. *Site*—Lands or areas indicated in the Contract Documents as being furnished by Owner upon which the Work is to be performed, including rights-of-way and easements, and such other lands furnished by Owner which are designated for the use of Contractor.
38. *Specifications*—The part of the Contract that consists of written requirements for materials, equipment, systems, standards, and workmanship as applied to the Work, and certain administrative requirements and procedural matters applicable to the Work.
39. *Subcontractor*—An individual or entity having a direct contract with Contractor or with any other Subcontractor for the performance of a part of the Work.
40. *Substantial Completion*—The time at which the Work (or a specified part thereof) has progressed to the point where, in the opinion of Engineer, the Work (or a specified part

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

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

1.02 Terminology

- A. The words and terms discussed in the following paragraphs are not defined but, when used in the Bidding Requirements or Contract Documents, have the indicated meaning.
- B. *Intent of Certain Terms or Adjectives*:
 1. The Contract Documents include the terms “as allowed,” “as approved,” “as ordered,” “as directed” or terms of like effect or import to authorize an exercise of professional judgment by Engineer. In addition, the adjectives “reasonable,” “suitable,” “acceptable,” “proper,” “satisfactory,” or adjectives of like effect or import are used to describe an action or

determination of Engineer as to the Work. It is intended that such exercise of professional judgment, action, or determination will be solely to evaluate, in general, the Work for compliance with the information in the Contract Documents and with the design concept of the Project as a functioning whole as shown or indicated in the Contract Documents (unless there is a specific statement indicating otherwise). The use of any such term or adjective is not intended to and shall not be effective to assign to Engineer any duty or authority to supervise or direct the performance of the Work, or any duty or authority to undertake responsibility contrary to the provisions of Article 10 or any other provision of the Contract Documents.

C. *Day:*

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

D. *Defective:*

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

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

1. The word “furnish,” when used in connection with services, materials, or equipment, shall mean to supply and deliver said services, materials, or equipment to the Site (or some other specified location) ready for use or installation and in usable or operable condition.
2. The word “install,” when used in connection with services, materials, or equipment, shall mean to put into use or place in final position said services, materials, or equipment complete and ready for intended use.
3. The words “perform” or “provide,” when used in connection with services, materials, or equipment, shall mean to furnish and install said services, materials, or equipment complete and ready for intended use.
4. If the Contract Documents establish an obligation of Contractor with respect to specific services, materials, or equipment, but do not expressly use any of the four words “furnish,” “install,” “perform,” or “provide,” then Contractor shall furnish and install said services, materials, or equipment complete and ready for intended use.

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

ARTICLE 2 – PRELIMINARY MATTERS

2.01 *Delivery of Bonds and Evidence of Insurance*

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

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

2.02 *Copies of Documents*

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

2.03 *Before Starting Construction*

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

2.04 *Preconstruction Conference; Designation of Authorized Representatives*

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

2.05 *Initial Acceptance of Schedules*

- A. At least 10 days before submission of the first Application for Payment a conference, attended by Contractor, Engineer, and others as appropriate, will be held to review for acceptability to Engineer

as provided below the schedules submitted in accordance with Paragraph 2.03.A. Contractor shall have an additional 10 days to make corrections and adjustments and to complete and resubmit the schedules. No progress payment shall be made to Contractor until acceptable schedules are submitted to Engineer.

1. The Progress Schedule will be acceptable to Engineer if it provides an orderly progression of the Work to completion within the Contract Times. Such acceptance will not impose on Engineer responsibility for the Progress Schedule, for sequencing, scheduling, or progress of the Work, nor interfere with or relieve Contractor from Contractor's full responsibility therefor.
2. Contractor's Schedule of Submittals will be acceptable to Engineer if it provides a workable arrangement for reviewing and processing the required submittals.
3. Contractor's Schedule of Values will be acceptable to Engineer as to form and substance if it provides a reasonable allocation of the Contract Price to the component parts of the Work.

2.06 *Electronic Transmittals*

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

ARTICLE 3 – DOCUMENTS: INTENT, REQUIREMENTS, REUSE

3.01 *Intent*

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

3.02 *Reference Standards*

- A. Standards Specifications, Codes, Laws and Regulations
 1. Reference in the Contract Documents to standard specifications, manuals, reference standards, or codes of any technical society, organization, or association, or to Laws or Regulations,

whether such reference be specific or by implication, shall mean the standard specification, manual, reference standard, code, or Laws or Regulations in effect at the time of opening of Bids (or on the Effective Date of the Contract if there were no Bids), except as may be otherwise specifically stated in the Contract Documents.

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

3.03 *Reporting and Resolving Discrepancies*

A. *Reporting Discrepancies:*

1. *Contractor's Verification of Figures and Field Measurements:* Before undertaking each part of the Work, Contractor shall carefully study the Contract Documents, and check and verify pertinent figures and dimensions therein, particularly with respect to applicable field measurements. Contractor shall promptly report in writing to Engineer any conflict, error, ambiguity, or discrepancy that Contractor discovers, or has actual knowledge of, and shall not proceed with any Work affected thereby until the conflict, error, ambiguity, or discrepancy is resolved, by a clarification or interpretation by Engineer, or by an amendment or supplement to the Contract Documents issued pursuant to Paragraph 11.01.
2. *Contractor's Review of Contract Documents:* If, before or during the performance of the Work, Contractor discovers any conflict, error, ambiguity, or discrepancy within the Contract Documents, or between the Contract Documents and (a) any applicable Law or Regulation, (b) actual field conditions, (c) any standard specification, manual, reference standard, or code, or (d) any instruction of any Supplier, then Contractor shall promptly report it to Engineer in writing. Contractor shall not proceed with the Work affected thereby (except in an emergency as required by Paragraph 7.15) until the conflict, error, ambiguity, or discrepancy is resolved, by a clarification or interpretation by Engineer, or by an amendment or supplement to the Contract Documents issued pursuant to Paragraph 11.01.
3. Contractor shall not be liable to Owner or Engineer for failure to report any conflict, error, ambiguity, or discrepancy in the Contract Documents unless Contractor had actual knowledge thereof.

B. *Resolving Discrepancies:*

1. Except as may be otherwise specifically stated in the Contract Documents, the provisions of the part of the Contract Documents prepared by or for Engineer shall take precedence in resolving any conflict, error, ambiguity, or discrepancy between such provisions of the Contract Documents and:
 - a. the provisions of any standard specification, manual, reference standard, or code, or the instruction of any Supplier (whether or not specifically incorporated by reference as a Contract Document); or
 - b. the provisions of any Laws or Regulations applicable to the performance of the Work (unless such an interpretation of the provisions of the Contract Documents would result in violation of such Law or Regulation).

3.04 *Requirements of the Contract Documents*

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

3.05 *Reuse of Documents*

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

ARTICLE 4 – COMMENCEMENT AND PROGRESS OF THE WORK

4.01 *Commencement of Contract Times; Notice to Proceed*

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

4.02 *Starting the Work*

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

4.03 *Reference Points*

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

4.04 *Progress Schedule*

- A. Contractor shall adhere to the Progress Schedule established in accordance with Paragraph 2.05 as it may be adjusted from time to time as provided below.
 - 1. Contractor shall submit to Engineer for acceptance (to the extent indicated in Paragraph 2.05) proposed adjustments in the Progress Schedule that will not result in changing the Contract Times.
 - 2. Proposed adjustments in the Progress Schedule that will change the Contract Times shall be submitted in accordance with the requirements of Article 11.
- B. Contractor shall carry on the Work and adhere to the Progress Schedule during all disputes or disagreements with Owner. No Work shall be delayed or postponed pending resolution of any disputes or disagreements, or during any appeal process, except as permitted by Paragraph 16.04, or as Owner and Contractor may otherwise agree in writing.

4.05 *Delays in Contractor's Progress*

- A. If Owner, Engineer, or anyone for whom Owner is responsible, delays, disrupts, or interferes with the performance or progress of the Work, then Contractor shall be entitled to an equitable adjustment in the Contract Times and Contract Price. Contractor's entitlement to an adjustment of the Contract Times is conditioned on such adjustment being essential to Contractor's ability to complete the Work within the Contract Times.
- B. Contractor shall not be entitled to an adjustment in Contract Price or Contract Times for delay, disruption, or interference caused by or within the control of Contractor. Delay, disruption, and interference attributable to and within the control of a Subcontractor or Supplier shall be deemed to be within the control of Contractor.
- C. If Contractor's performance or progress is delayed, disrupted, or interfered with by unanticipated causes not the fault of and beyond the control of Owner, Contractor, and those for which they are responsible, then Contractor shall be entitled to an equitable adjustment in Contract Times. Contractor's entitlement to an adjustment of the Contract Times is conditioned on such adjustment being essential to Contractor's ability to complete the Work within the Contract Times. Such an adjustment shall be Contractor's sole and exclusive remedy for the delays, disruption, and interference described in this paragraph. Causes of delay, disruption, or interference that may give rise to an adjustment in Contract Times under this paragraph include but are not limited to the following:
 - 1. severe and unavoidable natural catastrophes such as fires, floods, epidemics, and earthquakes;
 - 2. abnormal weather conditions;
 - 3. acts or failures to act of utility owners (other than those performing other work at or adjacent to the Site by arrangement with the Owner, as contemplated in Article 8); and

- 4. acts of war or terrorism.
- D. Delays, disruption, and interference to the performance or progress of the Work resulting from the existence of a differing subsurface or physical condition, an Underground Facility that was not shown or indicated by the Contract Documents, or not shown or indicated with reasonable accuracy, and those resulting from Hazardous Environmental Conditions, are governed by Article 5.
- E. Paragraph 8.03 governs delays, disruption, and interference to the performance or progress of the Work resulting from the performance of certain other work at or adjacent to the Site.
- F. Contractor shall not be entitled to an adjustment in Contract Price or Contract Times for any delay, disruption, or interference if such delay is concurrent with a delay, disruption, or interference caused by or within the control of Contractor.
- G. Contractor must submit any Change Proposal seeking an adjustment in Contract Price or Contract Times under this paragraph within 30 days of the commencement of the delaying, disrupting, or interfering event.

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

5.01 *Availability of Lands*

- A. Owner shall furnish the Site. Owner shall notify Contractor of any encumbrances or restrictions not of general application but specifically related to use of the Site with which Contractor must comply in performing the Work.
- B. Upon reasonable written request, Owner shall furnish Contractor with a current statement of record legal title and legal description of the lands upon which permanent improvements are to be made and Owner's interest therein as necessary for giving notice of or filing a mechanic's or construction lien against such lands in accordance with applicable Laws and Regulations.
- C. Contractor shall provide for all additional lands and access thereto that may be required for temporary construction facilities or storage of materials and equipment.

5.02 *Use of Site and Other Areas*

- A. *Limitation on Use of Site and Other Areas:*
 - 1. Contractor shall confine construction equipment, temporary construction facilities, the storage of materials and equipment, and the operations of workers to the Site, adjacent areas that Contractor has arranged to use through construction easements or otherwise, and other adjacent areas permitted by Laws and Regulations, and shall not unreasonably encumber the Site and such other adjacent areas with construction equipment or other materials or equipment. Contractor shall assume full responsibility for (a) damage to the Site; (b) damage to any such other adjacent areas used for Contractor's operations; (c) damage to any other adjacent land or areas; and (d) for injuries and losses sustained by the owners or occupants of any such land or areas; provided that such damage or injuries result from the performance of the Work or from other actions or conduct of the Contractor or those for which Contractor is responsible.
 - 2. If a damage or injury claim is made by the owner or occupant of any such land or area because of the performance of the Work, or because of other actions or conduct of the Contractor or those for which Contractor is responsible, Contractor shall (a) take immediate corrective or remedial action as required by Paragraph 7.12, or otherwise; (b) promptly attempt to settle the

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

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

5.03 *Subsurface and Physical Conditions*

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

2. other data, interpretations, opinions, and information contained in such reports or shown or indicated in such drawings; or
3. any Contractor interpretation of or conclusion drawn from any Technical Data or any such other data, interpretations, opinions, or information.

5.04 *Differing Subsurface or Physical Conditions*

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

1. is of such a nature as to establish that any Technical Data on which Contractor is entitled to rely as provided in Paragraph 5.03 is materially inaccurate; or
2. is of such a nature as to require a change in the Drawings or Specifications; or
3. differs materially from that shown or indicated in the Contract Documents; or
4. is of an unusual nature, and differs materially from conditions ordinarily encountered and generally recognized as inherent in work of the character provided for in the Contract Documents;

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

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

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

D. *Possible Price and Times Adjustments:*

1. Contractor shall be entitled to an equitable adjustment in Contract Price or Contract Times, or both, to the extent that the existence of a differing subsurface or physical condition, or any related delay, disruption, or interference, causes an increase or decrease in Contractor's cost of, or time required for, performance of the Work; subject, however, to the following:
 - a. such condition must fall within any one or more of the categories described in Paragraph 5.04.A;
 - b. with respect to Work that is paid for on a unit price basis, any adjustment in Contract Price will be subject to the provisions of Paragraph 13.03; and,

- c. Contractor's entitlement to an adjustment of the Contract Times is conditioned on such adjustment being essential to Contractor's ability to complete the Work within the Contract Times.
- 2. Contractor shall not be entitled to any adjustment in the Contract Price or Contract Times with respect to a subsurface or physical condition if:
 - a. Contractor knew of the existence of such condition at the time Contractor made a commitment to Owner with respect to Contract Price and Contract Times by the submission of a Bid or becoming bound under a negotiated contract, or otherwise; or
 - b. the existence of such condition reasonably could have been discovered or revealed as a result of any examination, investigation, exploration, test, or study of the Site and contiguous areas expressly required by the Bidding Requirements or Contract Documents to be conducted by or for Contractor prior to Contractor's making such commitment; or
 - c. Contractor failed to give the written notice as required by Paragraph 5.04.A.
- 3. If Owner and Contractor agree regarding Contractor's entitlement to and the amount or extent of any adjustment in the Contract Price or Contract Times, or both, then any such adjustment shall be set forth in a Change Order.
- 4. Contractor may submit a Change Proposal regarding its entitlement to or the amount or extent of any adjustment in the Contract Price or Contract Times, or both, no later than 30 days after Owner's issuance of the Owner's written statement to Contractor regarding the subsurface or physical condition in question.

5.05 *Underground Facilities*

- A. *Contractor's Responsibilities:* The information and data shown or indicated in the Contract Documents with respect to existing Underground Facilities at or adjacent to the Site is based on information and data furnished to Owner or Engineer by the owners of such Underground Facilities, including Owner, or by others. Unless it is otherwise expressly provided in the Supplementary Conditions:
 - 1. Owner and Engineer do not warrant or guarantee the accuracy or completeness of any such information or data provided by others; and
 - 2. the cost of all of the following will be included in the Contract Price, and Contractor shall have full responsibility for:
 - a. reviewing and checking all information and data regarding existing Underground Facilities at the Site;
 - b. locating all Underground Facilities shown or indicated in the Contract Documents as being at the Site;
 - c. coordination of the Work with the owners (including Owner) of such Underground Facilities, during construction; and
 - d. the safety and protection of all existing Underground Facilities at the Site, and repairing any damage thereto resulting from the Work.
- B. *Notice by Contractor:* If Contractor believes that an Underground Facility that is uncovered or revealed at the Site was not shown or indicated in the Contract Documents, or was not shown or indicated with reasonable accuracy, then Contractor shall, promptly after becoming aware thereof and before further disturbing conditions affected thereby or performing any Work in connection

therewith (except in an emergency as required by Paragraph 7.15), identify the owner of such Underground Facility and give written notice to that owner and to Owner and Engineer.

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

5.06 *Hazardous Environmental Conditions at Site*

- A. *Reports and Drawings:* The Supplementary Conditions identify:
 - 1. those reports and drawings known to Owner relating to Hazardous Environmental Conditions that have been identified at or adjacent to the Site; and
 - 2. Technical Data contained in such reports and drawings.

- B. *Reliance by Contractor on Technical Data Authorized:* Contractor may rely upon the accuracy of the Technical Data expressly identified in the Supplementary Conditions with respect to such reports and drawings, but such reports and drawings are not Contract Documents. If no such express identification has been made, then Contractor may rely on the accuracy of the Technical Data (as defined in Article 1) contained in any geotechnical or environmental report prepared for the Project and made available to Contractor. Except for such reliance on Technical Data, Contractor may not rely upon or make any claim against Owner or Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors with respect to:
1. the completeness of such reports and drawings for Contractor's purposes, including, but not limited to, any aspects of the means, methods, techniques, sequences and procedures of construction to be employed by Contractor and safety precautions and programs incident thereto; or
 2. other data, interpretations, opinions and information contained in such reports or shown or indicated in such drawings; or
 3. any Contractor interpretation of or conclusion drawn from any Technical Data or any such other data, interpretations, opinions or information.
- C. Contractor shall not be responsible for removing or remediating any Hazardous Environmental Condition encountered, uncovered, or revealed at the Site unless such removal or remediation is expressly identified in the Contract Documents to be within the scope of the Work.
- D. Contractor shall be responsible for controlling, containing, and duly removing all Constituents of Concern brought to the Site by Contractor, Subcontractors, Suppliers, or anyone else for whom Contractor is responsible, and for any associated costs; and for the costs of removing and remediating any Hazardous Environmental Condition created by the presence of any such Constituents of Concern.
- E. If Contractor encounters, uncovers, or reveals a Hazardous Environmental Condition whose removal or remediation is not expressly identified in the Contract Documents as being within the scope of the Work, or if Contractor or anyone for whom Contractor is responsible creates a Hazardous Environmental Condition, then Contractor shall immediately: (1) secure or otherwise isolate such condition; (2) stop all Work in connection with such condition and in any area affected thereby (except in an emergency as required by Paragraph 7.15); and (3) notify Owner and Engineer (and promptly thereafter confirm such notice in writing). Owner shall promptly consult with Engineer concerning the necessity for Owner to retain a qualified expert to evaluate such condition or take corrective action, if any. Promptly after consulting with Engineer, Owner shall take such actions as are necessary to permit Owner to timely obtain required permits and provide Contractor the written notice required by Paragraph 5.06.F. If Contractor or anyone for whom Contractor is responsible created the Hazardous Environmental Condition in question, then Owner may remove and remediate the Hazardous Environmental Condition, and impose a set-off against payments to account for the associated costs.
- F. Contractor shall not resume Work in connection with such Hazardous Environmental Condition or in any affected area until after Owner has obtained any required permits related thereto, and delivered written notice to Contractor either (1) specifying that such condition and any affected area is or has been rendered safe for the resumption of Work, or (2) specifying any special conditions under which such Work may be resumed safely.
- G. If Owner and Contractor cannot agree as to entitlement to or on the amount or extent, if any, of any adjustment in Contract Price or Contract Times, or both, as a result of such Work stoppage or such special conditions under which Work is agreed to be resumed by Contractor, then within 30 days of

Owner's written notice regarding the resumption of Work, Contractor may submit a Change Proposal, or Owner may impose a set-off.

- H. If after receipt of such written notice Contractor does not agree to resume such Work based on a reasonable belief it is unsafe, or does not agree to resume such Work under such special conditions, then Owner may order the portion of the Work that is in the area affected by such condition to be deleted from the Work, following the contractual change procedures in Article 11. Owner may have such deleted portion of the Work performed by Owner's own forces or others in accordance with Article 8.
- I. To the fullest extent permitted by Laws and Regulations, Owner shall indemnify and hold harmless Contractor, Subcontractors, and Engineer, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to a Hazardous Environmental Condition, provided that such Hazardous Environmental Condition (1) was not shown or indicated in the Drawings, Specifications, or other Contract Documents, identified as Technical Data entitled to limited reliance pursuant to Paragraph 5.06.B, or identified in the Contract Documents to be included within the scope of the Work, and (2) was not created by Contractor or by anyone for whom Contractor is responsible. Nothing in this Paragraph 5.06.H shall obligate Owner to indemnify any individual or entity from and against the consequences of that individual's or entity's own negligence.
- J. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to the failure to control, contain, or remove a Constituent of Concern brought to the Site by Contractor or by anyone for whom Contractor is responsible, or to a Hazardous Environmental Condition created by Contractor or by anyone for whom Contractor is responsible. Nothing in this Paragraph 5.06.J shall obligate Contractor to indemnify any individual or entity from and against the consequences of that individual's or entity's own negligence.
- K. The provisions of Paragraphs 5.03, 5.04, and 5.05 do not apply to the presence of Constituents of Concern or to a Hazardous Environmental Condition uncovered or revealed at the Site.

ARTICLE 6 – BONDS AND INSURANCE

6.01 *Performance, Payment, and Other Bonds*

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

Companies” as published in Circular 570 (as amended and supplemented) by the Financial Management Service, Surety Bond Branch, U.S. Department of the Treasury. A bond signed by an agent or attorney-in-fact must be accompanied by a certified copy of that individual’s authority to bind the surety. The evidence of authority shall show that it is effective on the date the agent or attorney-in-fact signed the accompanying bond.

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

6.02 *Insurance—General Provisions*

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

deficiency in compliance from the evidence provided, shall not be construed as a waiver of the other party's obligation to obtain and maintain such insurance.

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

6.03 *Contractor's Insurance*

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

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

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

6.04 *Owner's Liability Insurance*

- A. In addition to the insurance required to be provided by Contractor under Paragraph 6.03, Owner, at Owner's option, may purchase and maintain at Owner's expense Owner's own liability insurance as will protect Owner against claims which may arise from operations under the Contract Documents.
- B. Owner's liability policies, if any, operate separately and independently from policies required to be provided by Contractor, and Contractor cannot rely upon Owner's liability policies for any of Contractor's obligations to the Owner, Engineer, or third parties.

6.05 *Property Insurance*

- A. *Builder's Risk:* Unless otherwise provided in the Supplementary Conditions, Contractor shall purchase and maintain builder's risk insurance upon the Work on a completed value basis, in the amount of the full insurable replacement cost thereof (subject to such deductible amounts as may be provided in the Supplementary Conditions or required by Laws and Regulations). This insurance shall:
1. include the Owner and Contractor as named insureds, and all Subcontractors, and any individuals or entities required by the Supplementary Conditions to be insured under such builder's risk policy, as insureds or named insureds. For purposes of the remainder of this Paragraph 6.05, Paragraphs 6.06 and 6.07, and any corresponding Supplementary Conditions, the parties required to be insured shall collectively be referred to as "insureds."
 2. be written on a builder's risk "all risk" policy form that shall at least include insurance for physical loss or damage to the Work, temporary buildings, falsework, and materials and equipment in transit, and shall insure against at least the following perils or causes of loss: fire; lightning; windstorm; riot; civil commotion; terrorism; vehicle impact; aircraft; smoke; theft; vandalism and malicious mischief; mechanical breakdown, boiler explosion, and artificially generated electric current; earthquake; volcanic activity, and other earth movement;

flood; collapse; explosion; debris removal; demolition occasioned by enforcement of Laws and Regulations; water damage (other than that caused by flood); and such other perils or causes of loss as may be specifically required by the Supplementary Conditions. If insurance against mechanical breakdown, boiler explosion, and artificially generated electric current; earthquake; volcanic activity, and other earth movement; or flood, are not commercially available under builder's risk policies, by endorsement or otherwise, such insurance may be provided through other insurance policies acceptable to Owner and Contractor.

3. cover, as insured property, at least the following: (a) the Work and all materials, supplies, machinery, apparatus, equipment, fixtures, and other property of a similar nature that are to be incorporated into or used in the preparation, fabrication, construction, erection, or completion of the Work, including Owner-furnished or assigned property; (b) spare parts inventory required within the scope of the Contract; and (c) temporary works which are not intended to form part of the permanent constructed Work but which are intended to provide working access to the Site, or to the Work under construction, or which are intended to provide temporary support for the Work under construction, including scaffolding, form work, fences, shoring, falsework, and temporary structures.
 4. cover expenses incurred in the repair or replacement of any insured property (including but not limited to fees and charges of engineers and architects).
 5. extend to cover damage or loss to insured property while in temporary storage at the Site or in a storage location outside the Site (but not including property stored at the premises of a manufacturer or Supplier).
 6. extend to cover damage or loss to insured property while in transit.
 7. allow for partial occupation or use of the Work by Owner, such that those portions of the Work that are not yet occupied or used by Owner shall remain covered by the builder's risk insurance.
 8. allow for the waiver of the insurer's subrogation rights, as set forth below.
 9. provide primary coverage for all losses and damages caused by the perils or causes of loss covered.
 10. not include a co-insurance clause.
 11. include an exception for ensuing losses from physical damage or loss with respect to any defective workmanship, design, or materials exclusions.
 12. include performance/hot testing and start-up.
 13. be maintained in effect, subject to the provisions herein regarding Substantial Completion and partial occupancy or use of the Work by Owner, until the Work is complete.
- B. *Notice of Cancellation or Change:* All the policies of insurance (and the certificates or other evidence thereof) required to be purchased and maintained in accordance with this Paragraph 6.05 will contain a provision or endorsement that the coverage afforded will not be canceled or materially changed or renewal refused until at least 10 days prior written notice has been given to the purchasing policyholder. Within three days of receipt of any such written notice, the purchasing policyholder shall provide a copy of the notice to each other insured.
- C. *Deductibles:* The purchaser of any required builder's risk or property insurance shall pay for costs not covered because of the application of a policy deductible.
- D. *Partial Occupancy or Use by Owner:* If Owner will occupy or use a portion or portions of the Work prior to Substantial Completion of all the Work as provided in Paragraph 15.04, then Owner

(directly, if it is the purchaser of the builder's risk policy, or through Contractor) will provide notice of such occupancy or use to the builder's risk insurer. The builder's risk insurance shall not be canceled or permitted to lapse on account of any such partial use or occupancy; rather, those portions of the Work that are occupied or used by Owner may come off the builder's risk policy, while those portions of the Work not yet occupied or used by Owner shall remain covered by the builder's risk insurance.

- E. *Additional Insurance*: If Contractor elects to obtain other special insurance to be included in or supplement the builder's risk or property insurance policies provided under this Paragraph 6.05, it may do so at Contractor's expense.
- F. *Insurance of Other Property*: If the express insurance provisions of the Contract do not require or address the insurance of a property item or interest, such as tools, construction equipment, or other personal property owned by Contractor, a Subcontractor, or an employee of Contractor or a Subcontractor, then the entity or individual owning such property item will be responsible for deciding whether to insure it, and if so in what amount.

6.06 *Waiver of Rights*

- A. All policies purchased in accordance with Paragraph 6.05, expressly including the builder's risk policy, shall contain provisions to the effect that in the event of payment of any loss or damage the insurers will have no rights of recovery against any insureds thereunder, or against Engineer or its consultants, or their officers, directors, members, partners, employees, agents, consultants, or subcontractors. Owner and Contractor waive all rights against each other and the respective officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, for all losses and damages caused by, arising out of, or resulting from any of the perils or causes of loss covered by such policies and any other property insurance applicable to the Work; and, in addition, waive all such rights against Engineer, its consultants, all Subcontractors, all individuals or entities identified in the Supplementary Conditions as insureds, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, under such policies for losses and damages so caused. None of the above waivers shall extend to the rights that any party making such waiver may have to the proceeds of insurance held by Owner or Contractor as trustee or fiduciary, or otherwise payable under any policy so issued.
- B. Owner waives all rights against Contractor, Subcontractors, and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them, for:
 - 1. loss due to business interruption, loss of use, or other consequential loss extending beyond direct physical loss or damage to Owner's property or the Work caused by, arising out of, or resulting from fire or other perils whether or not insured by Owner; and
 - 2. loss or damage to the completed Project or part thereof caused by, arising out of, or resulting from fire or other insured peril or cause of loss covered by any property insurance maintained on the completed Project or part thereof by Owner during partial occupancy or use pursuant to Paragraph 15.04, after Substantial Completion pursuant to Paragraph 15.03, or after final payment pursuant to Paragraph 15.06.
- C. Any insurance policy maintained by Owner covering any loss, damage or consequential loss referred to in Paragraph 6.06.B shall contain provisions to the effect that in the event of payment of any such loss, damage, or consequential loss, the insurers will have no rights of recovery against Contractor, Subcontractors, or Engineer, or the officers, directors, members, partners, employees, agents, consultants, or subcontractors of each and any of them.

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

6.07 *Receipt and Application of Property Insurance Proceeds*

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

ARTICLE 7 – CONTRACTOR'S RESPONSIBILITIES

7.01 *Supervision and Superintendence*

- A. Contractor shall supervise, inspect, and direct the Work competently and efficiently, devoting such attention thereto and applying such skills and expertise as may be necessary to perform the Work in accordance with the Contract Documents. Contractor shall be solely responsible for the means, methods, techniques, sequences, and procedures of construction.
- B. At all times during the progress of the Work, Contractor shall assign a competent resident superintendent who shall not be replaced without written notice to Owner and Engineer except under extraordinary circumstances.

7.02 *Labor; Working Hours*

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

7.03 *Services, Materials, and Equipment*

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

7.04 *“Or Equals”*

- A. Whenever an item of material or equipment is specified or described in the Contract Documents by using the name of a proprietary item or the name of a particular Supplier, the Contract Price has been based upon Contractor furnishing such item as specified. The specification or description of such an item is intended to establish the type, function, appearance, and quality required. Unless the specification or description contains or is followed by words reading that no like, equivalent, or “or equal” item is permitted, Contractor may request that Engineer authorize the use of other items of material or equipment, or items from other proposed suppliers under the circumstances described below.
 - 1. If Engineer in its sole discretion determines that an item of material or equipment proposed by Contractor is functionally equal to that named and sufficiently similar so that no change in related Work will be required, Engineer shall deem it an “or equal” item. For the purposes of this paragraph, a proposed item of material or equipment will be considered functionally equal to an item so named if:
 - a. in the exercise of reasonable judgment Engineer determines that:
 - 1) it is at least equal in materials of construction, quality, durability, appearance, strength, and design characteristics;
 - 2) it will reliably perform at least equally well the function and achieve the results imposed by the design concept of the completed Project as a functioning whole;
 - 3) it has a proven record of performance and availability of responsive service; and
 - 4) it is not objectionable to Owner.
 - b. Contractor certifies that, if approved and incorporated into the Work:
 - 1) there will be no increase in cost to the Owner or increase in Contract Times; and
 - 2) it will conform substantially to the detailed requirements of the item named in the Contract Documents.
- B. *Contractor’s Expense:* Contractor shall provide all data in support of any proposed “or equal” item at Contractor’s expense.

- C. *Engineer's Evaluation and Determination:* Engineer will be allowed a reasonable time to evaluate each "or-equal" request. Engineer may require Contractor to furnish additional data about the proposed "or-equal" item. Engineer will be the sole judge of acceptability. No "or-equal" item will be ordered, furnished, installed, or utilized until Engineer's review is complete and Engineer determines that the proposed item is an "or-equal", which will be evidenced by an approved Shop Drawing or other written communication. Engineer will advise Contractor in writing of any negative determination.
- D. *Effect of Engineer's Determination:* Neither approval nor denial of an "or-equal" request shall result in any change in Contract Price. The Engineer's denial of an "or-equal" request shall be final and binding, and may not be reversed through an appeal under any provision of the Contract Documents.
- E. *Treatment as a Substitution Request:* If Engineer determines that an item of material or equipment proposed by Contractor does not qualify as an "or-equal" item, Contractor may request that Engineer consider the proposed item as a substitute pursuant to Paragraph 7.05.

7.05 *Substitutes*

- A. Unless the specification or description of an item of material or equipment required to be furnished under the Contract Documents contains or is followed by words reading that no substitution is permitted, Contractor may request that Engineer authorize the use of other items of material or equipment under the circumstances described below. To the extent possible such requests shall be made before commencement of related construction at the Site.
 - 1. Contractor shall submit sufficient information as provided below to allow Engineer to determine if the item of material or equipment proposed is functionally equivalent to that named and an acceptable substitute therefor. Engineer will not accept requests for review of proposed substitute items of material or equipment from anyone other than Contractor.
 - 2. The requirements for review by Engineer will be as set forth in Paragraph 7.05.B, as supplemented by the Specifications, and as Engineer may decide is appropriate under the circumstances.
 - 3. Contractor shall make written application to Engineer for review of a proposed substitute item of material or equipment that Contractor seeks to furnish or use. The application:
 - a. shall certify that the proposed substitute item will:
 - 1) perform adequately the functions and achieve the results called for by the general design,
 - 2) be similar in substance to that specified, and
 - 3) be suited to the same use as that specified.
 - b. will state:
 - 1) the extent, if any, to which the use of the proposed substitute item will necessitate a change in Contract Times,
 - 2) whether use of the proposed substitute item in the Work will require a change in any of the Contract Documents (or in the provisions of any other direct contract with Owner for other work on the Project) to adapt the design to the proposed substitute item, and
 - 3) whether incorporation or use of the proposed substitute item in connection with the Work is subject to payment of any license fee or royalty.

- c. will identify:
 - 1) all variations of the proposed substitute item from that specified, and
 - 2) available engineering, sales, maintenance, repair, and replacement services.
 - d. shall contain an itemized estimate of all costs or credits that will result directly or indirectly from use of such substitute item, including but not limited to changes in Contract Price, shared savings, costs of redesign, and claims of other contractors affected by any resulting change.
- B. *Engineer's Evaluation and Determination:* Engineer will be allowed a reasonable time to evaluate each substitute request, and to obtain comments and direction from Owner. Engineer may require Contractor to furnish additional data about the proposed substitute item. Engineer will be the sole judge of acceptability. No substitute will be ordered, furnished, installed, or utilized until Engineer's review is complete and Engineer determines that the proposed item is an acceptable substitute. Engineer's determination will be evidenced by a Field Order or a proposed Change Order accounting for the substitution itself and all related impacts, including changes in Contract Price or Contract Times. Engineer will advise Contractor in writing of any negative determination.
 - C. *Special Guarantee:* Owner may require Contractor to furnish at Contractor's expense a special performance guarantee or other surety with respect to any substitute.
 - D. *Reimbursement of Engineer's Cost:* Engineer will record Engineer's costs in evaluating a substitute proposed or submitted by Contractor. Whether or not Engineer approves a substitute so proposed or submitted by Contractor, Contractor shall reimburse Owner for the reasonable charges of Engineer for evaluating each such proposed substitute. Contractor shall also reimburse Owner for the reasonable charges of Engineer for making changes in the Contract Documents (or in the provisions of any other direct contract with Owner) resulting from the acceptance of each proposed substitute.
 - E. *Contractor's Expense:* Contractor shall provide all data in support of any proposed substitute at Contractor's expense.
 - F. *Effect of Engineer's Determination:* If Engineer approves the substitution request, Contractor shall execute the proposed Change Order and proceed with the substitution. The Engineer's denial of a substitution request shall be final and binding, and may not be reversed through an appeal under any provision of the Contract Documents. Contractor may challenge the scope of reimbursement costs imposed under Paragraph 7.05.D, by timely submittal of a Change Proposal.

7.06 *Concerning Subcontractors, Suppliers, and Others*

- A. Contractor may retain Subcontractors and Suppliers for the performance of parts of the Work. Such Subcontractors and Suppliers must be acceptable to Owner.
- B. Contractor shall retain specific Subcontractors, Suppliers, or other individuals or entities for the performance of designated parts of the Work if required by the Contract to do so.
- C. Subsequent to the submittal of Contractor's Bid or final negotiation of the terms of the Contract, Owner may not require Contractor to retain any Subcontractor, Supplier, or other individual or entity to furnish or perform any of the Work against which Contractor has reasonable objection.
- D. Prior to entry into any binding subcontract or purchase order, Contractor shall submit to Owner the identity of the proposed Subcontractor or Supplier (unless Owner has already deemed such proposed Subcontractor or Supplier acceptable, during the bidding process or otherwise). Such proposed Subcontractor or Supplier shall be deemed acceptable to Owner unless Owner raises a substantive, reasonable objection within five days.

- E. Owner may require the replacement of any Subcontractor, Supplier, or other individual or entity retained by Contractor to perform any part of the Work. Owner also may require Contractor to retain specific replacements; provided, however, that Owner may not require a replacement to which Contractor has a reasonable objection. If Contractor has submitted the identity of certain Subcontractors, Suppliers, or other individuals or entities for acceptance by Owner, and Owner has accepted it (either in writing or by failing to make written objection thereto), then Owner may subsequently revoke the acceptance of any such Subcontractor, Supplier, or other individual or entity so identified solely on the basis of substantive, reasonable objection after due investigation. Contractor shall submit an acceptable replacement for the rejected Subcontractor, Supplier, or other individual or entity.
- F. If Owner requires the replacement of any Subcontractor, Supplier, or other individual or entity retained by Contractor to perform any part of the Work, then Contractor shall be entitled to an adjustment in Contract Price or Contract Times, or both, with respect to the replacement; and Contractor shall initiate a Change Proposal for such adjustment within 30 days of Owner's requirement of replacement.
- G. No acceptance by Owner of any such Subcontractor, Supplier, or other individual or entity, whether initially or as a replacement, shall constitute a waiver of the right of Owner to the completion of the Work in accordance with the Contract Documents.
- H. On a monthly basis Contractor shall submit to Engineer a complete list of all Subcontractors and Suppliers having a direct contract with Contractor, and of all other Subcontractors and Suppliers known to Contractor at the time of submittal.
- I. Contractor shall be fully responsible to Owner and Engineer for all acts and omissions of the Subcontractors, Suppliers, and other individuals or entities performing or furnishing any of the Work just as Contractor is responsible for Contractor's own acts and omissions.
- J. Contractor shall be solely responsible for scheduling and coordinating the work of Subcontractors, Suppliers, and all other individuals or entities performing or furnishing any of the Work.
- K. Contractor shall restrict all Subcontractors, Suppliers, and such other individuals or entities performing or furnishing any of the Work from communicating with Engineer or Owner, except through Contractor or in case of an emergency, or as otherwise expressly allowed herein.
- L. The divisions and sections of the Specifications and the identifications of any Drawings shall not control Contractor in dividing the Work among Subcontractors or Suppliers or delineating the Work to be performed by any specific trade.
- M. All Work performed for Contractor by a Subcontractor or Supplier shall be pursuant to an appropriate contractual agreement that specifically binds the Subcontractor or Supplier to the applicable terms and conditions of the Contract Documents for the benefit of Owner and Engineer.
- N. Owner may furnish to any Subcontractor or Supplier, to the extent practicable, information about amounts paid to Contractor on account of Work performed for Contractor by the particular Subcontractor or Supplier.
- O. Nothing in the Contract Documents:
 - 1. shall create for the benefit of any such Subcontractor, Supplier, or other individual or entity any contractual relationship between Owner or Engineer and any such Subcontractor, Supplier, or other individual or entity; nor
 - 2. shall create any obligation on the part of Owner or Engineer to pay or to see to the payment of any money due any such Subcontractor, Supplier, or other individual or entity except as may otherwise be required by Laws and Regulations.

7.07 *Patent Fees and Royalties*

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

7.08 *Permits*

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

7.09 *Taxes*

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

7.10 *Laws and Regulations*

- A. Contractor shall give all notices required by and shall comply with all Laws and Regulations applicable to the performance of the Work. Except where otherwise expressly required by applicable Laws and Regulations, neither Owner nor Engineer shall be responsible for monitoring Contractor's compliance with any Laws or Regulations.
- B. If Contractor performs any Work or takes any other action knowing or having reason to know that it is contrary to Laws or Regulations, Contractor shall bear all resulting costs and losses, and shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers,

architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such Work or other action. It shall not be Contractor's responsibility to make certain that the Work described in the Contract Documents is in accordance with Laws and Regulations, but this shall not relieve Contractor of Contractor's obligations under Paragraph 3.03.

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

7.11 *Record Documents*

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

7.12 *Safety and Protection*

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

- E. All damage, injury, or loss to any property referred to in Paragraph 7.12.A.2 or 7.12.A.3 caused, directly or indirectly, in whole or in part, by Contractor, any Subcontractor, Supplier, or any other individual or entity directly or indirectly employed by any of them to perform any of the Work, or anyone for whose acts any of them may be liable, shall be remedied by Contractor at its expense (except damage or loss attributable to the fault of Drawings or Specifications or to the acts or omissions of Owner or Engineer or anyone employed by any of them, or anyone for whose acts any of them may be liable, and not attributable, directly or indirectly, in whole or in part, to the fault or negligence of Contractor or any Subcontractor, Supplier, or other individual or entity directly or indirectly employed by any of them).
- F. Contractor's duties and responsibilities for safety and protection shall continue until such time as all the Work is completed and Engineer has issued a notice to Owner and Contractor in accordance with Paragraph 15.06.B that the Work is acceptable (except as otherwise expressly provided in connection with Substantial Completion).
- G. Contractor's duties and responsibilities for safety and protection shall resume whenever Contractor or any Subcontractor or Supplier returns to the Site to fulfill warranty or correction obligations, or to conduct other tasks arising from the Contract Documents.

7.13 *Safety Representative*

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

7.14 *Hazard Communication Programs*

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

7.15 *Emergencies*

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

7.16 *Shop Drawings, Samples, and Other Submittals*

A. *Shop Drawing and Sample Submittal Requirements:*

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

- d. determined and verified all information relative to Contractor's responsibilities for means, methods, techniques, sequences, and procedures of construction, and safety precautions and programs incident thereto.
 2. Each submittal shall bear a stamp or specific written certification that Contractor has satisfied Contractor's obligations under the Contract Documents with respect to Contractor's review of that submittal, and that Contractor approves the submittal.
 3. With each submittal, Contractor shall give Engineer specific written notice of any variations that the Shop Drawing or Sample may have from the requirements of the Contract Documents. This notice shall be set forth in a written communication separate from the Shop Drawings or Sample submittal; and, in addition, in the case of Shop Drawings by a specific notation made on each Shop Drawing submitted to Engineer for review and approval of each such variation.
- B. *Submittal Procedures for Shop Drawings and Samples:* Contractor shall submit Shop Drawings and Samples to Engineer for review and approval in accordance with the accepted Schedule of Submittals. Each submittal will be identified as Engineer may require.
1. *Shop Drawings:*
 - a. Contractor shall submit the number of copies required in the Specifications.
 - b. Data shown on the Shop Drawings will be complete with respect to quantities, dimensions, specified performance and design criteria, materials, and similar data to show Engineer the services, materials, and equipment Contractor proposes to provide and to enable Engineer to review the information for the limited purposes required by Paragraph 7.16.D.
 2. *Samples:*
 - a. Contractor shall submit the number of Samples required in the Specifications.
 - b. Contractor shall clearly identify each Sample as to material, Supplier, pertinent data such as catalog numbers, the use for which intended and other data as Engineer may require to enable Engineer to review the submittal for the limited purposes required by Paragraph 7.16.D.
 3. Where a Shop Drawing or Sample is required by the Contract Documents or the Schedule of Submittals, any related Work performed prior to Engineer's review and approval of the pertinent submittal will be at the sole expense and responsibility of Contractor.
- C. *Other Submittals:* Contractor shall submit other submittals to Engineer in accordance with the accepted Schedule of Submittals, and pursuant to the applicable terms of the Specifications.
- D. *Engineer's Review:*
1. Engineer will provide timely review of Shop Drawings and Samples in accordance with the Schedule of Submittals acceptable to Engineer. Engineer's review and approval will be only to determine if the items covered by the submittals will, after installation or incorporation in the Work, conform to the information given in the Contract Documents and be compatible with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents.
 2. Engineer's review and approval will not extend to means, methods, techniques, sequences, or procedures of construction or to safety precautions or programs incident thereto.
 3. Engineer's review and approval of a separate item as such will not indicate approval of the assembly in which the item functions.

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

E. *Resubmittal Procedures:*

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

7.17 *Contractor's General Warranty and Guarantee*

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

not in accordance with the Contract Documents or a release of Contractor's obligation to perform the Work in accordance with the Contract Documents:

1. observations by Engineer;
 2. recommendation by Engineer or payment by Owner of any progress or final payment;
 3. the issuance of a certificate of Substantial Completion by Engineer or any payment related thereto by Owner;
 4. use or occupancy of the Work or any part thereof by Owner;
 5. any review and approval of a Shop Drawing or Sample submittal;
 6. the issuance of a notice of acceptability by Engineer;
 7. any inspection, test, or approval by others; or
 8. any correction of defective Work by Owner.
- D. If the Contract requires the Contractor to accept the assignment of a contract entered into by Owner, then the specific warranties, guarantees, and correction obligations contained in the assigned contract shall govern with respect to Contractor's performance obligations to Owner for the Work described in the assigned contract.

7.18 *Indemnification*

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

2. giving directions or instructions, or failing to give them, if that is the primary cause of the injury or damage.

7.19 *Delegation of Professional Design Services*

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

ARTICLE 8 – OTHER WORK AT THE SITE

8.01 *Other Work*

- A. In addition to and apart from the Work under the Contract Documents, the Owner may perform other work at or adjacent to the Site. Such other work may be performed by Owner's employees, or through contracts between the Owner and third parties. Owner may also arrange to have third-party utility owners perform work on their utilities and facilities at or adjacent to the Site.
- B. If Owner performs other work at or adjacent to the Site with Owner's employees, or through contracts for such other work, then Owner shall give Contractor written notice thereof prior to starting any such other work. If Owner has advance information regarding the start of any utility work at or adjacent to the Site, Owner shall provide such information to Contractor.
- C. Contractor shall afford each other contractor that performs such other work, each utility owner performing other work, and Owner, if Owner is performing other work with Owner's employees, proper and safe access to the Site, and provide a reasonable opportunity for the introduction and storage of materials and equipment and the execution of such other work. Contractor shall do all cutting, fitting, and patching of the Work that may be required to properly connect or otherwise make its several parts come together and properly integrate with such other work. Contractor shall not endanger any work of others by cutting, excavating, or otherwise altering such work; provided,

however, that Contractor may cut or alter others' work with the written consent of Engineer and the others whose work will be affected.

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

8.02 *Coordination*

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

8.03 *Legal Relationships*

- A. If, in the course of performing other work at or adjacent to the Site for Owner, the Owner's employees, any other contractor working for Owner, or any utility owner causes damage to the Work or to the property of Contractor or its Subcontractors, or delays, disrupts, interferes with, or increases the scope or cost of the performance of the Work, through actions or inaction, then Contractor shall be entitled to an equitable adjustment in the Contract Price or the Contract Times, or both. Contractor must submit any Change Proposal seeking an equitable adjustment in the Contract Price or the Contract Times under this paragraph within 30 days of the damaging, delaying, disrupting, or interfering event. The entitlement to, and extent of, any such equitable adjustment shall take into account information (if any) regarding such other work that was provided to Contractor in the Contract Documents prior to the submittal of the Bid or the final negotiation of the terms of the Contract. When applicable, any such equitable adjustment in Contract Price shall be conditioned on Contractor assigning to Owner all Contractor's rights against such other contractor or utility owner with respect to the damage, delay, disruption, or interference that is the subject of the adjustment. Contractor's entitlement to an adjustment of the Contract Times is conditioned on such adjustment being essential to Contractor's ability to complete the Work within the Contract Times.
- B. Contractor shall take reasonable and customary measures to avoid damaging, delaying, disrupting, or interfering with the work of Owner, any other contractor, or any utility owner performing other work at or adjacent to the Site. If Contractor fails to take such measures and as a result damages, delays, disrupts, or interferes with the work of any such other contractor or utility owner, then Owner may impose a set-off against payments due to Contractor, and assign to such other contractor or utility owner the Owner's contractual rights against Contractor with respect to the breach of the obligations set forth in this paragraph.
- C. When Owner is performing other work at or adjacent to the Site with Owner's employees, Contractor shall be liable to Owner for damage to such other work, and for the reasonable direct

delay, disruption, and interference costs incurred by Owner as a result of Contractor's failure to take reasonable and customary measures with respect to Owner's other work. In response to such damage, delay, disruption, or interference, Owner may impose a set-off against payments due to Contractor.

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

ARTICLE 9 – OWNER'S RESPONSIBILITIES

9.01 *Communications to Contractor*

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

9.02 *Replacement of Engineer*

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

9.03 *Furnish Data*

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

9.04 *Pay When Due*

- A. Owner shall make payments to Contractor when they are due as provided in the Agreement.

9.05 *Lands and Easements; Reports, Tests, and Drawings*

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

9.06 *Insurance*

- A. Owner's responsibilities, if any, with respect to purchasing and maintaining liability and property insurance are set forth in Article 6.

9.07 *Change Orders*

- A. Owner's responsibilities with respect to Change Orders are set forth in Article 11.

9.08 *Inspections, Tests, and Approvals*

- A. Owner's responsibility with respect to certain inspections, tests, and approvals is set forth in Paragraph 14.02.B.

9.09 *Limitations on Owner's Responsibilities*

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

9.10 *Undisclosed Hazardous Environmental Condition*

- A. Owner's responsibility in respect to an undisclosed Hazardous Environmental Condition is set forth in Paragraph 5.06.

9.11 *Evidence of Financial Arrangements*

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

9.12 *Safety Programs*

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

ARTICLE 10 – ENGINEER'S STATUS DURING CONSTRUCTION

10.01 *Owner's Representative*

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

10.02 *Visits to Site*

- A. Engineer will make visits to the Site at intervals appropriate to the various stages of construction as Engineer deems necessary in order to observe as an experienced and qualified design professional the progress that has been made and the quality of the various aspects of Contractor's executed Work. Based on information obtained during such visits and observations, Engineer, for the benefit of Owner, will determine, in general, if the Work is proceeding in accordance with the Contract Documents. Engineer will not be required to make exhaustive or continuous inspections on the Site to check the quality or quantity of the Work. Engineer's efforts will be directed toward providing for Owner a greater degree of confidence that the completed Work will conform generally to the Contract Documents. On the basis of such visits and observations, Engineer will keep Owner informed of the progress of the Work and will endeavor to guard Owner against defective Work.
- B. Engineer's visits and observations are subject to all the limitations on Engineer's authority and responsibility set forth in Paragraph 10.08. Particularly, but without limitation, during or as a result of Engineer's visits or observations of Contractor's Work, Engineer will not supervise, direct, control, or have authority over or be responsible for Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto,

or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work.

10.03 *Project Representative*

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

10.04 *Rejecting Defective Work*

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

10.05 *Shop Drawings, Change Orders and Payments*

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

10.06 *Determinations for Unit Price Work*

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

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

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

10.08 *Limitations on Engineer's Authority and Responsibilities*

- A. Neither Engineer's authority or responsibility under this Article 10 or under any other provision of the Contract, nor any decision made by Engineer in good faith either to exercise or not exercise such authority or responsibility or the undertaking, exercise, or performance of any authority or responsibility by Engineer, shall create, impose, or give rise to any duty in contract, tort, or otherwise owed by Engineer to Contractor, any Subcontractor, any Supplier, any other individual or entity, or to any surety for or employee or agent of any of them.
- B. Engineer will not supervise, direct, control, or have authority over or be responsible for Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work. Engineer will not be responsible for Contractor's failure to perform the Work in accordance with the Contract Documents.

- C. Engineer will not be responsible for the acts or omissions of Contractor or of any Subcontractor, any Supplier, or of any other individual or entity performing any of the Work.
- D. Engineer's review of the final Application for Payment and accompanying documentation and all maintenance and operating instructions, schedules, guarantees, bonds, certificates of inspection, tests and approvals, and other documentation required to be delivered by Paragraph 15.06.A will only be to determine generally that their content complies with the requirements of, and in the case of certificates of inspections, tests, and approvals, that the results certified indicate compliance with the Contract Documents.
- E. The limitations upon authority and responsibility set forth in this Paragraph 10.08 shall also apply to the Resident Project Representative, if any.

10.09 *Compliance with Safety Program*

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

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

11.01 *Amending and Supplementing Contract Documents*

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

Owner and also on Contractor, which shall perform the Work involved promptly. If Contractor believes that a Field Order justifies an adjustment in the Contract Price or Contract Times, or both, then before proceeding with the Work at issue, Contractor shall submit a Change Proposal as provided herein.

11.02 *Owner-Authorized Changes in the Work*

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

11.03 *Unauthorized Changes in the Work*

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

11.04 *Change of Contract Price*

- A. The Contract Price may only be changed by a Change Order. Any Change Proposal for an adjustment in the Contract Price shall comply with the provisions of Paragraph 11.06. Any Claim for an adjustment of Contract Price shall comply with the provisions of Article 12.
- B. An adjustment in the Contract Price will be determined as follows:
1. where the Work involved is covered by unit prices contained in the Contract Documents, then by application of such unit prices to the quantities of the items involved (subject to the provisions of Paragraph 13.03); or
 2. where the Work involved is not covered by unit prices contained in the Contract Documents, then by a mutually agreed lump sum (which may include an allowance for overhead and profit not necessarily in accordance with Paragraph 11.04.C.2); or
 3. where the Work involved is not covered by unit prices contained in the Contract Documents and the parties do not reach mutual agreement to a lump sum, then on the basis of the Cost of the Work (determined as provided in Paragraph 13.01) plus a Contractor's fee for overhead and profit (determined as provided in Paragraph 11.04.C).
- C. *Contractor's Fee:* When applicable, the Contractor's fee for overhead and profit shall be determined as follows:
1. a mutually acceptable fixed fee; or
 2. if a fixed fee is not agreed upon, then a fee based on the following percentages of the various portions of the Cost of the Work:
 - a. for costs incurred under Paragraphs 13.01.B.1 and 13.01.B.2, the Contractor's fee shall be 15 percent;

- b. for costs incurred under Paragraph 13.01.B.3, the Contractor's fee shall be five percent;
- c. where one or more tiers of subcontracts are on the basis of Cost of the Work plus a fee and no fixed fee is agreed upon, the intent of Paragraphs 11.01.C.2.a and 11.01.C.2.b is that the Contractor's fee shall be based on: (1) a fee of 15 percent of the costs incurred under Paragraphs 13.01.A.1 and 13.01.A.2 by the Subcontractor that actually performs the Work, at whatever tier, and (2) with respect to Contractor itself and to any Subcontractors of a tier higher than that of the Subcontractor that actually performs the Work, a fee of five percent of the amount (fee plus underlying costs incurred) attributable to the next lower tier Subcontractor; provided, however, that for any such subcontracted work the maximum total fee to be paid by Owner shall be no greater than 27 percent of the costs incurred by the Subcontractor that actually performs the work;
- d. no fee shall be payable on the basis of costs itemized under Paragraphs 13.01.B.4, 13.01.B.5, and 13.01.C;
- e. the amount of credit to be allowed by Contractor to Owner for any change which results in a net decrease in cost will be the amount of the actual net decrease in cost plus a deduction in Contractor's fee by an amount equal to five percent of such net decrease; and
- f. when both additions and credits are involved in any one change, the adjustment in Contractor's fee shall be computed on the basis of the net change in accordance with Paragraphs 11.04.C.2.a through 11.04.C.2.e, inclusive.

11.05 *Change of Contract Times*

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

11.06 *Change Proposals*

- A. Contractor shall submit a Change Proposal to Engineer to request an adjustment in the Contract Times or Contract Price; appeal an initial decision by Engineer concerning the requirements of the Contract Documents or relating to the acceptability of the Work under the Contract Documents; contest a set-off against payment due; or seek other relief under the Contract. The Change Proposal shall specify any proposed change in Contract Times or Contract Price, or both, or other proposed relief, and explain the reason for the proposed change, with citations to any governing or applicable provisions of the Contract Documents.
 - 1. *Procedures:* Contractor shall submit each Change Proposal to Engineer promptly (but in no event later than 30 days) after the start of the event giving rise thereto, or after such initial decision. The Contractor shall submit supporting data, including the proposed change in Contract Price or Contract Time (if any), to the Engineer and Owner within 15 days after the submittal of the Change Proposal. The supporting data shall be accompanied by a written statement that the supporting data are accurate and complete, and that any requested time or price adjustment is the entire adjustment to which Contractor believes it is entitled as a result of said event. Engineer will advise Owner regarding the Change Proposal, and consider any comments or response from Owner regarding the Change Proposal.
 - 2. *Engineer's Action:* Engineer will review each Change Proposal and, within 30 days after receipt of the Contractor's supporting data, either deny the Change Proposal in whole, approve

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

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

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

11.07 *Execution of Change Orders*

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

11.08 *Notification to Surety*

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

ARTICLE 12 – CLAIMS

12.01 *Claims*

- A. *Claims Process:* The following disputes between Owner and Contractor shall be submitted to the Claims process set forth in this Article:
 1. Appeals by Owner or Contractor of Engineer's decisions regarding Change Proposals;

2. Owner demands for adjustments in the Contract Price or Contract Times, or other relief under the Contract Documents; and
 3. Disputes that Engineer has been unable to address because they do not involve the design (as set forth in the Drawings, Specifications, or otherwise), the acceptability of the Work, or other engineering or technical matters.
- B. *Submittal of Claim:* The party submitting a Claim shall deliver it directly to the other party to the Contract promptly (but in no event later than 30 days) after the start of the event giving rise thereto; in the case of appeals regarding Change Proposals within 30 days of the decision under appeal. The party submitting the Claim shall also furnish a copy to the Engineer, for its information only. The responsibility to substantiate a Claim shall rest with the party making the Claim. In the case of a Claim by Contractor seeking an increase in the Contract Times or Contract Price, or both, Contractor shall certify that the Claim is made in good faith, that the supporting data are accurate and complete, and that to the best of Contractor's knowledge and belief the amount of time or money requested accurately reflects the full amount to which Contractor is entitled.
- C. *Review and Resolution:* The party receiving a Claim shall review it thoroughly, giving full consideration to its merits. The two parties shall seek to resolve the Claim through the exchange of information and direct negotiations. The parties may extend the time for resolving the Claim by mutual agreement. All actions taken on a Claim shall be stated in writing and submitted to the other party, with a copy to Engineer.
- D. *Mediation:*
1. At any time after initiation of a Claim, Owner and Contractor may mutually agree to mediation of the underlying dispute. The agreement to mediate shall stay the Claim submittal and response process.
 2. If Owner and Contractor agree to mediation, then after 60 days from such agreement, either Owner or Contractor may unilaterally terminate the mediation process, and the Claim submittal and decision process shall resume as of the date of the termination. If the mediation proceeds but is unsuccessful in resolving the dispute, the Claim submittal and decision process shall resume as of the date of the conclusion of the mediation, as determined by the mediator.
 3. Owner and Contractor shall each pay one-half of the mediator's fees and costs.
- E. *Partial Approval:* If the party receiving a Claim approves the Claim in part and denies it in part, such action shall be final and binding unless within 30 days of such action the other party invokes the procedure set forth in Article 17 for final resolution of disputes.
- F. *Denial of Claim:* If efforts to resolve a Claim are not successful, the party receiving the Claim may deny it by giving written notice of denial to the other party. If the receiving party does not take action on the Claim within 90 days, then either Owner or Contractor may at any time thereafter submit a letter to the other party indicating that as a result of the inaction, the Claim is deemed denied, thereby commencing the time for appeal of the denial. A denial of the Claim shall be final and binding unless within 30 days of the denial the other party invokes the procedure set forth in Article 17 for the final resolution of disputes.
- G. *Final and Binding Results:* If the parties reach a mutual agreement regarding a Claim, whether through approval of the Claim, direct negotiations, mediation, or otherwise; or if a Claim is approved in part and denied in part, or denied in full, and such actions become final and binding; then the results of the agreement or action on the Claim shall be incorporated in a Change Order to the extent they affect the Contract, including the Work, the Contract Times, or the Contract Price.

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

13.01 *Cost of the Work*

- A. *Purposes for Determination of Cost of the Work:* The term Cost of the Work means the sum of all costs necessary for the proper performance of the Work at issue, as further defined below. The provisions of this Paragraph 13.01 are used for two distinct purposes:
1. To determine Cost of the Work when Cost of the Work is a component of the Contract Price, under cost-plus-fee, time-and-materials, or other cost-based terms; or
 2. To determine the value of a Change Order, Change Proposal, Claim, set-off, or other adjustment in Contract Price. When the value of any such adjustment is determined on the basis of Cost of the Work, Contractor is entitled only to those additional or incremental costs required because of the change in the Work or because of the event giving rise to the adjustment.
- B. *Costs Included:* Except as otherwise may be agreed to in writing by Owner, costs included in the Cost of the Work shall be in amounts no higher than those prevailing in the locality of the Project, shall not include any of the costs itemized in Paragraph 13.01.C, and shall include only the following items:
1. Payroll costs for employees in the direct employ of Contractor in the performance of the Work under schedules of job classifications agreed upon by Owner and Contractor. Such employees shall include, without limitation, superintendents, foremen, and other personnel employed full time on the Work. Payroll costs for employees not employed full time on the Work shall be apportioned on the basis of their time spent on the Work. Payroll costs shall include, but not be limited to, salaries and wages plus the cost of fringe benefits, which shall include social security contributions, unemployment, excise, and payroll taxes, workers' compensation, health and retirement benefits, bonuses, sick leave, and vacation and holiday pay applicable thereto. The expenses of performing Work outside of regular working hours, on Saturday, Sunday, or legal holidays, shall be included in the above to the extent authorized by Owner.
 2. Cost of all materials and equipment furnished and incorporated in the Work, including costs of transportation and storage thereof, and Suppliers' field services required in connection therewith. All cash discounts shall accrue to Contractor unless Owner deposits funds with Contractor with which to make payments, in which case the cash discounts shall accrue to Owner. All trade discounts, rebates, and refunds and returns from sale of surplus materials and equipment shall accrue to Owner, and Contractor shall make provisions so that they may be obtained.
 3. Payments made by Contractor to Subcontractors for Work performed by Subcontractors. If required by Owner, Contractor shall obtain competitive bids from subcontractors acceptable to Owner and Contractor and shall deliver such bids to Owner, who will then determine, with the advice of Engineer, which bids, if any, will be acceptable. If any subcontract provides that the Subcontractor is to be paid on the basis of Cost of the Work plus a fee, the Subcontractor's Cost of the Work and fee shall be determined in the same manner as Contractor's Cost of the Work and fee as provided in this Paragraph 13.01.
 4. Costs of special consultants (including but not limited to engineers, architects, testing laboratories, surveyors, attorneys, and accountants) employed for services specifically related to the Work.

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

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

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

3. Any part of Contractor's capital expenses, including interest on Contractor's capital employed for the Work and charges against Contractor for delinquent payments.
 4. Costs due to the negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, including but not limited to, the correction of defective Work, disposal of materials or equipment wrongly supplied, and making good any damage to property.
 5. Other overhead or general expense costs of any kind and the costs of any item not specifically and expressly included in Paragraph 13.01.B.
- D. *Contractor's Fee*: When the Work as a whole is performed on the basis of cost-plus, Contractor's fee shall be determined as set forth in the Agreement. When the value of any Work covered by a Change Order, Change Proposal, Claim, set-off, or other adjustment in Contract Price is determined on the basis of Cost of the Work, Contractor's fee shall be determined as set forth in Paragraph 11.04.C.
- E. *Documentation*: Whenever the Cost of the Work for any purpose is to be determined pursuant to this Article 13, Contractor will establish and maintain records thereof in accordance with generally accepted accounting practices and submit in a form acceptable to Engineer an itemized cost breakdown together with supporting data.

13.02 Allowances

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

13.03 Unit Price Work

- A. Where the Contract Documents provide that all or part of the Work is to be Unit Price Work, initially the Contract Price will be deemed to include for all Unit Price Work an amount equal to the sum of the unit price for each separately identified item of Unit Price Work times the estimated quantity of each item as indicated in the Agreement.
- B. The estimated quantities of items of Unit Price Work are not guaranteed and are solely for the purpose of comparison of Bids and determining an initial Contract Price. Payments to Contractor for Unit Price Work will be based on actual quantities.

- C. Each unit price will be deemed to include an amount considered by Contractor to be adequate to cover Contractor's overhead and profit for each separately identified item.
- D. Engineer will determine the actual quantities and classifications of Unit Price Work performed by Contractor. Engineer will review with Contractor the Engineer's preliminary determinations on such matters before rendering a written decision thereon (by recommendation of an Application for Payment or otherwise). Engineer's written decision thereon will be final and binding (except as modified by Engineer to reflect changed factual conditions or more accurate data) upon Owner and Contractor, subject to the provisions of the following paragraph.
- E. Within 30 days of Engineer's written decision under the preceding paragraph, Contractor may submit a Change Proposal, or Owner may file a Claim, seeking an adjustment in the Contract Price if:
 - 1. the quantity of any item of Unit Price Work performed by Contractor differs materially and significantly from the estimated quantity of such item indicated in the Agreement;
 - 2. there is no corresponding adjustment with respect to any other item of Work; and
 - 3. Contractor believes that it is entitled to an increase in Contract Price as a result of having incurred additional expense or Owner believes that Owner is entitled to a decrease in Contract Price, and the parties are unable to agree as to the amount of any such increase or decrease.

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

14.01 *Access to Work*

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

14.02 *Tests, Inspections, and Approvals*

- A. Contractor shall give Engineer timely notice of readiness of the Work (or specific parts thereof) for all required inspections and tests, and shall cooperate with inspection and testing personnel to facilitate required inspections and tests.
- B. Owner shall retain and pay for the services of an independent inspector, testing laboratory, or other qualified individual or entity to perform all inspections and tests expressly required by the Contract Documents to be furnished and paid for by Owner, except that costs incurred in connection with tests or inspections of covered Work shall be governed by the provisions of Paragraph 14.05.
- C. If Laws or Regulations of any public body having jurisdiction require any Work (or part thereof) specifically to be inspected, tested, or approved by an employee or other representative of such public body, Contractor shall assume full responsibility for arranging and obtaining such inspections, tests, or approvals, pay all costs in connection therewith, and furnish Engineer the required certificates of inspection or approval.
- D. Contractor shall be responsible for arranging, obtaining, and paying for all inspections and tests required:
 - 1. by the Contract Documents, unless the Contract Documents expressly allocate responsibility for a specific inspection or test to Owner;

2. to attain Owner's and Engineer's acceptance of materials or equipment to be incorporated in the Work;
3. by manufacturers of equipment furnished under the Contract Documents;
4. for testing, adjusting, and balancing of mechanical, electrical, and other equipment to be incorporated into the Work; and
5. for acceptance of materials, mix designs, or equipment submitted for approval prior to Contractor's purchase thereof for incorporation in the Work.

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

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

14.03 *Defective Work*

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

14.04 *Acceptance of Defective Work*

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

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

14.05 *Uncovering Work*

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

14.06 *Owner May Stop the Work*

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

14.07 *Owner May Correct Defective Work*

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

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

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

15.01 *Progress Payments*

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

C. *Review of Applications:*

1. Engineer will, within 10 days after receipt of each Application for Payment, including each resubmittal, either indicate in writing a recommendation of payment and present the Application to Owner, or return the Application to Contractor indicating in writing Engineer's reasons for refusing to recommend payment. In the latter case, Contractor may make the necessary corrections and resubmit the Application.
2. Engineer's recommendation of any payment requested in an Application for Payment will constitute a representation by Engineer to Owner, based on Engineer's observations of the executed Work as an experienced and qualified design professional, and on Engineer's review of the Application for Payment and the accompanying data and schedules, that to the best of Engineer's knowledge, information and belief:
 - a. the Work has progressed to the point indicated;
 - b. the quality of the Work is generally in accordance with the Contract Documents (subject to an evaluation of the Work as a functioning whole prior to or upon Substantial Completion, the results of any subsequent tests called for in the Contract Documents, a final determination of quantities and classifications for Unit Price Work under Paragraph 13.03, and any other qualifications stated in the recommendation); and
 - c. the conditions precedent to Contractor's being entitled to such payment appear to have been fulfilled in so far as it is Engineer's responsibility to observe the Work.
3. By recommending any such payment Engineer will not thereby be deemed to have represented that:
 - a. inspections made to check the quality or the quantity of the Work as it has been performed have been exhaustive, extended to every aspect of the Work in progress, or involved detailed inspections of the Work beyond the responsibilities specifically assigned to Engineer in the Contract; or
 - b. there may not be other matters or issues between the parties that might entitle Contractor to be paid additionally by Owner or entitle Owner to withhold payment to Contractor.
4. Neither Engineer's review of Contractor's Work for the purposes of recommending payments nor Engineer's recommendation of any payment, including final payment, will impose responsibility on Engineer:
 - a. to supervise, direct, or control the Work, or
 - b. for the means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or
 - c. for Contractor's failure to comply with Laws and Regulations applicable to Contractor's performance of the Work, or
 - d. to make any examination to ascertain how or for what purposes Contractor has used the money paid on account of the Contract Price, or
 - e. to determine that title to any of the Work, materials, or equipment has passed to Owner free and clear of any Liens.
5. Engineer may refuse to recommend the whole or any part of any payment if, in Engineer's opinion, it would be incorrect to make the representations to Owner stated in Paragraph 15.01.C.2.

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

D. *Payment Becomes Due:*

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

E. *Reductions in Payment by Owner:*

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

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

15.02 *Contractor's Warranty of Title*

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

15.03 *Substantial Completion*

- A. When Contractor considers the entire Work ready for its intended use Contractor shall notify Owner and Engineer in writing that the entire Work is substantially complete and request that Engineer issue a certificate of Substantial Completion. Contractor shall at the same time submit to Owner and Engineer an initial draft of punch list items to be completed or corrected before final payment.
- B. Promptly after Contractor's notification, Owner, Contractor, and Engineer shall make an inspection of the Work to determine the status of completion. If Engineer does not consider the Work substantially complete, Engineer will notify Contractor in writing giving the reasons therefor.
- C. If Engineer considers the Work substantially complete, Engineer will deliver to Owner a preliminary certificate of Substantial Completion which shall fix the date of Substantial Completion. Engineer shall attach to the certificate a punch list of items to be completed or corrected before final payment. Owner shall have seven days after receipt of the preliminary certificate during which to make written objection to Engineer as to any provisions of the certificate or attached punch list. If, after considering the objections to the provisions of the preliminary certificate, Engineer concludes that the Work is not substantially complete, Engineer will, within 14 days after submission of the preliminary certificate to Owner, notify Contractor in writing that the Work is not substantially complete, stating the reasons therefor. If Owner does not object to the provisions of the certificate, or if despite consideration of Owner's objections Engineer concludes that the Work is substantially complete, then Engineer will, within said 14 days, execute and deliver to Owner and Contractor a final certificate of Substantial Completion (with a revised punch list of items to be completed or corrected) reflecting such changes from the preliminary certificate as Engineer believes justified after consideration of any objections from Owner.
- D. At the time of receipt of the preliminary certificate of Substantial Completion, Owner and Contractor will confer regarding Owner's use or occupancy of the Work following Substantial

Completion, review the builder's risk insurance policy with respect to the end of the builder's risk coverage, and confirm the transition to coverage of the Work under a permanent property insurance policy held by Owner. Unless Owner and Contractor agree otherwise in writing, Owner shall bear responsibility for security, operation, protection of the Work, property insurance, maintenance, heat, and utilities upon Owner's use or occupancy of the Work.

- E. After Substantial Completion the Contractor shall promptly begin work on the punch list of items to be completed or corrected prior to final payment. In appropriate cases Contractor may submit monthly Applications for Payment for completed punch list items, following the progress payment procedures set forth above.
- F. Owner shall have the right to exclude Contractor from the Site after the date of Substantial Completion subject to allowing Contractor reasonable access to remove its property and complete or correct items on the punch list.

15.04 *Partial Use or Occupancy*

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

15.05 *Final Inspection*

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

15.06 *Final Payment*

- A. *Application for Payment:*
 - 1. After Contractor has, in the opinion of Engineer, satisfactorily completed all corrections identified during the final inspection and has delivered, in accordance with the Contract

Documents, all maintenance and operating instructions, schedules, guarantees, bonds, certificates or other evidence of insurance, certificates of inspection, annotated record documents (as provided in Paragraph 7.11), and other documents, Contractor may make application for final payment.

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

B. Engineer's Review of Application and Acceptance:

1. If, on the basis of Engineer's observation of the Work during construction and final inspection, and Engineer's review of the final Application for Payment and accompanying documentation as required by the Contract Documents, Engineer is satisfied that the Work has been completed and Contractor's other obligations under the Contract have been fulfilled, Engineer will, within ten days after receipt of the final Application for Payment, indicate in writing Engineer's recommendation of final payment and present the Application for Payment to Owner for payment. Such recommendation shall account for any set-offs against payment that are necessary in Engineer's opinion to protect Owner from loss for the reasons stated above with respect to progress payments. At the same time Engineer will also give written notice to Owner and Contractor that the Work is acceptable, subject to the provisions of Paragraph 15.07. Otherwise, Engineer will return the Application for Payment to Contractor, indicating in writing the reasons for refusing to recommend final payment, in which case Contractor shall make the necessary corrections and resubmit the Application for Payment.

C. Completion of Work: The Work is complete (subject to surviving obligations) when it is ready for final payment as established by the Engineer's written recommendation of final payment.

D. Payment Becomes Due: Thirty days after the presentation to Owner of the final Application for Payment and accompanying documentation, the amount recommended by Engineer (less any further sum Owner is entitled to set off against Engineer's recommendation, including but not limited to set-offs for liquidated damages and set-offs allowed under the provisions above with respect to progress payments) will become due and shall be paid by Owner to Contractor.

15.07 *Waiver of Claims*

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

15.08 *Correction Period*

- A. If within one year after the date of Substantial Completion (or such longer period of time as may be prescribed by the terms of any applicable special guarantee required by the Contract Documents, or by any specific provision of the Contract Documents), any Work is found to be defective, or if the repair of any damages to the Site, adjacent areas that Contractor has arranged to use through construction easements or otherwise, and other adjacent areas used by Contractor as permitted by Laws and Regulations, is found to be defective, then Contractor shall promptly, without cost to Owner and in accordance with Owner's written instructions:
 - 1. correct the defective repairs to the Site or such other adjacent areas;
 - 2. correct such defective Work;
 - 3. if the defective Work has been rejected by Owner, remove it from the Project and replace it with Work that is not defective, and
 - 4. satisfactorily correct or repair or remove and replace any damage to other Work, to the work of others, or to other land or areas resulting therefrom.
- B. If Contractor does not promptly comply with the terms of Owner's written instructions, or in an emergency where delay would cause serious risk of loss or damage, Owner may have the defective Work corrected or repaired or may have the rejected Work removed and replaced. Contractor shall pay all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such correction or repair or such removal and replacement (including but not limited to all costs of repair or replacement of work of others).
- C. In special circumstances where a particular item of equipment is placed in continuous service before Substantial Completion of all the Work, the correction period for that item may start to run from an earlier date if so provided in the Specifications.
- D. Where defective Work (and damage to other Work resulting therefrom) has been corrected or removed and replaced under this paragraph, the correction period hereunder with respect to such Work will be extended for an additional period of one year after such correction or removal and replacement has been satisfactorily completed.
- E. Contractor's obligations under this paragraph are in addition to all other obligations and warranties. The provisions of this paragraph shall not be construed as a substitute for, or a waiver of, the provisions of any applicable statute of limitation or repose.

ARTICLE 16 – SUSPENSION OF WORK AND TERMINATION

16.01 *Owner May Suspend Work*

- A. At any time and without cause, Owner may suspend the Work or any portion thereof for a period of not more than 90 consecutive days by written notice to Contractor and Engineer. Such notice will fix the date on which Work will be resumed. Contractor shall resume the Work on the date so fixed. Contractor shall be entitled to an adjustment in the Contract Price or an extension of the Contract Times, or both, directly attributable to any such suspension. Any Change Proposal seeking such adjustments shall be submitted no later than 30 days after the date fixed for resumption of Work.

16.02 *Owner May Terminate for Cause*

- A. The occurrence of any one or more of the following events will constitute a default by Contractor and justify termination for cause:
 - 1. Contractor's persistent failure to perform the Work in accordance with the Contract Documents (including, but not limited to, failure to supply sufficient skilled workers or suitable materials or equipment or failure to adhere to the Progress Schedule);
 - 2. Failure of Contractor to perform or otherwise to comply with a material term of the Contract Documents;
 - 3. Contractor's disregard of Laws or Regulations of any public body having jurisdiction; or
 - 4. Contractor's repeated disregard of the authority of Owner or Engineer.
- B. If one or more of the events identified in Paragraph 16.02.A occurs, then after giving Contractor (and any surety) ten days written notice that Owner is considering a declaration that Contractor is in default and termination of the contract, Owner may proceed to:
 - 1. declare Contractor to be in default, and give Contractor (and any surety) notice that the Contract is terminated; and
 - 2. enforce the rights available to Owner under any applicable performance bond.
- C. Subject to the terms and operation of any applicable performance bond, if Owner has terminated the Contract for cause, Owner may exclude Contractor from the Site, take possession of the Work, incorporate in the Work all materials and equipment stored at the Site or for which Owner has paid Contractor but which are stored elsewhere, and complete the Work as Owner may deem expedient.
- D. Owner may not proceed with termination of the Contract under Paragraph 16.02.B if Contractor within seven days of receipt of notice of intent to terminate begins to correct its failure to perform and proceeds diligently to cure such failure.
- E. If Owner proceeds as provided in Paragraph 16.02.B, Contractor shall not be entitled to receive any further payment until the Work is completed. If the unpaid balance of the Contract Price exceeds the cost to complete the Work, including all related claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals) sustained by Owner, such excess will be paid to Contractor. If the cost to complete the Work including such related claims, costs, losses, and damages exceeds such unpaid balance, Contractor shall pay the difference to Owner. Such claims, costs, losses, and damages incurred by Owner will be reviewed by Engineer as to their reasonableness and, when so approved by Engineer, incorporated in a Change Order. When exercising any rights or remedies under this paragraph, Owner shall not be required to obtain the lowest price for the Work performed.

- F. Where Contractor's services have been so terminated by Owner, the termination will not affect any rights or remedies of Owner against Contractor then existing or which may thereafter accrue, or any rights or remedies of Owner against Contractor or any surety under any payment bond or performance bond. Any retention or payment of money due Contractor by Owner will not release Contractor from liability.
- G. If and to the extent that Contractor has provided a performance bond under the provisions of Paragraph 6.01.A, the provisions of that bond shall govern over any inconsistent provisions of Paragraphs 16.02.B and 16.02.D.

16.03 *Owner May Terminate For Convenience*

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

16.04 *Contractor May Stop Work or Terminate*

- A. If, through no act or fault of Contractor, (1) the Work is suspended for more than 90 consecutive days by Owner or under an order of court or other public authority, or (2) Engineer fails to act on any Application for Payment within 30 days after it is submitted, or (3) Owner fails for 30 days to pay Contractor any sum finally determined to be due, then Contractor may, upon seven days written notice to Owner and Engineer, and provided Owner or Engineer do not remedy such suspension or failure within that time, terminate the contract and recover from Owner payment on the same terms as provided in Paragraph 16.03.
- B. In lieu of terminating the Contract and without prejudice to any other right or remedy, if Engineer has failed to act on an Application for Payment within 30 days after it is submitted, or Owner has failed for 30 days to pay Contractor any sum finally determined to be due, Contractor may, seven days after written notice to Owner and Engineer, stop the Work until payment is made of all such amounts due Contractor, including interest thereon. The provisions of this paragraph are not intended to preclude Contractor from submitting a Change Proposal for an adjustment in Contract Price or Contract Times or otherwise for expenses or damage directly attributable to Contractor's stopping the Work as permitted by this paragraph.

ARTICLE 17 – FINAL RESOLUTION OF DISPUTES

17.01 *Methods and Procedures*

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

ARTICLE 18 – MISCELLANEOUS

18.01 *Giving Notice*

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

18.02 *Computation of Times*

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

18.03 *Cumulative Remedies*

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

18.04 *Limitation of Damages*

- A. With respect to any and all Change Proposals, Claims, disputes subject to final resolution, and other matters at issue, neither Owner nor Engineer, nor any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors, shall be liable to Contractor for any

claims, costs, losses, or damages sustained by Contractor on or in connection with any other project or anticipated project.

18.05 *No Waiver*

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

18.06 *Survival of Obligations*

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

18.07 *Controlling Law*

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

18.08 *Headings*

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

SECTION 00800 - SUPPLEMENTARY CONDITIONS

ARTICLE 1 – DEFINITIONS AND TERMINOLOGY

SC-1.01 *Defined Terms*

- SC-1.01. Add to the list of definitions in Paragraph 1.01.A by inserting the following as numbered items in their proper alphabetical positions:

Compensable Delay - Any delay beyond the control and without the fault or negligence of the CONTRACTOR resulting from OWNER-caused changes in the Work, differing site conditions, suspensions of the Work, or termination for convenience by the OWNER.

Excusable Delay - Any delay beyond the control and without the fault or negligence of the CONTRACTOR, the OWNER, or any other contractor caused by events or circumstances such as, but not limited to, acts of God or of the public enemy, acts of interveners, acts of the government, fires, floods, epidemics, quarantine restrictions, freight embargoes, and hurricanes, tornadoes, or new sink holes. Labor disputes and above average rainfall shall give rise only to Inexcusable Delays.

Float or Slack Time - The time available in the progress schedule during which an unexpected activity can be completed without delaying the Substantial Completion of the Work.

Geotechnical Baseline Report (GBR) — The interpretive report prepared by or for Owner regarding subsurface conditions at the Site, and containing specific baseline geotechnical conditions that may be anticipated or relied upon for bidding and contract administration purposes, subject to the controlling provisions of the Contract, including the GBR's own terms. The GBR is a Contract Document.

Geotechnical Data Report (GDR) — The factual report that collects and presents data regarding actual subsurface conditions at or adjacent to the Site, including Technical Data and other geotechnical data, prepared by or for Owner in support of the Geotechnical Baseline Report. The GDR's content may include logs of borings, trenches, and other site investigations, recorded measurements of subsurface water levels, the results of field and laboratory testing, and descriptions of the investigative and testing programs. The GDR does not include an interpretation of the data. If opinions, or interpretive or speculative non-factual comments or statements appear in a document that is labeled a GDR, such opinions, comments, or statements are not operative parts of the GDR and do not have contractual standing. Subject to that exception, the GDR is a Contract Document.

Inexcusable Delay - Any delay caused either (i) by events or circumstances within the control of the CONTRACTOR, such as inadequate crewing, slow submittals, etc., which might have been avoided by the exercise of care, prudence, foresight, or diligence on the part of the CONTRACTOR, (ii) by weather conditions (other than hurricanes and tornadoes) or (iii) labor disputes.

Nonprejudicial Delay - Any delay impacting a portion of the Work within the available total Float or Slack Time, as that term is used in Section 01310: Progress Schedules and not necessarily preventing completion of the Work within the Contract Time.

Prejudicial Delay - Any Excusable or Compensable Delay impacting the Work and exceeding the total Float Time available in the progress schedule, thus preventing completion of the Work within the Contract Time unless the Work is accelerated.

ARTICLE 2 – PRELIMINARY MATTERS

SC-2.05 Initial Acceptance of Schedules

SC-2.05 Add the following new paragraph 2.05.A.2

2.05.A.2 CONTRACTOR'S schedule of shop drawings and sample submittals will be acceptable to ENGINEER only if it provides a minimum of thirty (30) days for reviewing and processing the submittals. Shop Drawings requiring resubmission and review shall not rise to an excusable delay.

ARTICLE 3 – DOCUMENTS: INTENTS, REQUIREMENTS, REUSE

SC-3.03 Reporting and Resolving Discrepancies

SC-3.03 Delete paragraph 3.03 A.3 of the General Conditions in its entirety and replace with the following:

3.03 A.3 Measurements

1. When measurements are affected by conditions already established or where items have to be fitted into construction conditions, it shall be the CONTRACTOR's responsibility to verify all such dimensions at the site and the actual job dimensions shall take precedence over scale and figure dimensions on the Drawings.

2. The CONTRACTOR shall carefully study and compare all Drawings, Specifications and other instructions; shall test all figures on the Drawings before laying out the Work; shall notify the ENGINEER of all errors, inconsistencies, or omissions which he may discover; and obtain specific instructions before proceeding with the Work. The CONTRACTOR shall not take advantage of any apparent error or omissions which may be found in the Contract Documents, and the ENGINEER shall be entitled to make such corrections therein and interpretations thereof as may be deemed necessary for the fulfillment of their intent. The CONTRACTOR shall be responsible for all errors in construction which could have been avoided by such examination and notification and shall correct, at CONTRACTORS own expense, all Work improperly constructed through failure to notify the ENGINEER and request specific instructions.

ARTICLE 4 - COMMENCEMENT AND PROGRESS OF THE WORK

SC-4.01 Commencement of Contract times; Notice to Proceed

SC-4.01 A. Delete Paragraph 4.01 in its entirety and replace it with:

4.01 The Contract Time will commence to run on the day indicated in the Notice to Proceed. The Notice to Proceed may be given at any time after the Effective Date of the Agreement.

SC-4.05 Delays in Contractor's Progress

SC-4.01 A. Delete the words, "and Contract Price" at the end of the first sentence.

ARTICLE 6 – BONDS AND INSURANCE

SC-6.02 Insurance—General Provisions

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

1. Contractor may obtain worker's compensation insurance from an insurance company that has not been rated by A.M. Best, provided that such company (a) is domiciled in the state in which the project is located, (b) is certified or authorized as a worker's compensation insurance provider by the appropriate state agency, and (c) has been accepted to provide worker's compensation insurance for similar projects by the state within the last 12 months.

SC-6.03 Contractor's Liability Insurance

SC 6.03 Add the following new paragraph immediately after Paragraph 6.03.J:

- K. The limits of liability for the insurance required by Paragraph 6.03 of the General Conditions shall provide coverage for not less than the following amounts or greater where required by Laws and Regulations:

1. Workers' Compensation, and related coverages under Paragraphs 6.03.A.1 and A.2 of the General Conditions:

State:	<u>Statutory</u>
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Federal, if applicable (e.g., Longshoreman's):	<u>Statutory</u>
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Jones Act coverage, if applicable:

Bodily injury by accident, each accident	\$ <u>1,000,000</u>
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Bodily injury by disease, aggregate	\$ <u>1,000,000</u>
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Employer's Liability:

Bodily injury, each accident	\$ <u>3,000,000</u>
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Bodily injury by disease, each employee	\$ <u>3,000,000</u>
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Bodily injury/disease aggregate	\$ <u>3,000,000</u>
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For work performed in monopolistic states, stop-gap liability coverage shall be endorsed to either the worker's compensation or commercial general liability policy with a minimum limit of:

\$ <u>1,000,000</u>

Foreign voluntary worker compensation

<u>Statutory</u>

2. Contractor's Commercial General Liability under Paragraphs 6.03.B and 6.03.C of the General Conditions:

General Aggregate	\$ <u>2,000,000</u>
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Products - Completed Operations Aggregate \$ 2,000,000

Personal and Advertising Injury \$ 1,000,000

Each Occurrence (Bodily Injury and Property
Damage) \$ 1,000,000

3. Automobile Liability under Paragraph 6.03.D. of the General Conditions:

Bodily Injury:

Each person \$ 1,000,000

Each accident \$ 1,000,000

Property Damage:

Each accident \$ 1,000,000

[OR]

Combined Single Limit of \$ 2,000,000

4. Excess or Umbrella Liability:

Per Occurrence \$ 3,000,000

General Aggregate \$ 3,000,000

5. Contractor's Pollution Liability:

Each Occurrence \$ 1,000,000

General Aggregate \$ 2,000,000

6. Additional Insureds: Include as additional insureds the following:

- a. City of Flint, MI, and including all elected and appointed officials, all employees and volunteers, all boards, commissions, and/or authorities and their board members, employees, and volunteers.

- b. Tetra Tech, Inc.

SC-

SC-6.05 Property Insurance

SC-6.05. Delete sections 6.05, 6.06 and 6.07 entirely. Builder's Risk Insurance is not required.

ARTICLE 7 – CONTRACTOR’S RESPONSIBILITIES

SC-7.01 Supervision and Superintendence

SC-7.02.B. Add the following to the end of Paragraph 7.02.B, “Resident Superintendent shall be fluent in English.”

SC-7.04 “Or Equals”

SC-7.04.A. Delete the first paragraph in 7.04.A of the General Conditions in its entirety and insert the following in its place:

7.04.A ENGINEER and OWNER have no obligation to consider "or equal" items or substitutions unless such items are specifically identified in Section 00435-Subcontractor and Product List by CONTRACTOR at the time of bid. All "or equal" items and substitute items must be identified at the time of bid. It is the OWNER's sole prerogative to have ENGINEER review proposals, other than those identified in Section 00435, proposed by CONTRACTOR during the course of the Work. Whenever an item of material or equipment is specified or described in the Contract Documents by using the name of a proprietary item or the name of a particular Supplier, the specification or description is intended to establish the type, function and quality required. Unless the specification or description contains or is followed by words "or equal" or "or approved equal" no substitution is permitted. Other items of material or equipment of other Suppliers will be reviewed by ENGINEER, with OWNER's approval, if the material or equipment is not named in Section 00435.

SC-7.06 Concerning Subcontractors, Suppliers and Others

SC-7.06.D. In the last sentence of the paragraph replace “five days” with “ten days.”

SC-7.08 Permits

SC-7.08.A. Replace entire section with:

Contractor will apply and obtain all needed construction permits. Owner will pay for trade permits and environmental permits. Contractor will be responsible for permit fees outside the City of Flint such as soil erosion control permits.

SC-7.20 Reimbursing Owner’s Costs

SC-7.20. Add the following after paragraph 7.19:

7.20 Additional Costs: Contractor shall reimburse Owner for services rendered by the Engineer when made necessary by any of the following:

7.20.1. Work damaged by fire, flood, collapse, or any other cause during construction.

7.20.2. Default by Contractor or any Subcontractor.

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

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

SC-11.02 B & C Add the following new paragraphs B and C after 11.01.A

SC-11.01.B At anytime, ENGINEER may request a quotation from CONTRACTOR for a proposed change in the Work. Within seven (7) calendar days after receipt of a request for a quotation for a proposed change, the CONTRACTOR shall submit a written and detailed proposal for an increase or decrease in the Contract Price or Contract Time for the proposed change. ENGINEER shall have twenty-one (21) calendar days after receipt of the detailed proposal to respond in writing. The proposal shall include an itemized estimate of all costs and time for performance that will result directly or indirectly from the proposed change. Unless otherwise directed, itemized estimates shall be in accordance with Articles 11 and 12 of the General Conditions and in sufficient detail to permit an analysis by ENGINEER of all material, labor, equipment, subcontract, and overhead costs and fees and shall cover all Work involved in the change, whether such Work was deleted, added, changed, or impacted. Any amount claimed for subcontracts shall be similarly supported. Itemized schedule adjustments shall be in sufficient detail to permit an analysis of impact as required in Section 01310: Progress Schedules. Notwithstanding the request for quotation, the CONTRACTOR shall carry on the Work and maintain the progress schedule.

SC- 11.02.C The adjustment in Contract Price and/or Contract Time stated in a Change Order shall comprise the total price and/or time adjustment due or owed the CONTRACTOR for the Work or changes defined in the Change Order. By executing the Change Order, the CONTRACTOR acknowledges and agrees that the stipulated price and/or time adjustments include the costs and delays for all Work contained in the Change Order, including costs and delays associated with the interruption of schedules, extended overheads, delay, acceleration and cumulative impacts or ripple effect on all other non-affected Work under this contract. Signing of the Change Order constitutes full and mutual accord and satisfaction for the adjustment in the Contract Price or Contract Time as a result of increases or decreases in costs and time of performance caused directly and indirectly from the change, subject to the current scope of the entire Work as set forth in the Contract Documents. Acceptance of the Change Order constitutes an agreement between OWNER and CONTRACTOR that the Change Order represents an equitable adjustment to the Contract Documents, and that the CONTRACTOR will waive all rights to file a claim on this Change Order after it is properly executed.

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

SC-13.03 *Unit Price Work*

SC 13.03.E Delete Paragraph 13.03.E in its entirety and insert the following in its place:

- E. The unit price of an item of Unit Price Work shall be subject to reevaluation and adjustment under the following conditions:
 - 1. if the extended price of a particular item of Unit Price Work amounts to 5 percent or more of the Contract Price (based on estimated quantities at the time of Contract formation) and the variation in the quantity of that particular item of Unit Price Work actually furnished or performed by Contractor differs by more than 25 percent from the estimated quantity of such item indicated in the Agreement; and
 - 2. if there is no corresponding adjustment with respect to any other item of Work; and

3. if Contractor believes that Contractor has incurred additional expense as a result thereof, Contractor may submit a Change Proposal, or if Owner believes that the quantity variation entitles Owner to an adjustment in the unit price, Owner may make a Claim, seeking an adjustment in the Contract Price.

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

SC-15.01 Progress Payments

SC 15.01.D. In the first sentence, delete “Ten” and insert “Thirty” in its place.

ARTICLE 16 – SUSPENSION OF WORK AND TERMINATION

SC-16.03 Owner May Terminate for Convenience

SC 16.03.A. Add the following new paragraph 16.03.A.4:

4. Such sums will be due and payable on the same conditions as set forth for final payment to the extent applicable. Upon receipt of such payment, the parties hereto shall have no further obligations to each other except for the Contractor’s obligations to perform corrective and/or warranty work and to indemnify the Owner as provided for in the Contract Documents.

SC 16.03.C. Add the following new paragraph 16.03.C:

- C. Termination by Owner as provided in this section shall not obviate, release or otherwise waive any claims the Owner possesses against insurance policies maintained by the Contractor.

SC 16.03.A. Add the following new paragraph 16.03.D:

- D. The Contractor agrees that each subcontract and purchase order issued by it will reserve for the Contractor the same right of termination provided by this section, and the Contractor further agrees to require that comparable provisions be included in all lower tier subcontracts and purchase orders.

ARTICLE 17 – FINAL RESOLUTION OF DISPUTES

SC-17.02 Add the following new paragraph immediately after Paragraph 17.01.

SC-17.02 Arbitration

- A. All matters subject to final resolution under this Article will be decided by arbitration in accordance with the rules of *the American Arbitration Association*, subject to the conditions and limitations of this paragraph. This agreement to arbitrate and any other agreement or consent to arbitrate entered into will be specifically enforceable under the prevailing law of any court having jurisdiction.
- B. The demand for arbitration will be filed in writing with the other party to the Contract and with the selected arbitrator or arbitration provider, and a copy will be sent to Engineer for information. The demand for arbitration will be made within the specific time required in this Article, or if no specified time is applicable within a reasonable time after the matter in question has arisen, and in no event shall any such demand be made after the date when institution of legal or equitable proceedings based on such matter in question would be

barred by the applicable statute of limitations. The demand for arbitration should include specific reference to Paragraph SC-17.02.D below.

- C. No arbitration arising out of or relating to the Contract shall include by consolidation, joinder, or in any other manner any other individual or entity (including Engineer, and Engineer's consultants and the officers, directors, partners, agents, employees or consultants of any of them) who is not a party to this Contract unless:
 - 1. the inclusion of such other individual or entity is necessary if complete relief is to be afforded among those who are already parties to the arbitration; and
 - 2. such other individual or entity is substantially involved in a question of law or fact which is common to those who are already parties to the arbitration and which will arise in such proceedings.
- D. The award rendered by the arbitrator(s) shall be consistent with the agreement of the parties, in writing, and include a concise breakdown of the award, and a written explanation of the award specifically citing the Contract provisions deemed applicable and relied on in making the award.
- E. The award will be final. Judgment may be entered upon it in any court having jurisdiction thereof, and it will not be subject to modification or appeal, subject to provisions of the Laws and Regulations relating to vacating or modifying an arbitral award.
- F. The fees and expenses of the arbitrators and any arbitration service shall be shared equally by Owner and Contractor.

ARTICLE 18 – MISCELLANEOUS

SC-18.01 Giving Notice

SC-18.01 Add the following new paragraph immediately after Paragraph 18.01.A.2.:

"3. Delivered by an independent carrier than can substantiate delivery with a tracking number and name of an individual or member of the firm accepting receipt."

SC-SC-18.07 Controlling Law

SC-18.07 Add the following new paragraphs immediately after Paragraph 18.07 A.:

- B. In accordance with Section 209 of the Elliott-Larsen Civil Rights Act, a Contract to which the State, a political subdivision, or an agency thereof is a party shall contain a covenant by CONTRACTOR and his subcontractors not to discriminate against an Employee or Applicant for employment with respect to hire, tenure, conditions, or privileges of employment, or a matter directly or indirectly related to employment because of race, color, religion, national origin or ancestry, age, sex, height, weight, or marital status. Breach of this covenant may be regarded as a material breach of the Contract.

SC-18.09 Funding Agency Requirements

- A. OWNER will require the use of prevailing wage rates on this Project. CONTRACTOR must comply with:

1. Section 00450 - Prevailing Wage Rates, General Decision Number MI20230083, dated 05/05/2023 and General Decision Number MI20230157 dated 05/19/2023.

END OF SECTION

SECTION 00931 - REQUEST FOR INFORMATION

From: _____ RFI Number: _____

_____ Date: _____

_____ Project: _____

Submitted to: _____

ENGINEER - Tetra Tech, Inc. Contract: _____

Specification Drawing

Section: _____ Paragraph: _____ Reference: _____ Detail: _____

Request: _____

☐ Attachments

Signed by: _____

Response: _____

☐ Attachments

Follow-up: ☐ Contract Clarification ☐ Field Order ☐ Work Change Directive ☐ .Proposal Request

Signed by: _____ Date: _____

ENGINEER - Tetra Tech, Inc.

Copy: ☐ OWNER ☐ CONTRACTOR ☐ RPR ☐ CPM ☐ Shop Dwg. File

END OF SECTION

SECTION 00942 - FIELD ORDER

CONTRACTOR: _____ F.O. Number: _____

Date: _____
Project: _____
From: _____
ENGINEER - Tetra Tech, Inc. Contract: _____

You are hereby directed to promptly execute this Field Order, which interprets the Contract Documents or orders minor changes in the Work without change in Contract Price or Time. If you consider that a change in Contract Price or Time is warranted, notify us immediately and prior to proceeding with this Work.³

Specification Section: _____ Paragraph: _____
Drawing Reference: _____ Detail: _____

Description of Interpretation or Change:

☐ Attachments

Signed by: _____ Date: _____
ENGINEER - Tetra Tech, Inc.

Copy: ☐ OWNER ☐ CONTRACTOR ☐ RPR ☐ CPM ☐ Shop Dwg. File

END OF SECTION

SECTION 00943 - WORK CHANGE DIRECTIVE

CONTRACTOR: _____ W.C.D. Number: _____

Date: _____
Project: _____
From: _____
ENGINEER - Tetra Tech, Inc. Contract: _____

To prevent a possible delay in the Work you are directed to proceed with the following changes:

Reason:

The Contract Price and/or Contract Times will be adjusted by a future Change Order based on:

_____	Extension of Unit Prices as indicated in Agreement.	
_____	Actual time and material costs plus OH&P.	
_____	Actual time and material costs plus OH&P, not to exceed.	\$ _____
_____	An agreed sum to be added.	\$ _____
_____	An agreed sum to be deducted.	\$ _____
_____	No change in Contract Price.	
_____	No change in Contract Time.	

A detailed breakdown _____ is needed.
_____ has been received.

ENGINEER: _____ Tetra Tech, Inc. _____

Recommended by: _____ Date _____

CONTRACTOR: _____

Accepted by: _____ Date _____

OWNER: _____

Approved by: _____ Date _____

Copy: ☐ OWNER ☐ CONTRACTOR ☐ RPR ☐ CPM ☐ Shop Dwg. File

SECTION 00943 - WORK CHANGE DIRECTIVE - SUBSTITUTION

CONTRACTOR: _____ W.C.D. Number: _____

Date: _____
Project: _____
From: _____
ENGINEER - Tetra Tech, Inc. Contract: _____

CONTRACTOR has submitted the following material or equipment to ENGINEER for review as a Substitute item in accordance with Paragraph 6.05 of the General Conditions and as supplemented by the Supplementary Conditions.

Opinion of probable ENGINEER's costs for Substitution Review:

Minimum review fee \$300
Hours to review _____ hours at \$220 per hour \$ _____
Opinion of Probable costs for Substitute review \$ _____

The Contract Price and/or Contract Times will be adjusted by a future Change Order based on:
_____ Actual time and material costs to be deducted

ENGINEER will notify CONTRACTOR if review hours are to exceed those listed above.

Section 01630, Substitution Request Application _____ is needed.
_____ has been received.

ENGINEER: Tetra Tech, Inc. _____

Recommended by: _____ Date _____

CONTRACTOR: _____

Accepted by: _____ Date _____

OWNER: _____

Approved by: _____ Date _____

Copy: ☐ OWNER ☐ CONTRACTOR ☐ RPR ☐ CPM ☐ Shop Dwg. File

END OF SECTION

SECTION 00946 - CHANGE ORDER

CONTRACTOR: _____ C.O. Number: _____
 _____ Date: _____
 _____ Project: _____

 OWNER: _____ Contract: _____

TO THE CONTRACTOR NAMED ABOVE:

Under the terms of this Agreement, and upon acceptance of CONTRACTOR and approval of OWNER, ENGINEER recommends the following changes to the Agreement:

No.	Description	Add/ Deduct	Amount
			\$
			\$
			\$
TOTAL THIS CHANGE ORDER			\$

REASON FOR CHANGE:

Current Contract Price	\$
This Change Order Add/Deduct	\$
Revised Contract Price	\$
Current Substantial Completion Date	
Current Final Completion Date	
Contract Time Extension	Days
Revised Substantial Completion Date	
Revised Final Completion Date	

The above is agreed to as full and complete compensation for the Work listed in this Change Order.

RECOMMENDED BY: Tetra Tech, Inc.

 DATE _____

ACCEPTED BY: CONTRACTOR: _____
 _____ DATE _____

APPROVED BY: OWNER: _____
 _____ DATE _____

Copy: ☐ OWNER ☐ CONTRACTOR ☐ RPR ☐ CPM ☐ Shop Dwg. File

DIVISION 1

GENERAL REQUIREMENTS

SECTION 01110 - SUMMARY OF WORK

PART 1 - GENERAL

1.01 SUMMARY

- A. The Project is located at the City of Flint Water Pollution Control Facility, 4652 Beecher Road, Flint, MI 48532.
- B. The Work consists of the following:
 - 1. Replacement of following medium voltage main switchgear.
 - a. Switchgear S1 North
 - b. Switchgear S1 South
 - c. Switchgear S2
 - d. Switchgear S3
 - 2. Installation of new duct banks, conduit, and wire for refeeding the treatment plant switchgear.
 - 3. Replace primary wire from Consumers equipment to S2 switchgear...
 - 4. Concrete work to repair & enhance the two outdoor switchgear S1 North and S1 South utility vaults.
 - 5. Supply and install two pre-engineered buildings for S1 North and S1 South switchgear.
 - 6. Installation and repair of related concrete housekeeping pads, foundations, and floor repairs as needed.
 - 7. Replacement of the following transformers as indicated on the contract drawings:
 - a) Sludge Thickener
 - b) Oil Barn Transformer
 - c) Incinerator Complex Transformers (2)
 - d) Northwest Pump Station Transformers (2)
 - e) Digester Transformer
 - f) East Pumping Station Transformers (2)
 - g) Third Avenue Pumping Station Transformers (2)
 - h) Transformers related to Switchgear S3 (2)
 - 8. Execution of electrical coordination study, short circuit and arc-flash analysis as indicated on drawing and with specifications.
 - 9. Replace the existing Third Ave. Pumping Station primary distribution transformers.
 - 10. Provide 3-year maintenance contract for entire facility's electrical distribution equipment to include recommended quarterly, 6-month, yearly and 3-year procedures to properly maintain equipment.
 - 11. Supply, install and maintain backup (diesel generators) power during switchover of equipment including separate units for main treatment plant and digester building.
 - 12. Consumers Transformer Yard related work.

1.02 WORK SEQUENCE

- A. CONTRACTOR shall arrange its Work so that at no time shall it cause unnecessary interruption to the operation of existing facilities. When construction operations must be done with any portion of the existing facilities out of service, such Work shall be done at such times and in the sequence as recommended by ENGINEER and with the prior approval of the Michigan Department of Environment, Great Lakes and Energy (EGLE), if required. During such period of curtailment of facility operation, the Work shall be done with all haste possible under the circumstances, even to the

extent of working continuously 24 hours a day for this period. General Constraints that the CONTRACTOR shall incorporate in the project schedule and sequence of construction are outlined below. Additional accommodations to facilitate operation and temporary facilities shall also be required to complete the work.

B. Suggested Sequence of Construction:

1. Refer to contract drawings. Sequencing of the work shall be coordinated with the Owner and Consumers Energy. Contractor shall pay any fees to Consumers Energy as required for shutdown and scheduling of the replacement of the existing outdoor main switchgear.
- C. Half of the switchgear shall be replaced at a time. The downtime for the consumers energy sources shall be minimized. Ductbanks, conduit, wire, concrete pads, shall all be installed in advance to the greatest extent possible in order to minimize the time that the plant is only operating on one source of power. Generator power shall be available for a particular source when one utility source is out of service during the construction. This work requirement is similar for the rework of the two low voltage house switchboards and transformers shown on the contract drawings.

1.03 CONTRACTOR USE OF PREMISES

- A. Limit use of the premises to construction activities in areas indicated; allow for OWNER occupancy and use by the public. Confine operations to areas within Contract limits indicated. Portions of the Site beyond areas in which construction operations are indicated are not to be disturbed.
- B. Keep driveways and entrances serving the premises clear and available to OWNER, OWNER's employees, and private property owners at all times. Do not use these areas for parking or storage of materials. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on Site. Areas for CONTRACTOR's trailers, equipment, and material storage, and CONTRACTOR's employee parking shall be as indicated on Drawings or agreed by OWNER prior to the start of construction.
- C. Use of the Existing Building: Maintain the existing building in a weathertight condition throughout the construction period. Repair damage caused by construction operations. Take all precautions necessary to protect the building and its occupants during the construction period.

1.04 OWNER OCCUPANCY

- A. Full OWNER Occupancy: OWNER will occupy the Site and existing building during the entire construction period. Cooperate with OWNER during construction operations to minimize conflicts and facilitate OWNER usage. Perform the Work so as not to interfere with OWNER's operations.

1.05 MISCELLANEOUS PROVISIONS

- A. CONTRACTOR shall notify all Owners of public utilities within the right-of-way or easement for the purpose of establishing the approximate locations of the utilities in accordance with the requirements of Act No. 53 Public Acts of 1974 of the State of Michigan. CONTRACTOR shall notify MISS DIG-Utility Communication System, 1-800-482-7171, three working days prior to starting any excavation with power equipment.
- B. CONTRACTOR shall be responsible for verifying the location of all underground utilities by magnetic or other type instruments before beginning excavation Work.

- C. Time and Sequence of Work: In general, it is the intention and understanding that CONTRACTOR shall have control over the sequence or order of execution of the several parts of the Work to be done under the Contract and over the method of accomplishing the required results, except as some particular sequence or method may be distinctly demanded by the Drawings and Project Manual or by the expressed provisions of the Contract. ENGINEER may, however, make such reasonable requirements as may, in ENGINEER's judgment, be necessary for the proper and effective protection of Work partially or wholly completed, and to these requirements CONTRACTOR shall conform.

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

NOT USED

END OF SECTION

SECTION 01210 - ALLOWANCES

PART 1 - GENERAL

1.01 SUMMARY

- A. This Section specifies administrative and procedural requirements for processing Allowances. Selected materials and equipment, and in some cases their installation, are shown and specified in the Contract Documents by Allowances. Allowances have been established in lieu of additional requirements and to defer selection of actual materials and equipment to a later date when additional information is available for evaluation. Additional requirements, if necessary, will be issued by Change Order.

1.02 DEFINITIONS

- A. Lump Sum Allowance: A monetary sum that includes, as part of the Contract Price, the associated costs and requirements to complete the specified Allowance.
- B. Unit-cost Allowance: A specified quantity of a product or assembly, as part of the Contract Price, that is to be included in the Work even though the location of the product or assembly is not indicated on Drawings or shown in the specifications.
- C. Contingency Allowance: A monetary sum that, as part of the Contract Price, is to be utilized as directed by OWNER, through a Change Order, to cover minor changes in the Work.
- D. Provisionary Allowance: A monetary sum that, as part of the Contract Price, is to be utilized as directed by OWNER, through a Change Order, to cover minor changes in the Work.

1.03 SUBMITTALS

- A. Submit invoices or delivery slips to indicate actual quantities of materials delivered to the Site for use in fulfillment of each Allowance.

1.04 OWNER'S INSTRUCTIONS

- A. At the earliest feasible date after Contract Award, advise ENGINEER of the date when the final selection and purchase of each product or system described by an Allowance must be completed in order to avoid delay in performance of the Work.
- B. When requested by ENGINEER, obtain Bids for each Allowance for use in making final selections; include recommendations that are relevant to performance of the Work.
- C. Purchase products and systems as selected by ENGINEER from the designated supplier.
- D. Use Allowances only as directed for OWNER's purposes, and only by Change Orders which designate amounts to be charged to the Allowance.

- E. If the actual price for the specified Allowance is more or less than the stated Allowance, the Contract Price shall be adjusted accordingly by Change Order. The adjustment in Contract Price shall be made in accordance with the General Conditions.
- F. Change Orders authorizing use of funds from the Contingency or Provisionary Allowances will include CONTRACTOR's related costs and reasonable overhead and profit margins.
- G. At Project closeout, any amounts remaining in Allowances will be credited to OWNER by Change Order.

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

3.01 INSPECTION

- A. Inspect products covered by an Allowance promptly upon delivery for damage or defects.

3.02 PREPARATION

- A. Coordinate materials and their installation for each Allowance with related materials and installations to ensure that each Allowance item is completely integrated and interfaced with related construction activities.

SCHEDULE OF ALLOWANCES

1. Lump sum allowance for payment to Consumers Energy for services associated with turning off each source of power so that the existing main plant switchgear can be replaced. An Allowance of **\$75,000** shall be included in the Contract Price for this Work. No mark-ups shall be permitted. Unused monies shall be credited back to Owner at project completion.
2. Lump sum allowance for Unforeseen Items, Changed Site Conditions and Owner Directed Changes. An Allowance of **\$500,000** shall be included in the Contract Price for this Work for Unforeseen Items, Changed Conditions and Owner directed changes that will be for the Owners exclusive use to pay Contractor for Changes in the Work. Unused monies shall be credited back to Owner at project completion.

END OF SECTION

SECTION 01310 - PROJECT COORDINATION

PART 1 - GENERAL

1.01 SUMMARY

- A. This Section specifies administrative and supervisory requirements necessary for Project coordination including, but not necessarily limited to:
 - 1. Coordination of Work under this Contract.
 - 2. Coordination with other Contractors.
 - 3. Administrative and supervisory personnel.
 - 4. Land survey work.
 - 5. Pre-Construction Conference.
 - 6. Pre-Excavation Conference.
 - 7. Pre-Installation Conference.
 - 8. Progress meetings.
 - 9. General installation provisions.
 - 10. Cleaning and protection.
- B. Related Sections Specified Elsewhere:
 - 1. Equipment installation check, and operation, maintenance, and training of OWNER's personnel are included in Section 01600 and Sections for specific equipment items.
 - 2. Requirements for CONTRACTOR's Construction Schedule are included in Section 01330.

1.02 DEFINITIONS

- A. Monument: The term "monument" shall be considered as any object defining the location of a property corner, street location, section line, fractional section line, right-of-way marker, or other delineation of land ownership or division.

1.03 SUBMITTALS

- A. Within 15 days of Notice to Proceed, submit a list of CONTRACTOR's principal staff assignments, including the Superintendent and other personnel in attendance at Site; identify individuals, their duties and responsibilities; list their addresses and telephone numbers.

1.04 SCHEDULING

- A. Coordinate construction operations included under different Sections of the Specifications that are dependent upon each other for proper installation, connection, and operation. Where installation of one part of the Work is dependent on installation of other components, either before or after its own installation, schedule construction activities in the sequence required to obtain the best results. Where availability of space is limited, coordinate installation of different components to assure maximum accessibility for required maintenance, service and repair. Make adequate provisions to accommodate items scheduled for later installation.
- B. 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 Site in accordance with Laws or Regulations. CONTRACTOR shall train CONTRACTOR's employees on use of these sheets and shall keep a master copy on hand at Site.

- C. Coordination with Other Contractors:
 - 1. CONTRACTOR shall so conduct CONTRACTOR's operations as not to interfere with or injure the Work of other Contractors or workmen employed on adjoining or related Work, and CONTRACTOR shall promptly make good any injury or damage which may be done to such Work by CONTRACTOR or CONTRACTOR's employees or agents.
 - 2. Should a contract for adjoining Work be awarded to another CONTRACTOR, and should the Work on one of these contracts interfere with that of the other, ENGINEER shall decide which contract shall cease Work for the time being and which shall continue, or whether Work on both contracts shall continue at the same time and in what manner.
- D. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities to avoid conflicts and ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:
 - 1. Preparation of schedules.
 - 2. Installation and removal of temporary facilities.
 - 3. Delivery and processing of submittals.
 - 4. Progress meetings.
 - 5. Project closeout activities.

1.05 PRE-CONSTRUCTION CONFERENCE

- A. ENGINEER will schedule a Pre-Construction Conference and organizational meeting at the Site or other convenient location prior to commencement of construction activities to review responsibilities and personnel assignments.
- B. Attendees: OWNER, ENGINEER and ENGINEER's consultants, CONTRACTOR and its superintendent, major subcontractors, manufacturers, suppliers and other concerned parties shall each be represented at the conference by persons familiar with and authorized to conclude matters relating to the Work.
- C. Agenda: Discuss items of significance that could affect progress including such topics as:
 - 1. Tentative Construction Schedule.
 - 2. Critical Work sequencing.
 - 3. Designation of responsible personnel.
 - 4. Procedures for processing field decisions and Change Orders.
 - 5. Procedures for processing Applications for Payment.
 - 6. Distribution of Contract Documents.
 - 7. Submittal of Shop Drawings, product data, and samples.
 - 8. Preparation of Record Documents.
 - 9. Use of the premises.
 - 10. Office, Work, and storage areas.
 - 11. Equipment deliveries and priorities.
 - 12. Safety procedures.
 - 13. First aid.
 - 14. Security.
 - 15. Housekeeping.
 - 16. Working hours.

1.06 PRE-EXCAVATION CONFERENCE

- A. In addition to the Pre-Construction Conference, ENGINEER may also require a Pre-Excavation Conference. CONTRACTOR and Subcontractors performing excavation Work on Site shall provide written descriptions of their plans for shoring, dewatering, disposal of spoils, protection of existing utilities, and any other particulars of the excavation process, including the technical basis for their selection of the means and methods to be employed. ENGINEER will prepare and distribute minutes.

1.07 PRE-INSTALLATION CONFERENCE

- A. Where specified, CONTRACTOR, supplier, and ENGINEER shall meet on Site and discuss tools, techniques, and procedures for installation of products and equipment prior to performing the Work.

1.08 PROGRESS MEETINGS

- A. Attendees: In addition to representatives of OWNER and ENGINEER, each subcontractor, supplier, or other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings by persons familiar with the Project and authorized to conclude matters relating to progress.
- B. Agenda: Review and correct or approve minutes of the previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to the current status of the Project.
- C. CONTRACTOR's Construction Schedule: Review progress since the last meeting. Determine where each activity is in relation to CONTRACTOR's Construction Schedule, whether on time or ahead or behind schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.
- D. Reporting: CONTRACTOR will prepare and distribute copies of minutes of the meeting to each party present and to other parties who should have been present. The minutes will include a brief summary, in narrative form, of progress since the previous meeting and report.
- E. Schedule Updating: CONTRACTOR shall revise Construction Schedule after each progress meeting where revisions to Schedule have been made or recognized. Issue revised Schedule no later than 3 days after the progress meeting date to ENGINEER for distribution concurrently with the progress meeting minutes.

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

3.01 CLEANING AND PROTECTION

- A. During handling and installation, clean and protect construction in progress and adjoining materials in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.
- B. Clean and maintain completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.

END OF SECTION

SECTION 01330 - SUBMITTALS

PART 1 - GENERAL

1.01 SUMMARY

- A. This Section specifies administrative and procedural requirements for submittals, including, but not necessarily limited to, the following:
 - 1. CONTRACTOR's Construction Schedule.
 - 2. Submittal Schedule.
 - 3. Shop Drawings.
 - 4. Product data.
 - 5. Samples.
 - 6. Progress photographs.
- B. Topics covered elsewhere include, but are not limited to:
 - 1. Permits.
 - 2. Applications for payment.
 - 3. Performance and payment bonds.
 - 4. Insurance certificates.
 - 5. List of subcontractors.

1.02 SUBMITTALS

- A. Bonds and Insurance Certificates shall be submitted to and approved by OWNER and ENGINEER prior to the initiation of any construction on Site.
- B. Permits, Licenses, and Certificates: For OWNER's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, and similar documents; correspondence and records established in conjunction with compliance with standards; and regulations bearing upon performance of the Work.

1.03 SUBMITTAL PROCEDURES

- A. Coordination:
 - 1. Coordinate preparation and processing of submittals with performance of construction activities. Transmit each submittal sufficiently in advance of performance of related construction activities to avoid delay.
 - 2. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
 - 3. Coordinate transmittal of different types of submittals for related elements of the Work so processing will not be delayed by the need to review submittals concurrently for coordination.
 - 4. ENGINEER reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.
- B. Processing:
 - 1. Allow sufficient review time so that installation shall not be delayed as a result of the time required to process submittals, including time for resubmittals.

2. ENGINEER will review and return submittals with reasonable promptness, or advise CONTRACTOR when a submittal being processed must be delayed for coordination or receipt of additional information by putting the submittal "On Hold" and returning a transmittal identifying the reasons for the delay.
3. No extension of Contract Time will be authorized because of failure to transmit submittals to ENGINEER sufficiently in advance of the Work to permit processing.

C. Submittal Preparation:

1. Place a permanent label or title block on each submittal for identification. Indicate the name of the entity that prepared each submittal on the label or title block.
2. Provide a space approximately 4 inches by 5 inches on the label or beside the title block on submittals not originating from CONTRACTOR to record CONTRACTOR's review and approval markings and the action taken.
3. Include the following information on the label for processing and recording action taken.
 - a. Project name.
 - b. Date.
 - c. Name and address of ENGINEER.
 - d. Name and address of CONTRACTOR.
 - e. Name and address of subcontractor.
 - f. Name and address of supplier.
 - g. Name of manufacturer.
 - h. Number and title of appropriate Specification Section.
 - i. Drawing number and detail references, as appropriate.
4. Any markings done by CONTRACTOR shall be done in a color other than red. Red is reserved for ENGINEER's marking.
5. The number of hard copies to be submitted will be two (2) for the OWNER, two (2) for the ENGINEER, and the number require by the CONTRACTOR. Reproducibles may be submitted and will be marked and returned to CONTRACTOR. Blue or black line prints shall be submitted in sufficient quantity for distribution to ENGINEER and OWNER recipients.
6. The CONTRACTOR may submit electronic submittals consisting of an email with scanned attachment(s) of the submittal. This shall be allowed for only submittals consisting of scanned 8 ½" x 11" and 11" x 17" size sheets. Full sized drawings (24" x 36") shall be submitted as hard copies only. Scans must be legible.

D. Submittal Transmittal:

1. Package each submittal appropriately for shipping and handling. This shall include an index either on the transmittal or within the submittal itself. Transmit each submittal from CONTRACTOR to ENGINEER using a transmittal form. Submittals received from sources other than CONTRACTOR will be returned without action. Use separate transmittals for items from different specification sections. Number each submittal consecutively. Resubmittals should have the same number as the original, plus a letter designation for each resubmittal (i.e., 7-A, 7-B, etc.).
2. Indicate on the transmittal relevant information and requests for data. On the form, or separate sheet, record deviations from Contract Document requirements, including minor variations and limitations. Include CONTRACTOR's certification that information complies with Contract Document requirements. On resubmittal, all changes shall be clearly identified for ease of review. Resubmittals shall be reviewed for the clearly identified changes only. Any changes not clearly identified will not be reviewed and original submittal shall govern.

1.04 CONSTRUCTION SCHEDULE

A. Bar Chart Schedule:

1. Prepare a fully developed, horizontal bar chart type Construction Schedule. Submit within 30 days of the date established for "Commencement of the Work."
2. Provide a separate time bar for each significant construction activity. Provide a continuous vertical line to identify the first working day of each week. Use the same breakdown of units of the Work as indicated on Schedule of Values.
3. Prepare Schedule on a sheet, or series of sheets, of stable transparency or other reproducible media, of sufficient width to show data for the entire construction period.
4. Secure time commitments for performing critical elements of the Work from parties involved. Coordinate each element on Schedule with other construction activities; include minor elements involved in the sequence of the Work. Show each activity in proper sequence. Indicate graphically sequences necessary for completion of related portions of the Work.
5. Coordinate Construction Schedule with Schedule of Values, list of subcontracts, Submittal Schedule, progress reports, payment requests, and other schedules.
6. Indicate completion in advance of the date established for Substantial Completion. Indicate Substantial Completion on Schedule to allow time for ENGINEER's procedures necessary for certification of Substantial Completion.

B. Schedule Updating: Revised Schedule shall be provided at progress meetings as needed.

1.05 SUBMITTAL SCHEDULE

- A. After development and acceptance of Construction Schedule, prepare a complete Schedule of Submittals. Submit Schedule within 10 days of the date required for establishment of Construction Schedule.
- B. Coordinate Submittal Schedule with the list of subcontracts, Schedule of Values, and the list of products, as well as Construction Schedule.
- C. Prepare Schedule in chronological order; include submittals required during the first 90 days of construction. Provide the following information:
1. Scheduled date for the first submittal.
 2. Related Section number.
 3. Submittal category.
 4. Name of subcontractor.
 5. Description of the part of the Work covered.
 6. Scheduled date for resubmittal.
 7. Scheduled date ENGINEER's final release or approval.
- D. Following response to initial submittal, print and distribute copies to ENGINEER, OWNER, subcontractors, and other parties required to comply with submittal dates indicated. Post copies in the CONTRACTOR's field office.
- E. When revisions are made, distribute to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in construction activities.
- F. Schedule Updating: Revised Schedule shall be provided at progress meetings as needed.

1.06 SHOP DRAWINGS

- A. Submit newly prepared information, drawn to accurate scale. Highlight, encircle, or otherwise indicate deviations from the Contract Documents. Do not reproduce Contract Documents or copy standard information as the basis of Shop Drawings. Standard information prepared without specific reference to the Project is not considered Shop Drawings.
- B. Shop Drawings include fabrication and installation drawings, setting diagrams, schedules, patterns, templates, and similar drawings. Include the following information:
 - 1. Dimensions.
 - 2. Identification of products and materials included.
 - 3. Compliance with specified standards.
 - 4. Notation of coordination requirements.
 - 5. Notation of dimensions established by field measurement.
- C. Nameplate data for equipment including electric motors shall be included on Shop Drawings. Electric motor data shall state the manufacturer, horsepower, service factor, voltage, enclosure type, oversize wiring box, etc.
- D. Shop Drawings shall indicate shop painting requirements to include type of paint and manufacturer.
- E. Standard manufactured items in the form of catalog work sheets showing illustrated cuts of the items to be furnished, scale details, sizes, dimensions, quantity, and all other pertinent information should be submitted and approved in a similar manner.
- F. Measurements given on Shop Drawings or standard catalog sheets, as established from Contract Drawings and as approved by ENGINEER, shall be followed. When it is necessary to verify field measurements, they shall be checked and established by CONTRACTOR. The field measurements so established shall be followed by CONTRACTOR and by all affected trades.
- G. Sheet Size: Except for templates, patterns, and similar full-size Drawings, submit Shop Drawings on sheets at least 8-1/2 inches by 11 inches but no larger than 36 inches by 24 inches.
- H. Do not use Shop Drawings without an appropriate final stamp indicating action taken in connection with construction.

1.07 PRODUCT DATA

- A. Collect Product Data into a single submittal for each element of construction or system. Product Data includes printed information such as manufacturer's installation instructions, catalog cuts, standard color charts, roughing-in diagrams and templates, standard wiring diagrams, and performance curves. Where Product Data must be specially prepared because standard printed data is not suitable for use, submit as Shop Drawings.
- B. Mark each copy to show applicable choices and options. Where printed Product Data includes information on several products, some of which are not required, mark copies to indicate the applicable information. Include the following information:
 - 1. Manufacturer's printed recommendations.
 - 2. Compliance with recognized trade association standards.

3. Compliance with recognized testing agency standards.
 4. Application of testing agency labels and seals.
 5. Notation of dimensions verified by field measurement.
 6. Notation of coordination requirements.
- C. Do not submit Product Data until compliance with requirements of the Contract Documents has been confirmed.

1.08 SAMPLES

- A. Submit full-size, fully fabricated Samples cured and finished as specified and physically identical with the material or product proposed. Samples include partial sections of manufactured or fabricated components, cuts or containers of materials, color range sets, and swatches showing color, texture, and pattern.
- B. Mount, display, or package Samples in the manner specified to facilitate review of qualities indicated. Prepare Samples to match ENGINEER's Sample. Include the following:
 1. Generic description of the Sample.
 2. Sample source.
 3. Product name or name of manufacturer.
 4. Compliance with recognized standards.
 5. Availability and delivery time.
- C. Submit Samples for review of kind, color, pattern, and texture, for a final check of these characteristics with other elements, and for a comparison of these characteristics between the final submittal and the actual component as delivered and installed.
- D. Where variation in color, pattern, texture, or other characteristics are inherent in the material or product represented, submit multiple units (not less than 3) that show approximate limits of the variations.
- E. Refer to other Specification Sections for requirements for Samples that illustrate workmanship, fabrication techniques, details of assembly, connections, operation, and similar construction characteristics.
- F. Preliminary Submittals: Where Samples are for selection of color, pattern, texture, or similar characteristics from a range of standard choices, submit a full set of choices for the material or product.
 1. Preliminary submittals will be reviewed and returned with ENGINEER's mark indicating selection and other action.
- G. Except for Samples illustrating assembly details, workmanship, fabrication techniques, connections, operation and similar characteristics, submit 3 sets; 1 will be returned marked with the action taken.
- H. Maintain sets of Samples, as returned, at the Site, for quality comparisons throughout the course of construction.
- I. Unless noncompliance with Contract Document provisions is observed, the submittal may serve as the final submittal.

- J. Sample sets may be used to obtain final acceptance of the construction associated with each set.

1.09 ENGINEER'S ACTION

- A. Except for submittals for record, information or similar purposes, where action and return is required or requested, ENGINEER will review each submittal, mark to indicate action taken, and return promptly.
 - 1. Compliance with specified characteristics is CONTRACTOR's responsibility.
- B. Action Stamp: ENGINEER will stamp each submittal with a uniform, self-explanatory action stamp. The stamp will be appropriately marked, as follows, to indicate the action taken:
 - 1. Final Unrestricted Release: Where submittals are marked "No Exceptions Taken," that part of the Work covered by the submittal may proceed provided it complies with requirements of the Contract Documents; final acceptance will depend upon that compliance.
 - 2. Final-But-Restricted Release: When submittals are marked "Furnish as Corrected," that part of the Work covered by the submittal may proceed, provided it complies with notation or corrections on the submittal and requirements of the Contract Documents; final acceptance will depend on that compliance.
 - 3. Returned for Resubmittal: When submittal is marked "Rejected" or "Revise and Resubmit," do not proceed with that part of the Work covered by the submittal, including purchasing, fabrication, delivery, or other activity. Revise or prepare a new submittal in accordance with the notations; resubmit without delay. Repeat if necessary to obtain a different action mark.
 - a. Do not permit submittals marked "Rejected" or "Revise and Resubmit" to be used at Site, or elsewhere where Work is in progress.
 - 4. Other Action: Where a submittal is primarily for information or record purposes, special processing or other activity, the submittal will be returned, marked "Acknowledge Receipt."
 - 5. The approval of ENGINEER shall not relieve CONTRACTOR of responsibility for errors on Drawings or submittals as ENGINEER's checking is intended to cover compliance with Drawings and Specifications and not enter into every detail of the shop work.

1.10 PROGRESS PHOTOGRAPHS

- A. During the process of the Work, digital photos shall be taken at the rate of at least 4 every day from start of construction until acceptance by OWNER. These photos shall be representative of the work done each day. Resolution of the digital photos shall be acceptable to the OWNER and ENGINEER.
- B. These digital photos shall be provided to the ENGINEER and OWNER every month as email attachments or on a CD.

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

NOT USED

END OF SECTION

SECTION 01420 - DEFINITIONS AND STANDARDS

PART 1 - GENERAL

1.01 DEFINITIONS

- A. Basic Contract definitions are included in the General Conditions.
- B. Testing Laboratories: A "testing laboratory" is an independent entity engaged to perform specific inspections or tests, either at the Site or elsewhere, and to report on and, if required, to interpret results of those inspections or tests.

1.02 INDUSTRY STANDARDS

- A. Applicability of Standards: Except where the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the Contract Documents. Such standards are made a part of the Contract Documents by reference. Individual Sections indicate which codes and standards CONTRACTOR must keep available at Site for reference.
- B. Updated Standards: At the request of ENGINEER, CONTRACTOR, or authority having jurisdiction, submit a Change Order proposal where an applicable code or standard has been revised and reissued after the date of the Contract Documents and before performance of Work affected. ENGINEER will decide whether to issue a Change Order to proceed with the updated standard.
- C. Minimum Quantity or Quality Levels: In every instance the quantity or quality level shown or specified shall be the minimum to be provided or performed. The actual installation may comply exactly, within specified tolerances, with the minimum quantity or quality specified, or it may exceed that minimum within reasonable limits. In complying with these requirements, indicated numeric values are minimum or maximum values, as noted, or appropriate for the context of the requirements. Refer instances of uncertainty to ENGINEER for a decision before proceeding.
- D. Copies of Standards: Each entity engaged in construction on the Project is required to be familiar with industry standards applicable to that entity's construction activity. Copies of applicable standards are not bound with the Contract Documents.
 - 1. Where copies of standards are needed for performance of a required construction activity, CONTRACTOR shall obtain copies directly from the publication source.
- E. Abbreviations and Names: Trade association names and titles of general standards are frequently abbreviated. The following acronyms or abbreviations as referenced in Contract Documents are defined to mean the associated names. Names and addresses are subject to change and are believed to be, but are not assured to be, accurate and up to date as of date of Contract Documents.

AA Aluminum Association
 900 19th St., NW; Washington, D.C. 20006

AABC Associated Air Balance Council
 1518 K St. NW, Suite 503; Washington, D.C. 20005

AASHTO American Association of State Highway and

	Transportation Officials 444 North Capitol St., NW, Suite 249; Washington, D.C. 20001
ACI	American Concrete Institute P.O. Box 9094; Farmington Hills, MI 48333-9094
ACPA	American Concrete Pipe Association 222 West Las Colinas Blvd., Suite 641; Irving, TX 75039-5423
AFBMA	Anti-Friction Bearing Manufacturing Association
AFPA	American Forest & Paper Association 1111 19 th St., NW, Suite 800; Washington, D.C. 20036
AGA	American Gas Association 400 N Capitol St., NW; Washington, D.C. 20001
AGMA	American Gear Manufacturers Association
AI	Asphalt Institute Research Park Dr., P.O. Box 14052; Lexington, KY 40512-4052
A.I.A.	American Insurance Association 1130 Connecticut Ave., NW, Suite 1000; Washington, D.C. 20036
AISC	American Institute of Steel Construction One East Wacker Dr., Suite 3100; Chicago, IL 60601-2001
AISI	American Iron and Steel Institute 1101 Seventeenth St., NW; Washington, D.C. 20036
AITC	American Institute of Timber Construction 7012 S. Revere Parkway, Suite 140; Englewood, CO 80112
ALI	Associated Laboratories, Inc. P.O. Box 152837; Dallas, TX 75315
ALSC	American Lumber Standard Committee P.O. Box 210; Germantown, MD 20875-0210
AMCA	Air Movement and Control Association 30 W. University Dr.; Arlington Heights, IL 60004-1893
ANSI	American National Standards Institute 25 West 43 rd St.; New York, NY 10036
API	American Petroleum Institute 1220 L St., NW; Washington, D.C. 20005-4070

AREA	American Railway Engineering Association 50 F Street, NW, Suite 7702, Washington, D.C. 20001
ASCE	American Society of Civil Engineers 1801 Alexander Bell Dr.; Reston, VA 20191-4400
ASHRAE	American Society of Heating, Refrigerating and Air Conditioning Engineers 1791 Tullie Circle, NE; Atlanta, GA 30329
ASME	American Society of Mechanical Engineers 345 East 47th St.; New York, NY 10017
ASSE	American Society of Safety Engineers 1800 East Oakton Street, Des Plaines, IL 60018
ASTM	American Society for Testing and Materials 100 Barr Harbor Dr.; West Conshohocken, PA 19428-2959
AWPA	American Wood-Preservers' Association P.O. Box 5690; Granbury, TX 76049
AWS	American Welding Society 550 NW Le Jeune Rd.; Miami, FL 33126
AWWA	American Water Works Association 6666 W. Quincy Ave.; Denver, CO 80235
CISPI	Cast Iron Soil Pipe Institute 1499 Chain Bridge Rd.; Suite 203; McLean, VA 22101
CRSI	Concrete Reinforcing Steel Institute 933 North Plum Grove Rd.; Schaumburg, IL 60173
CSA	Canadian Standards Association
FM	Factory Mutual Engineering and Research 1151 Boston-Providence Turnpike; Norwood, MA 02062-9102
H.I.	Hydraulic Institute 9 Sylvan Way; Parsippany, NJ 07054
IEEE	Institute of Electrical and Electronic Engineers 3 Park Ave., 17 th Floor; New York, NY 10016-5997
IPCEA	Insulated Power Cable Engineers Association
ISA	Instrument Society of America 67 Alexander Dr.; Research Triangle Park, NC 27709

MBMA	Metal Building Manufacturers Association 1300 Summer Ave.; Cleveland, OH 44115-2851
NAPA	National Asphalt Pavement Association 5100 Forbes Blvd.; Lanham, MD 20706-4413
NCPI	National Clay Pipe Institute P.O. Box 759; Lake Geneva, WI 53147
NEC	National Electrical Code (by NFPA)
NESC	National Electrical Safety Code
NEMA	National Electrical Manufacturers Association 1300 North 17 th St., Suite 1847; Rosslyn, VA 22209
NFPA	National Fire Protection Association 1 Batterymarch Park; Quincy, MA 02269-9101
NPCA	National Precast Concrete Association 10333 North Meridian St., Suite 272; Indianapolis, IN 46290
PCA	Portland Cement Association 5420 Old Orchard Rd.; Skokie, IL 60077-1083
PCI	Precast/Prestressed Concrete Institute 209 W. Jackson Blvd.; Chicago, IL 60606-6938
PDI	Plumbing and Drainage Institute 800 Turnpike Street, Suite 300, North Andover, MA 01845
PTI	Post-Tensioning Institute 1717 W. Northern Ave., Suite 114; Phoenix, AZ 85021
RIS	Redwood Inspection Service 405 Enfente Dr., Suite 200; Novato, CA 94949
SAE	Society of Automotive Engineers 400 Commonwealth Dr.; Warrendale, PA 15096-0001
SDI	Steel Deck Institute P.O. Box 25; Fox River Grove, IL 60021-0025
SJI	Steel Joist Institute 3127 10 th Ave. North Ext.; Myrtle Beach, SC 29577-6760
SMACNA	Sheet Metal & Air Conditioning Contractors' National Association 4201 Lafayette Center Dr.; Chantilly, VA 20151-1209

SPIB	Southern Pine Inspection Bureau 4709 Scenic Highway; Pensacola, FL 32504-9094
SSPC	The Society for Protective Coatings 40 24 th St., 6 th Floor; Pittsburgh, PA 15222-4565
TPI	Truss Plate Institute 583 Donofrio Dr., Suite 200; Madison, WI 53719
UL	Underwriters Laboratories 333 Pfingsten Rd.; Northbrook, IL 60062-2096
WCLIB	West Coast Lumber Inspection Bureau P.O. Box 23145; Portland, OR 97281
WWPA	Western Wood Products Association 522 SW Fifth Ave., Suite 500; Portland, OR 97204-2122

- F. Government Agencies. Names and titles of state and Federal Government standard or Specification producing agencies are frequently abbreviated. The following acronyms or abbreviations referenced in the Contract Documents indicate names of standard or Specification producing agencies of the Federal government. Names and addresses are subject to change but are believed to be, but are not assured to be, accurate and up to date as of the date of the Contract Documents.

CE	Corps of Engineers (U.S. Department of the Army) Chief of Engineers - Referral Washington, D.C. 20314
CFR	Code of Federal Regulations (Available from the Government Printing Office) N. Capitol Street between G and H St. NW Washington, D.C. 20402 (Material is usually first published in the Federal Register)
DOT	Department of Transportation 400 Seventh Street, SW Washington, D.C. 20590
EGLE	Michigan Department of Environment, Great Lakes, and Energy
EDA	Economic Development Administration U.S. Department of Commerce 121 N. Canal Street, Suite 855 Chicago, IL 60606
EPA	Environmental Protection Agency 401 M Street, SW Washington, D.C. 20460

MDOT Michigan Department of Transportation

MIOSHA State of Michigan OSHA

OSHA Occupational Safety and Health Administration
(U.S. Department of Labor)
Government Printing Office
Washington, D.C. 20402

1.03 GOVERNING REGULATIONS/AUTHORITIES

- A. ENGINEER has contacted authorities having jurisdiction where necessary to obtain information necessary for the preparation of Contract Documents; that information may or may not be of significance to CONTRACTOR. Contact authorities having jurisdiction directly for information and decisions having a bearing on the Work.

1.04 SUBMITTALS

- A. Permits, Licenses, and Certificates: For OWNER's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, and similar documents, correspondence, and records established in conjunction with compliance with standards and regulations bearing upon performance of the Work.

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

NOT USED

END OF SECTION

SECTION 01450 - QUALITY CONTROL SERVICES

PART 1 - GENERAL

1.01 SUMMARY

- A. This Section specifies administrative and procedural requirements for quality control services.
- B. Quality control services include inspections and tests and related actions including reports, performed by independent agencies, governing authorities, and CONTRACTOR. They do not include Contract enforcement activities performed by ENGINEER.
- C. Inspection and testing services are required to verify compliance with requirements specified or indicated. These services do not relieve CONTRACTOR of responsibility for compliance with Contract Document requirements.
- D. Requirements of this Section relate to customized fabrication and installation procedures, not production of standard products.
- E. Specific quality control requirements for individual construction activities are specified in the Sections that specify those activities. Those requirements, including inspections and tests, cover production of standard products as well as customized fabrication and installation procedures.
- F. Inspections, tests, and related actions specified are not intended to limit CONTRACTOR's quality control procedures that facilitate compliance with Contract Document requirements.
- G. Requirements for CONTRACTOR to provide quality control services required by ENGINEER, OWNER, or authorities having jurisdiction are not limited by provisions of this Section.

1.02 CONTRACTOR RESPONSIBILITIES

- A. Provide inspections, tests, and similar quality control services, specified in individual Specification Sections and required by governing authorities, except where they are specifically indicated to be OWNER's responsibility, or are provided by another identified entity; these services include those specified to be performed by an independent agency and not by CONTRACTOR. Costs for these services shall be included in the Contract Price.
- B. Employ and pay an independent agency to perform specified quality control services.
- C. CONTRACTOR and each agency engaged to perform inspections, tests, and similar services shall coordinate the sequence of activities to accommodate required services with a minimum of delay. In addition, CONTRACTOR and each agency shall coordinate activities to avoid the necessity of removing and replacing construction to accommodate inspections and tests.
- D. Schedule times for inspections, tests, taking samples, and similar activities.

- E. Retesting: CONTRACTOR is responsible for retesting where results of required inspections, tests, or similar services prove unsatisfactory and do not indicate compliance with Contract Document requirements, regardless of whether the original test was CONTRACTOR's responsibility.
 - 1. Cost of retesting construction revised or replaced by CONTRACTOR is CONTRACTOR's responsibility, where required tests were performed on original construction.
- F. Associated Services: Cooperate with agencies performing required inspections, tests, and similar services and provide reasonable auxiliary services as requested. Notify the agency sufficiently in advance of operations to permit assignment of personnel. Auxiliary services required include but are not limited to:
 - 1. Providing access to the Work and furnishing incidental labor and facilities necessary to facilitate inspections and tests.
 - 2. Taking adequate quantities of representative samples of materials that require testing or assisting the agency in taking samples.
 - 3. Providing facilities for storage and curing of test samples, and delivery of samples to testing laboratories.
 - 4. Providing the agency with a preliminary design mix proposed for use for materials mixes that require control by the testing agency.
 - 5. Security and protection of samples and test equipment at the Project site.

1.03 ENGINEER RESPONSIBILITIES

- A. Provide inspections, tests, and similar quality control services specified to be performed by independent agencies and not by CONTRACTOR, except where they are specifically indicated as CONTRACTOR's responsibility or are provided by another identified entity. Costs for these services are not included in the Contract Price.
- B. Engage and pay for the services of an independent agency to perform inspections and tests specified as ENGINEER's responsibility.
- C. ENGINEER will employ and pay for the services of an independent agency, testing laboratory, or other qualified firm to perform services which are ENGINEER's responsibility.

1.04 TESTING AGENCY RESPONSIBILITIES

- A. Where OWNER has engaged a testing agency or other entity for testing and inspection of a part of the Work, and CONTRACTOR is also required to engage an entity for the same or related element, CONTRACTOR shall not employ the entity engaged by OWNER, unless otherwise agreed in writing with OWNER.
- B. The independent testing agency engaged to perform inspections, sampling, and testing of materials and construction specified in individual Specification Sections shall cooperate with ENGINEER and CONTRACTOR in performance of its duties, and shall provide qualified personnel to perform required inspections and tests.
- C. The agency shall notify ENGINEER and CONTRACTOR promptly of irregularities or deficiencies observed in the Work during performance of its services.
- D. The agency is not authorized to release, revoke, alter, or enlarge requirements of the Contract Documents, or approve or accept any portion of the Work.

- E. The agency shall not perform any duties of CONTRACTOR.

1.05 SUBMITTALS

- A. The independent testing agency shall submit a certified written report of each inspection, test, or similar service to ENGINEER in triplicate, unless CONTRACTOR is responsible for the service. If CONTRACTOR is responsible for the service, submit a certified written report of each inspection, test, or similar service through CONTRACTOR in triplicate.
- B. Submit additional copies of each written report directly to the governing authority, when the authority so directs.
- C. Written reports of each inspection, test, or similar service shall include, but not be limited to:
 - 1. Date of issue.
 - 2. Project title and number.
 - 3. Name, address, and telephone number of testing agency.
 - 4. Dates and locations of samples and tests or inspections.
 - 5. Names of individuals making the inspection or test.
 - 6. Designation of the Work and test method.
 - 7. Identification of product and Specification Section.
 - 8. Complete inspection or test data.
 - 9. Test results and an interpretation of test results.
 - 10. Ambient conditions at the time of sample taking and testing.
 - 11. Comments or professional opinion as to whether inspected or tested Work complies with Contract Document requirements.
 - 12. Name and signature of laboratory inspector.
 - 13. Recommendations on retesting.
- D. Submittals to the ENGINEER and OWNER may be electronically submitted as described in Section 01330-SUBMITTALS.

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

3.01 REPAIR AND PROTECTION

- A. Upon completion of inspection, testing, sample taking, and similar services, repair damaged construction and restore substrates and finishes to eliminate deficiencies, including deficiencies in visual qualities of exposed finishes.
- B. Protect construction exposed by or for quality control service activities and protect repaired construction.

- C. Repair and protection is CONTRACTOR's responsibility regardless of the assignment of responsibility for inspection, testing, or similar services.

END OF SECTION

SECTION 01500 - TEMPORARY FACILITIES

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes: This Section specifies procedural and administrative requirements for temporary services and facilities.
- B. Temporary Utilities include, but are not limited to:
 - 1. Temporary electric power.
 - 2. Temporary lighting.
- C. Temporary Construction and Support Facilities include, but are not limited to:
 - 1. Temporary heating facilities.
 - 2. CONTRACTOR's field offices and storage sheds.
 - 3. ENGINEER's field office.
 - 4. Sanitary facilities.
 - 5. Dewatering facilities and drains.
- D. Construction Buildings and Facilities include, but are not limited to.
 - 1. Temporary enclosures.
 - 2. Temporary Project identification signs.
 - 3. Temporary Site identification signs.
 - 4. Temporary Project bulletin boards.
 - 5. Stairs.
 - 6. Ongoing construction cleanup.
 - 7. Rodent and pest control.
 - 8. Storage of equipment and material.
- E. Security and Protection Facilities required include, but are not limited to:
 - 1. Barricades, warning signs, lights.
 - 2. Enclosure fence for the Site.
 - 3. Security enclosure and lockup.
 - 4. Environmental protection.
 - 5. Control of noise.
 - 6. Dust control.
- F. Sedimentation Control Facilities required include, but are not limited to:
 - 1. Soil erosion and sedimentation control.
 - 2. Stormwater discharge control.
 - 3. Dewatering trenches and disposal of excess excavated material.

1.02 REFERENCES

- A. Natural Resources and Environmental Protection Act, P.A. 451 (Act 451) of 1994.
- B. Guidebook of Best Management Practices for Michigan Watersheds.

- C. Local Soil Erosion Control Ordinance or requirements.
- D. Michigan Manual of Uniform Traffic Control Devices (MMUTCD).
- E. Codes and Standards:
 - 1. Comply with NFPA Code 241, "Building Construction and Demolition Operations," ANSI A10 Series standards for "Safety Requirements for Construction and Demolition," and NECA Electrical Design Library, "Temporary Electrical Facilities."
 - 2. Refer to "Guidelines for Bid Conditions for Temporary Job Utilities and Services," prepared jointly by AGC and ASC, for industry recommendations.
 - 3. Comply with NEMA, NECA, and UL standards and regulations for temporary electric service. Install service in compliance with National Electric Code (NFPA 70).

1.03 SUBMITTALS

- A. Shop Drawings: Submit in accordance with Section 01330, Shop Drawings covering the items included under this Section. Shop Drawing submittals shall include:
 - 1. CONTRACTOR shall submit the Plan of Action for Traffic Control within 10 days after the Notice to Proceed is issued.
 - 2. Soil Erosion and Sedimentation Control Program prepared by CONTRACTOR, as specified in this Section, shall be reviewed and have received at least preliminary concurrence from the local Enforcing Agent before it will be presented and discussed at the Pre-Construction Conference, at which time final revisions may be made. Copies of the final agreed program, and Act 451 Permit, shall be delivered to ENGINEER a minimum of 2 weeks prior to beginning any Work on Site.
 - 3. Temporary Utilities: Submit a schedule indicating dates for implementation and termination of each temporary utility. At the earliest feasible time, when acceptable to OWNER, change over from use of temporary service to use of the permanent service.

1.04 QUALITY ASSURANCE

- A. Regulatory Requirements: Comply with industry standards and applicable laws and regulations of authorities having jurisdiction including, but not limited to:
 - 1. Building Code requirements.
 - 2. Health and Safety regulations.
 - 3. Utility Company regulations.
 - 4. Police, Fire Department, and Rescue Squad rules.
 - 5. Environmental Protection regulations.
 - 6. State and Local Soil Erosion and Sedimentation Control regulations.
- B. Inspection: Arrange for authorities having jurisdiction to inspect and test each temporary utility before use. Obtain required certifications and permits.

1.05 PROJECT CONDITIONS

- A. Unless otherwise provided in these Specifications, CONTRACTOR shall make CONTRACTOR's own arrangements for electricity, gas, water, and sewer services for use during the construction of the Work and shall pay for all temporary facilities, connections, extensions, and services.
 - 1. Cost or use charges for temporary facilities are not chargeable to OWNER or ENGINEER, and will not be accepted as a basis of claims for a Change Order.

- B. Keep temporary services and facilities clean and neat in appearance. Operate in a safe and efficient manner. Take necessary fire prevention measures. Do no overload facilities or permit them to interfere with progress. Do not allow hazardous, dangerous or unsanitary conditions, or public nuisances to develop or persist on Site.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Provide new materials; if acceptable to ENGINEER, undamaged previously used materials in serviceable condition may be used. Provide materials suitable for the use intended.
- B. Water: Provide potable water approved by local health authorities.
- C. Seed: Consisting of, per acre, 10 pounds Kentucky 31 fescue, 3 pounds Birdsfoot Trefoil, and 3 pounds white clover.
- D. Fertilizers: Consisting of, at least, 200 pounds per acre 12:12:12, or equivalent.
- E. Mulches: Consisting of 2 tons per acre of straw or hay. Chemical mulch or other approved material may be used.
- F. Sod: Shall be as specified in Division 2.
- G. Barricades: Temporary barricades as approved by ENGINEER and OWNER shall be placed around construction area at all times to keep unauthorized personnel from entering such areas.

2.02 EQUIPMENT

- A. Provide new equipment; if acceptable to ENGINEER, undamaged, previously used equipment in serviceable condition may be used. Provide equipment suitable for use intended.
- B. Electrical Outlets: Provide properly configured NEMA polarized outlets to prevent insertion of 110 to 120 volt plugs into higher voltage outlets. Provide receptacle outlets equipped with ground-fault circuit interrupters, reset button, and pilot light for connection of power tools and equipment.
- C. Electrical Power Cords: Provide grounded extension cords; use "hard-service" cords where exposed to abrasion and traffic. Provide waterproof connectors to connect separate lengths of electric cords, if single lengths will not reach areas where construction activities are in progress.
- D. Heating Units: Provide temporary heating units that have been tested and labeled by UL, FM, or another recognized trade association related to the type of fuel being consumed.
- E. Temporary Offices: Provide prefabricated or mobile units or similar on-site construction with lockable entrances, operable windows, and serviceable finishes. Provide heated and air conditioned units on foundations adequate for normal loading.

- F. Temporary Toilet Units: Provide self-contained single-occupant toilet units, properly vented and fully enclosed with a glass fiber-reinforced polyester shell or similar nonabsorbent material.
- G. First Aid Supplies: Comply with governing regulations.
- H. Fire Extinguishers: Provide hand-carried, portable, UL rated, Class "A" fire extinguishers for temporary offices and similar spaces.
 - 1. In other locations, provide hand-carried, portable, UL rated, Class "ABC" dry chemical extinguishers, or a combination of extinguishers of NFPA recommended classes for the exposures.
 - 2. Comply with NFPA 10 and 241 for classification, extinguishing agent and size required by location and class of fire exposure.
- I. Project Identification Signs: Provide 8-foot wide by 4-foot high Project sign as detailed, of solid cedar wood and MDO plywood, painted, with exhibit lettering by a professional sign painter, with final graphics as approved by ENGINEER.
- J. Bulletin Board: Provide in CONTRACTOR's trailer, mounted in a conspicuous location.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Use qualified personnel for installation of temporary facilities. Locate facilities where they shall serve the Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required.
- B. Provide each facility ready for use when needed to avoid delay. Maintain and modify as required. Do not remove until facilities are no longer needed, or are replaced by authorized use of completed permanent facilities.

3.02 TEMPORARY UTILITY INSTALLATION

- A. Engage the appropriate local utility company to install temporary service or to connect to existing service. Where the company provides only part of the service, provide the remainder with matching, compatible materials and equipment; comply with the company's recommendations.
 - 1. Arrange with the company and existing users for a time when service can be interrupted, where necessary, to make connections for temporary services.
- B. Water Service and Distribution: CONTRACTOR shall at all times provide for CONTRACTOR's employees an abundant and convenient supply of cool drinking water taken from a potable source.
- C. Temporary Electric Power Service: Provide weatherproof, grounded electric power service and distribution system of sufficient size, capacity, and power characteristics during construction period. Include meters, transformers, overload protected disconnects, automatic ground fault interrupters, and main distribution switchgear.
 - 1. Except where overhead service must be used, install electric power service underground.

2. Install wiring overhead, and rise vertically where least exposed to damage. Where permitted, wiring circuits not exceeding 125 volts, AC 20 ampere rating, and lighting circuits may be nonmetallic sheathed cable where overhead and exposed for surveillance.
- D. Temporary Lighting: Wherever overhead floor or roof deck has been installed, provide temporary lighting with local switching.
1. Install and operate temporary lighting that shall fulfill security and protection requirements, without operating the entire system, and shall provide adequate illumination for construction operations and traffic conditions.
 2. When permanent lights and receptacles are installed in new areas of construction, CONTRACTOR may use them.
- E. Temporary Telephones: Provide temporary telephone service for all personnel engaged in construction activities, throughout the construction period. Install telephone on a separate line for each temporary office and first aid station.
1. At each telephone, post a list of important telephone numbers.
- F. Public and Private Utilities: Where any utilities, water, sewer, gas, telephone, or any other either public or private, are encountered, CONTRACTOR must provide adequate protection for them, and CONTRACTOR shall be held responsible for any damages to such utilities arising from CONTRACTOR's operations.
1. When it is apparent that construction operations may endanger the foundation of any utility conduit or the support of any structure, CONTRACTOR shall notify the utility Owner of this possibility and CONTRACTOR shall take such steps as may be required to provide temporary bracing or support of conduits or structures.
 2. Where it is the policy of utility Owners to make repairs to damaged conduit or other structures, CONTRACTOR shall cooperate to the fullest extent with the utility, and CONTRACTOR shall see that CONTRACTOR's operations interfere as little as possible with those operations.
 3. When it is necessary to carry out the Work, that an electric, telephone, or light pole be moved to a new location, or moved and replaced after construction, CONTRACTOR shall arrange for the moving of such poles and the lines thereof, and shall pay any charges therefor.
 4. Where existing utilities are encountered along the line of Work, CONTRACTOR shall perform CONTRACTOR's operations in such a manner that service will not be interrupted, and shall, at CONTRACTOR's own expense, make all temporary provisions to maintain service.
 5. Unless otherwise indicated on Drawings, CONTRACTOR shall replace any disturbed sewer or drain, or relay same at a new grade to be established by ENGINEER, such that sufficient clearance for the sewer will be provided.
 6. CONTRACTOR will receive no extra compensation for replacement of sewers or drains encountered, or for relaying at a new grade and/or line where necessary, except where specifically noted otherwise on Drawings or Specifications.
 7. Where existing gas mains and services are encountered, CONTRACTOR shall arrange with the gas company for any necessary relaying, and shall pay for the cost of such work.
 8. Materials used in repairing or relaying utilities shall be the same type and strength as the existing Work.
- G. Storm and Sanitary Sewers: If sewers are available, CONTRACTOR may provide temporary connections to remove effluent that can be discharged lawfully. If sewers are not available or cannot be used, provide portable units.

1. If gas is present in existing sewers or tanks where CONTRACTOR must work, they shall be cleared of gas before entering. If the gas cannot be removed by natural ventilation by the removal of covers, CONTRACTOR shall maintain forced draft to render the area safe as determined by gas detection equipment.
2. Filter out excessive amounts of soil, construction debris, chemicals, oils, and similar contaminants that might clog sewers or pollute waterways before discharge.
3. Connect temporary sewers to the municipal system as directed by the sewer department officials.
4. Maintain temporary sewers and drainage facilities in a clean, sanitary condition. Following heavy use, restore normal conditions promptly.
5. Provide barriers in and around excavations and subgrade construction, sufficient to prevent flooding by runoff of stormwater from heavy rains.

3.03 TEMPORARY CONSTRUCTION AND SUPPORT FACILITIES INSTALLATION

- A. Locate field offices, storage sheds, sanitary facilities, and other temporary construction and support facilities for easy access.
 1. Maintain temporary construction and support facilities until near Substantial Completion. Remove prior to Substantial Completion. Personnel remaining after Substantial Completion will be permitted to use permanent facilities, under conditions acceptable to OWNER.
 2. Provide incombustible construction for offices, shops, and sheds located within the construction area, or within 30 feet of building lines. Comply with requirements of NFPA 241.
- B. Temporary Heating Facilities: Provide temporary heat required by construction activities for curing or drying of completed installations or protection of installed construction from adverse effects of low temperatures or high humidity. Select safe equipment that will not have a harmful effect on completed installations or elements being installed. Coordinate ventilation requirements to produce the ambient condition required and minimize consumption of energy.
 1. Except where use of the permanent system is authorized, provide vented self-contained LP gas or fuel oil heaters with individual space thermostatic control.
 2. Use of gasoline-burning space heaters, open flame, or salamander-type heating units is prohibited.
- C. CONTRACTOR's Field Offices: Provide insulated, weathertight temporary offices of sufficient size to accommodate required office personnel at Site. Keep the office clean and orderly for use for small progress meetings.
- D. ENGINEER's Field Office: CONTRACTOR shall provide and maintain one of the following types of field offices for the life of the Project as listed on Bid Form. ENGINEER's field office shall be operational 3 weeks before and after the construction period.
 1. Type B Field Office shall have minimum exterior dimensions of 8-foot width and 20-foot length and be equipped using acceptable second-hand or on-site constructed furniture as follows:
 - a. At least four windows with provision for cross-ventilation.
 - b. Securely locking exterior door.
 - c. Two desks with drawers.
 - d. Three desk chairs.
 - e. Plan table and stool.
 - f. Two wastebaskets.
 - g. Six electric outlets.
 - h. Two smoke alarms.

- i. Two 10-pound Class "ABC" fire extinguishers
 - 2. ENGINEER's field office shall be for the exclusive use of ENGINEER and shall be securely anchored for stability in high winds.
 - 3. CONTRACTOR shall provide electric or propane heat, electric air conditioning, screened and locking windows, toilet and lavatory facilities with potable water, wardrobe closet, electric light, local telephone service with two phone lines, and semi-weekly janitorial service in ENGINEER's office during the continuance of this Contract. Offices shall have a minimum of 6'-9" ceiling height.
 - 4. CONTRACTOR shall arrange, furnish and provide service for during the Contract Times:
 - a. DSL service.
 - b. Plain paper facsimile machine.
- E. Sanitary Facilities: Sanitary facilities include temporary toilets, wash facilities, and drinking water fixtures. Comply with regulations and health Codes for the type, number, location, operation, and maintenance of fixtures and facilities. Install where facilities will best service the Project's needs.
- 1. Provide toilet tissue, paper towels, paper cups, and similar disposable materials for each facility. Provide covered waste containers for used material.
 - 2. Install self-contained toilet units. Shield toilets to ensure privacy. Use of pit-type privies will not be permitted.
 - 3. Install wash facilities supplied with potable water at convenient locations for personnel involved in handling materials that require wash-up for a healthy and sanitary condition. Dispose of drainage properly. Supply cleaning compounds appropriate for each condition.
 - 4. Provide safety showers, eyewash fountains and similar facilities where needed for safety and sanitation of personnel.
- F. Dewatering Facilities and Drains: For temporary drainage and dewatering facilities and operations not directly associated with construction activities included under individual Sections, comply with dewatering requirements of applicable Division 2 Sections. Where feasible, utilize the same facilities. Maintain the Site, excavations, and construction free of water.

3.04 CONSTRUCTION BUILDINGS AND FACILITIES INSTALLATION

- A. Storage platforms, sheds, temporary closures for doors, windows and other openings of buildings, temporary sidewalks, runways, and ladders shall be provided.
 - 1. Hazardous areas shall be protected by guardrails and fences. Storage platforms and sheds shall be provided for materials which require protection from the weather.
 - 2. Sheds shall be substantially constructed and covered with "ready roofing." Doors, windows, and other openings in the permanent work shall be closed as soon as necessary to safeguard the construction and materials from tampering or damage.
 - 3. Enclosures for openings easily accessible from the exterior shall be of solid wood or sash, provided with necessary hardware and padlocks. Other openings shall be enclosed by old sash or canvas on wooden frames for the protection of the building against damage by weather.
 - 4. Enclosures shall be weathertight and secured in such manner as not to damage the finish of the building.
- B. Temporary Enclosures: Provide temporary enclosure for protection of construction in progress and completed, from exposure, foul weather, other construction operations and similar activities.
 - 1. Where heat is needed and the permanent building enclosure is not complete, provide temporary enclosures where there is no other provision for containment of heat. Coordinate enclosure with

- ventilating and material drying or curing requirements to avoid dangerous conditions and effects.
 - 2. Install tarpaulins securely, with incombustible wood framing and other materials. Close openings of 25 square feet or less with plywood or similar materials.
 - 3. Close openings through floor or roof decks and horizontal surfaces with load-bearing wood-framed construction.
- C. Temporary Project Identification Signs: Engage an experienced sign painter to apply graphics. Comply with details indicated. Verify with ENGINEER final wording of graphics to be placed on sign and final location of sign. Obtain sign permit from local authority.
- D. Temporary Site Identification and Signs: Prepare Site identification and other signs of the size indicated; install signs where indicated or as directed by ENGINEER to inform construction personnel, public and visitors seeking entrance to Site. Do not permit installation of unauthorized signs.
- E. Temporary Project Bulletin Board: As a minimum, the following items must be posted:
- 1. Wage Rates (when applicable).
 - 2. Safety Poster (OSHA or State OSHA).
 - 3. Nondiscrimination Poster.
 - 4. Equal Employment Opportunity Statement signed by a Company official.
 - 5. Grading Permit (Soil Erosion and Sedimentation Control Act 451).
- F. Stairs: Until permanent stairs are available, provide temporary stairs where ladders are not adequate. Cover finished permanent stairs with a protective covering of plywood or similar material so finishes will be undamaged at the time of acceptance.
- G. Hoists: CONTRACTOR shall provide temporary hoists to lift building materials and equipment to the intended areas. Hoists shall be capable of carrying the intended load without exceeding the load limitation of the hoisting device.
- H. Ongoing Construction Cleanup: Project cleanup shall be an ongoing operation. CONTRACTOR shall maintain an order of neatness and good housekeeping comparable to that maintained by OWNER. Project cleanup applies to the Site and all areas affected by construction operations. CONTRACTOR shall:
- 1. Collect waste from construction areas and elsewhere daily. Comply with requirements of NFPA 241 for removal of combustible waste material and debris. Enforce requirements strictly. Do not hold materials more than 7 days during normal weather or 3 days when the temperature is expected to rise above 80 degrees F (27 degrees C). Handle hazardous, dangerous, or unsanitary waste materials separately from other waste by containerizing properly. Dispose of material in a lawful manner.
 - 2. Maintain dirt and debris resulting from CONTRACTOR's operations in designated spoil piles as approved by ENGINEER or remove from the Site daily. Dirt and debris shall not collect or interfere with OWNER's facility operations. Excess dirt and debris shall be removed from the Site as needed to confine spoil piles in designated areas.
 - 3. Perform general cleanup inside of OWNER's buildings at least once every two weeks. Cleanup shall include consolidation of stored materials, removal of waste material and debris, and sweeping of flooring surfaces.

4. Maintain clear access to all properties affected by construction activities. Maintain unobstructed access to existing buildings, equipment, safety equipment, and other items requiring OWNER access for facility operation.
 5. Keep tools, equipment, and materials in a neat and orderly arrangement.
 6. Maintain culverts, sewers, and drainage structures by removing sediment and debris from construction operations.
 7. Repair all holes and ruts resulting from construction operations that affect OWNER's use of property with approved material; compact, level, and restore.
- I. Rodent and Pest Control: CONTRACTOR shall employ a licensed pest control service during the Contract Times of this Contract.
1. Pest control service shall maintain Site free from:
 - a. Mice, rats, and similar rodents.
 - b. Termites, carpenter ants, and similar pests.
 2. Pest control services shall be performed at the start of the Project. Inspections and maintenance of pest control products shall be performed on a monthly basis.
- J. Storage of Equipment and Material: Pumps and other machinery units shall be stored in weathertight structures provided by CONTRACTOR.
1. Motors, electrical switchgear, gauges, and other equipment of a delicate nature, as determined by ENGINEER, shall be stored in weathertight warehouses which are maintained at a temperature of at least 60 degrees F.
 2. Structural steel, miscellaneous and cast iron items may be placed in open yard storage, but any such items having attached motors or other machinery units shall have such units well wrapped with waterproof paper or cloth for protection from the weather.
 3. 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 ENGINEER.
 4. Materials and equipment distributed, stored, and placed upon or near the Site of the Work shall at all times be so disposed as not to interfere with work prosecuted by OWNER or other Contractors in the employment of OWNER or with drainage. Materials and equipment shall not be stored on public streets.

3.05 SECURITY AND PROTECTION FACILITIES INSTALLATION

- A. Except for use of permanent fire protection as soon as available, do not change over from use of temporary security and protection facilities to permanent facilities until Substantial Completion, or longer as requested by ENGINEER.
- B. Temporary Fire Protection: Until fire protection needs are supplied by permanent facilities, install and maintain temporary fire protection facilities of the types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 10, "Standard for Portable Fire Extinguishers," and NFPA 241, "Standard for Safeguarding Construction, Alterations and Demolition Operations."
1. Locate fire extinguishers where convenient and effective for their intended purpose, but not less than 1 extinguisher on each floor at or near each usable stairwell.
 2. Store combustible materials in containers in fire-safe locations.
 3. Maintain unobstructed access to fire extinguishers, fire hydrants, temporary fire protection facilities, stairways, and other access routes for fighting fires. Prohibit smoking in hazardous fire exposure areas.

4. Provide supervision of welding operations, combustion type temporary heating units, and similar sources of fire ignition.
- C. Barricades, Warning Signs, and Lights: Comply with Standards and Code requirements for erection of structurally adequate barricades. Paint with appropriate colors, graphics, and warning signs to inform personnel and the public of the hazard being protected against. Where appropriate and needed, provide lighting, including flashing red or amber lights.
- D. Environmental Protection: Provide protection, operate temporary facilities and conduct construction in ways and by methods that comply with environmental regulations and minimize the possibility that air, waterways and subsoil might be contaminated or polluted, or that other undesirable effects might result. Avoid use of tools and equipment which produce harmful noise. Restrict use of noise-making tools and equipment to hours that will minimize complaints from persons or firms near the Site.
- E. Control of Noise: CONTRACTOR shall eliminate noise to as great an extent as possible at all times. Air compressors shall be equipped with silencers, and the exhaust of all gasoline motors and other power equipment shall be provided with mufflers.
- F. On-Site Burning: Burning of waste materials resulting from the Work under this Contract will not be allowed unless authorized in writing by OWNER. Where burning is not allowed, CONTRACTOR shall haul all waste materials from Site and dispose of same in a manner acceptable to ENGINEER.
 1. The costs of hauling and disposal of waste materials shall be included in other items of the Work under this Contract.
- G. Dust Control: CONTRACTOR shall take all steps necessary for the alleviation or prevention of dust nuisance caused by or resulting from CONTRACTOR's operations and shall apply water or dust palliative, or both, as required. No direct payment will be made for any such Work performed or materials used to control dust from this Contract.

3.06 SEDIMENTATION CONTROL FACILITIES INSTALLATION

- A. Soil Erosion and Sedimentation Control: CONTRACTOR shall take all precautions necessary to prevent soil erosion of areas disturbed by the construction and shall ensure that all soil erosion be contained within the construction Site. CONTRACTOR shall provide temporary slope protection, temporary dikes, etc., as required to prevent eroded materials from entering any sewers or natural watercourses.

3.07 FIELD QUALITY CONTROL

- A. Any unforeseen situations that may be encountered during the course of construction that may cause accelerated erosion and deposition of sediment into waterways and/or lakes shall be controlled by methods that may include sediment traps, sediment basins, or holding ponds. Any slope failures or development of gullies after construction has been completed shall be corrected immediately.
- B. Should the local Regulatory Agency determine at any time during construction that the construction operation is in violation of the Natural Resources and Environmental Protection Act, P.A. 451 (Act 451) of 1994 and cite OWNER, CONTRACTOR or Subcontractor shall take immediate action, as directed by OWNER, to ensure compliance with the Act.

3.08 OPERATION, TERMINATION, AND REMOVAL

- A. Supervision: Enforce strict discipline in use of temporary facilities. Limit availability of temporary facilities to essential and intended uses to minimize waste and abuse.
- B. Maintenance: Maintain facilities in good operating condition until removal. Protect from damage by freezing temperatures and similar elements.
 - 1. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation, and similar facilities on a 24-hour-day basis where required to achieve indicated results and to avoid possibility of damage.
- C. Protection: Prevent water-filled piping from freezing. Maintain markers for underground lines. Protect from damage during excavation operations.
- D. Termination and Removal: Unless ENGINEER requires that it be maintained longer, remove each temporary facility when the need has ended, or when replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with the temporary facility. Repair damaged Work, clean exposed surfaces and replace construction that cannot be satisfactorily repaired.
 - 1. Materials and facilities that constitute temporary facilities are property of CONTRACTOR. OWNER reserves the right to take possession of Project identification signs.
 - 2. At Substantial Completion, clean and renovate permanent facilities that have been used during the construction period including, but not limited to:
 - a. Replace air filters and clean inside of ductwork and housings.
 - b. Replace significantly worn parts and parts that have been subject to unusual operating conditions.
 - c. Replace lamps that are burned out or noticeably dimmed by substantial hours of use.

END OF SECTION

SECTION 01600 - GENERAL EQUIPMENT STIPULATIONS

PART 1 - GENERAL

1.01 SUMMARY

- A. These General Equipment Stipulations apply, in general, to all equipment provided under other Specification Sections. They shall supplement the detailed equipment specifications, but in cases of conflict the equipment specifications shall govern.

1.02 OPERATION AND MAINTENANCE

- A. All equipment suppliers shall submit to ENGINEER, through CONTRACTOR, 4 bound copies and 1 electronic/digital format copy of a manual containing specifications, Drawings, and descriptions of equipment; installation instructions; operation, maintenance, and lubrication manuals; parts lists; emergency instructions; and where applicable, test data with curves, wiring diagrams, PLC programs on CD and schematics. This information shall be submitted for each item of equipment furnished under this Contract and shall be specific to the exact equipment models complete with all appurtenances provided. It shall also include detailed, comprehensive directions for all required maintenance activities and for the repair or replacement of all wearing parts. Special attention shall be paid to necessary safety precautions that OWNER's staff should take when operating, maintaining, or repairing the equipment.

1. Bound copies of O&M Manuals shall be in addition to any instructions shipped with the equipment and shall be submitted only after ENGINEER has given final approval of Shop Drawings. All manuals shall be submitted to ENGINEER following final Shop Drawing approval and prior to the date of shipment of the equipment to the Site. Organize operation and maintenance manuals into suitable sets of manageable size, organized by section or process, as directed by ENGINEER. Bind properly indexed data in heavy-duty 2-inch, 3-ring vinyl-covered binders, with pocket folders for folded sheet information. Appropriate identification shall be noted on the front and spine of each binder.
2. Electronic Copy of O&M Manuals: Each equipment O&M manual shall be provided with an electronic disk, matching the content of the final approved printed O&M Manual. The information shall be saved in a single ".pdf" file, with bookmarks for each chapter, section, appendices, etc., as well as each piece of equipment. Where numerous pieces of equipment may be addressed within a section, a second tier of bookmarks shall be provided to allow quick access to each piece of equipment or key piece of information.
3. "Sample" Table of Contents:

Bookmarks

Table of Contents

Section 1 - Approved Shop Drawings

Submersible Pumps

Base-mounted Pumps

Section 2 - Installation Instructions and Parts Identification

Submersible Pumps

Base-mounted Pumps

Section 3 - Operations and Maintenance Information

Section 4 - Troubleshooting (If not included in Section 3.)

Section 5 - Parts List (If not included in Section 3.)

Section 6 - Lubrication Instructions (If not included in Section 3.)

4. These manuals shall be in addition to any instructions shipped with the equipment and shall be submitted only after ENGINEER has given final approval of Shop Drawings. All manuals shall be submitted to ENGINEER following final Shop Drawing approval and prior to the date of shipment of the equipment to the Site. Organize operation and maintenance manuals into suitable sets of manageable size, organized by section or process, as directed by ENGINEER. Bind properly indexed data in heavy-duty 2-inch, 3-ring vinyl-covered binders, with pocket folders for folded sheet information. Appropriate identification shall be noted on the front and spine of each binder. Three CD's shall be provide that include information in manual.

1.03 QUALITY ASSURANCE

- A. Compliance with OSHA: All equipment provided under this Contract shall meet all the requirements of the Federal and/or State Occupational Safety and Health Acts. Each equipment supplier shall submit to ENGINEER certification that the equipment furnished is in compliance with OSHA.
- B. Electrical Codes, Ordinances, and Industrial Standards: The design, testing, assembly, and methods of installation of the wiring materials, electrical equipment and accessories proposed under this Contract shall conform to the National Electrical Code and to applicable State and local requirements. UL listing and labeling shall be adhered to under this Contract. Any equipment that does not have a UL, FM, CSA, or other listed testing laboratory label shall be furnished with a notarized letter signed by the supplier stating that the equipment furnished has been manufactured in accordance with the National Electrical Code and OSHA requirements. Any additional cost resulting from any deviation from codes or local requirements shall be borne by CONTRACTOR.

1.04 SHIPPING AND HANDLING EQUIPMENT

- A. All equipment shall be boxed, crated, or otherwise completely enclosed and protected during shipment and handling.

1.05 SPARE MATERIALS

- A. Spare material shall be provided as indicated in the individual specification sections.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Manufacturers shall be indicated in individual specification sections.

2.02 MATERIALS

- A. Anchor and Hardware: Anchors, bolts, nuts, washers, hangers, strut, etc shall be 316 stainless steel.
- B. Shop Painting:
 1. Non-submerged Applications: Tnemec Series 37H, Chem-Prime.
 2. Submerged, Non-potable Applications: Tnemec Series 66, Hi-Build Epoxoline.
 3. Submerged, Potable Applications: Tnemec Series 139, Pota-Pox II.

4. Rust preventive compound shall be:
 - a. Dearborn Chemical, No-Ox-ID2W.
 - b. Houghton, Rust Veto 344.
 - c. Rust-Oleum R-9.

2.03 MANUFACTURED UNITS

- A. Wall and Slab Sleeves and Castings: Where water- or gas-tightness is essential and at other locations where indicated, wall castings and sleeves shall be provided with an intermediate flange located approximately at the center of the wall or slab.
 1. All sleeves and casting shall be flush with walls and underside of slabs but shall extend 2 inches above finished floors.

2.04 COMPONENTS

- A. Lubrication: Equipment shall be adequately lubricated by systems which require attention no more often than weekly during continuous operation. Lubrication system shall not require attention during start-up or shutdown and shall not waste lubricants.
 1. Lubrication point shall be easily accessible with all points of application provided with standard fittings for greasing or placing oil.
 2. Lubricants of the type recommended by the equipment manufacturer shall be provided in sufficient quantity for all consumption prior to completion of required testing and acceptance of equipment by OWNER.
- B. Safety Guards: All belt or chain drives, fan blades, couplings, vertical or horizontal drive shafts, and other moving or rotating parts shall be covered on all sides by a safety guard. Safety guards shall be fabricated from 16 gauge or heavier galvanized or aluminum-clad sheet steel or 1/2-inch mesh galvanized expanded metal. Each guard shall be designed for easy installation and removal and painted safety yellow.
 1. All necessary supports and accessories shall be provided for each guard. Supports and accessories, including bolts, shall be hot-dipped galvanized.
 2. All safety guards in outdoor locations shall be designed to prevent the entrance of rain and dripping water.
- C. Anchor Bolts: All necessary anchor bolts shall be provided as per the manufacturer's recommendations for size, strength, and location and shall meet the requirements of Standard Details on Drawings. Substantial templates and working drawings for installation shall be provided. Two nuts shall be furnished.
 1. Unless otherwise shown or specified, anchor bolts for items of equipment mounted on baseplates shall be long enough to permit 1-1/2 inches of grout beneath the baseplate and to provide adequate anchorage into structural concrete.
- D. Seals: Mercury seals will not be acceptable.
- E. Bearings: All antifriction bearings shall be designed per the Anti-Friction Bearing Manufacturers Association (AFBMA) recommendations with a rating life of B-10, 30,000 hours.
- F. Equipment Bases: A cast iron or welded steel baseplate shall be provided for all equipment and motor assemblies. Each baseplate shall support the unit and its drive assembly, shall be of a neat design with pads for anchoring the units, shall have a raised lip all around, and shall have a threaded

drain connection. Bases shall be fully braced to withstand shock loads and resist buckling. Necessary safety guard mounting shall be provided as part of the equipment base.

- G. Motor Starters and Control Panels: Motor starters 480 volt or less shall be size one or larger and have 120 volt AC contactor coils. All control circuits and indicating lights associated with the starter shall be 120 volt. The control transformer shall be sized to have 100 VA minimum spare capacity for future use. A terminal strip shall be provided for all control wires entering the starter with spare terminals for future use. The terminal strip and wires shall be identified. One spare normally open auxiliary starter contact, wired to the terminal strip, shall be provided for future use. Indicating lights shall be 120 volt, oiltight, push-to-test type. Explosion-proof units shall meet NEC Class I, Division I, Group D requirements.
 - 1. Provide equipment enclosures appropriate for areas in which they are installed. Each area will be designated on Drawings with a type of construction, such as NEMA 4, 4X, 7, or 9 if it is other than NEMA 12. An area designated by a name and elevation includes space bounded by floor, ceiling, and enclosing walls.

2.05 FABRICATION

- A. Shop Painting: All iron and steel surfaces shall be protected by suitable paint or coatings applied in the shop or at point of fabrication. Surfaces which will be inaccessible after assembly shall be protected for the life of the equipment.
 - 1. All iron and steel surfaces which will be totally or partially submerged or located in a continuously or intermittently moist atmosphere during normal operation shall be shop blast cleaned to a near-white finish, removing all dirt, rust-scale, and foreign matter by any of the recommended methods outlined in the Steel Structures Painting Council Specification SP-10.
 - 2. The cleaned surfaces shall be shop primed before any rust bloom forms. All other exposed surface shall be properly filed, scraped, sanded, etched, brushed, sandblasted, and/or cleaned to provide surfaces free from dirt, loose crystals, rust, scale, oil, and grease and shop primed.
 - 3. Shop primed surfaces shall be painted with one or more coats of a primer which meets the requirements of this Section and is compatible with the finish painting system specified in Section 09900. Minimum shop coat thickness shall be 1.5 dry mills.
- B. Sluice gates shall be factory painted with coal tar.
- C. The exterior surfaces of all ground-buried valves shall receive a coal tar or bituminous coating in accordance with manufacturer's standards. The inside surfaces of all valves shall be coated with coal-tar pitch varnish in accordance with the latest AWWA Specifications.
- D. Electric motors, speed reducers, starters, pumps, motor control centers, control panels, and other self-contained or enclosed components shall be shop finished with 2 coats of an enamel paint as per manufacturer's recommendations.
- E. Where specified, steel and iron surfaces shall be hot-dipped galvanized in conformity with ASTM A 153 and A 385.
- F. Machined, polished, and nonferrous surfaces which are not to be painted or galvanized shall be coated with rust preventive compound.

PART 3 - EXECUTION

3.01 EQUIPMENT BASES

- A. The baseplate shall be installed on a concrete base. Baseplates shall be anchored to the concrete base with suitable anchor bolts and grouted in place.

3.02 WALL AND SLAB SLEEVES AND CASTINGS

- A. Unless otherwise shown on Drawings or specified, at all points where pipes or conduit pass through walls, slabs or roofs, suitable sleeves or castings shall be furnished and installed. Sleeves and castings shall not be painted in areas to be embedded in the concrete. All loose rust, scale, grease, or oil shall be removed prior to pouring the concrete.
- B. Unless otherwise shown or approved by ENGINEER, the space between the pipe and the sleeve shall be link-sealed as shown on the drawings or caulked if the space is too small for link-seal.

3.03 EQUIPMENT INSTALLATION CHECK

- A. An experienced, competent, and authorized representative of the manufacturer or supplier of each item of equipment shall visit Site of Work a minimum of 2 times, once prior to installation to review installation procedures with CONTRACTOR and once after installation to inspect, check, adjust if necessary, and approve the equipment's installation. The equipment supplier's representative shall revisit Site as often as necessary until all trouble is corrected and the equipment installation and operation is satisfactory to ENGINEER.
- B. Manufacturer's representative shall provide all necessary tools and testing equipment required including noise level and vibration sensing equipment.
- C. Each equipment supplier's representative shall furnish to OWNER, through ENGINEER, a written report certifying that the equipment:
 - 1. Has been properly installed and lubricated;
 - 2. Is in accurate alignment;
 - 3. Is free from any undue stress imposed by connecting piping or anchor bolts;
 - 4. Has been operated under full load condition and that it operated satisfactorily to ENGINEER;
 - 5. That OWNER's Representative has been instructed in the proper maintenance and operation of the equipment; and
 - 6. Furnish OWNER a copy of all test data recorded during the installation check including noise level and vibration readings.

3.04 OPERATION AND MAINTENANCE TRAINING

- A. Provide services of manufacturer's service representative to instruct OWNER's personnel in operation and maintenance of equipment. Training shall include start-up and shutdown, servicing and preventative maintenance schedule and procedures, and troubleshooting procedures plus procedures for obtaining repair parts and technical assistance.
 - 1. Manufacturer's representative shall provide 1 day, 8 hours, on-Site training.
 - 2. Review operating and maintenance data contained in the operating and maintenance manuals.
 - 3. Schedule training with OWNER, provide at least 7-day prior written notice to ENGINEER.

END OF SECTION

SECTION 01730 - CUTTING AND PATCHING

PART 1 - GENERAL

1.01 SUMMARY

- A. This Section specifies administrative and procedural requirements for cutting and patching.
- B. Related Sections:
 - 1. Refer to other Sections for specific requirements and limitations applicable to cutting and patching individual parts of the Work. Requirements of this Section apply to mechanical and electrical installations. Refer to Division 15 and Division 16 Sections for other requirements and limitations applicable to cutting and patching mechanical and electrical installations.

1.02 SUBMITTALS

- A. Cutting and Patching Proposed Method: Where approval of procedures for cutting and patching is required before proceeding, submit a proposal describing procedures well in advance of the time cutting and patching will be performed and request approval from ENGINEER to proceed.

1.03 QUALITY ASSURANCE

- A. Requirements for Structural Work: Do not cut and patch structural elements in a manner that would reduce their load-carrying capacity or load-deflection ratio.
- B. Operational and Safety Limitations: Do not cut and patch operating elements or safety related components in a manner that would result in reducing their capacity to perform as intended, or result in increased maintenance or decreased operational life or safety.
- C. Visual Requirements: Do not cut and patch construction exposed on the exterior or in occupied spaces, in a manner that would, in ENGINEER's opinion, reduce the building's aesthetic qualities, or result in visual evidence of cutting and patching. Remove and replace Work cut and patched in a visually unsatisfactory manner.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Use materials that are identical to existing materials. If identical materials are not available or cannot be used where exposed surfaces are involved, use materials that match existing adjacent surfaces to the fullest extent possible with regard to visual effect. Use materials whose installed performance shall equal or surpass that of existing materials.

PART 3 - EXECUTION

3.01 INSPECTION

- A. Before cutting existing surfaces, examine surfaces to be cut and patched and conditions under which cutting and patching is to be performed. Take corrective action before proceeding, if unsafe or unsatisfactory conditions are encountered.

3.02 PREPARATION

- A. Provide temporary support of Work to be cut.
- B. Protect existing construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of the Project that might be exposed during cutting and patching operations.
- C. Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.
- D. Take all precautions necessary to avoid cutting existing pipe, conduit, or ductwork serving the building, but scheduled to be removed or relocated until provisions have been made to bypass them.

3.03 PERFORMANCE

- A. Employ skilled workmen to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time and complete without delay.
- B. Cut existing construction to provide for installation of other components or performance of other construction activities and the subsequent fitting and patching required to restore surfaces to their original condition.
- C. Cutting: Cut existing construction using methods least likely to damage elements to be retained or adjoining construction. Where possible review proposed procedures with the original installer; comply with the original installer's recommendations.
 - 1. In general, where cutting is required use hand or small power tools designed for sawing or grinding, not hammering and chopping. Cut holes and slots neatly to size required with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
 - 2. To avoid marring existing finished surfaces, cut or drill from the exposed or finished side into concealed surfaces.
 - 3. Cut through concrete and masonry using a cutting machine such as a carborundum saw or diamond core drill.
- D. Comply with requirements of applicable Sections of Division 2 where cutting and patching requires excavating and backfilling.
- E. Cap, valve or plug, and seal the remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after bypassing and cutting.
- F. Patching: Patch with durable seams that are as invisible as possible. Comply with specified tolerances.
 - 1. Where feasible, inspect and test patched areas to demonstrate integrity of the installation.

2. Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will eliminate evidence of patching and refinishing.
3. Patch, repair or rehang existing ceilings as necessary to provide an even plane surface of uniform appearance.

3.04 CLEANING

- A. Thoroughly clean areas and spaces where cutting and patching is performed or used as access. Remove completely paint, mortar, oils, putty, and items of similar nature. Thoroughly clean piping, conduit and similar features before painting or other finishing is applied. Restore damaged pipe covering to its original condition.

END OF SECTION

SECTION 01770 - CONTRACT CLOSEOUT

PART 1 - GENERAL

1.01 SUMMARY

- A. This Section specifies administrative and procedural requirements for Contract closeout including, but not limited to:
 - 1. Warranties and Bonds.
 - 2. Requirements for Substantial Completion.
 - 3. Project record document submittal.
 - 4. Equipment acceptance.
 - 5. Operating and maintenance manual submittal.
 - 6. Final cleaning.
- B. Refer to the General Conditions for terms of CONTRACTOR's special warranty of workmanship and materials.
- C. Specific requirements for warranties for the Work and products and installation that are specified to be warranted, are included in the individual Sections of Divisions 2 through 16.
- D. Certifications and other commitments and agreements for continuing services to OWNER are specified elsewhere in the Contract Documents.

1.02 WARRANTY REQUIREMENTS

- A. Disclaimers and Limitations: Manufacturer's disclaimers and limitations on product warranties do not relieve CONTRACTOR of the warranty on the Work that incorporates the products, nor does it relieve suppliers, manufacturers, and subcontractors required to countersign special warranties with CONTRACTOR.
- B. Related Damages and Losses: When correcting warranted Work that has failed, remove and replace other Work that has been damaged as a result of such failure or that must be removed and replaced to provide access for correction of warranted Work.
- C. Reinstatement of Warranty: When Work covered by a warranty has failed and been corrected by replacement or rebuilding, reinstate the warranty by written endorsement. The reinstated warranty shall be equal to the original warranty with an equitable adjustment for depreciation.
- D. Replacement Cost: Upon determination that Work covered by a warranty has failed, replace or rebuild the Work to an acceptable condition complying with requirements of Contract Documents. CONTRACTOR is responsible for the cost of replacing or rebuilding defective Work regardless of whether OWNER has benefited from use of the Work through a portion of its anticipated useful service life.
- E. OWNER's Recourse: Written warranties made to OWNER are in addition to implied warranties, and shall not limit the duties, obligations, rights, and remedies otherwise available under the law, nor shall warranty periods be interpreted as limitations on time in which OWNER can enforce such other duties, obligations, rights, or remedies.

- F. Rejection of Warranties: OWNER reserves the right to reject warranties and to limit selections to products with warranties not in conflict with requirements of the Contract Documents.
- G. OWNER reserves the right to refuse to accept Work for the Project where a special warranty, certification, or similar commitment is required on such Work or part of the Work, until evidence is presented that entities required to countersign such commitments are willing to do so.

1.03 SUBSTANTIAL COMPLETION

- A. Before requesting inspection for certification of Substantial Completion, complete the following. List exceptions in the request.
 - 1. In the Application for Payment that coincides with, or first follows, the date Substantial Completion is claimed, show 100 percent completion for the portion of the Work claimed as substantially complete. Include supporting documents for completion as indicated in these Contract Documents and a statement showing an accounting of changes to the Contract Price.
 - 2. If 100 percent completion cannot be shown, include a list of incomplete items, the value of incomplete construction, and reasons the Work is not complete.
 - 3. Advise OWNER of pending insurance changeover requirements.
 - 4. Submit specific warranties, workmanship bonds, maintenance agreements, final certifications, and similar documents.
 - 5. Obtain and submit releases enabling OWNER unrestricted use of the Work and access to services and utilities; include occupancy permits, operating certificates, and similar releases.
 - 6. Complete final clean up requirements, including touch-up painting. Touch-up and otherwise repair and restore marred exposed finishes.
- B. Inspection Procedures: On receipt of a request for inspection, ENGINEER will either proceed with inspection or advise CONTRACTOR of unfilled requirements.
 - 1. ENGINEER will prepare the Certificate of Substantial Completion following inspection, or advise CONTRACTOR of construction that must be completed or corrected before the certificate will be issued.
 - 2. ENGINEER will repeat inspection when requested and assured that the Work has been substantially completed.
 - 3. Results of the completed inspection will form the basis of requirements for final acceptance.
- C. The warranty period for specific portions of the Work will begin on the date established on Component Acceptance Form or at such other date as agreed by OWNER, ENGINEER, and CONTRACTOR.

1.04 FINAL ACCEPTANCE

- A. Before requesting final inspection for certification of final acceptance and final payment, complete the following. List exceptions in the request.
 - 1. Submit the final payment request with releases and supporting documentation not previously submitted and accepted. Include certificates of insurance for products and completed operations where required.
 - 2. Submit an updated final statement, accounting for final additional changes to the Contract Price.
 - 3. Submit a copy of ENGINEER's final inspection list of items to be completed or corrected, stating that each item has been completed or otherwise resolved for acceptance, and the list has been endorsed and dated by ENGINEER.

4. Submit final meter readings for utilities, a measured record of stored fuel, and similar data as of the date of Substantial Completion, or when OWNER took possession of and responsibility for corresponding elements of the Work.
 5. Submit consent of surety to final payment.
 6. Submit a final liquidated damages settlement statement.
 7. Submit evidence of final, continuing insurance coverage complying with insurance requirements.
 8. Submit record drawings, maintenance manuals, final Project photographs, damage or settlement survey, property survey, and similar final record information.
 9. Deliver tools, spare parts, extra stock, and similar items.
 10. Make final changeover of permanent locks and transmit keys to OWNER. Advise OWNER's personnel of changeover in security provisions.
 11. Complete start-up testing of systems, and instruction of OWNER's operating and maintenance personnel. Discontinue or change over and remove temporary facilities from the site, along with construction tools, mock-ups, and similar elements.
- B. Reinspection Procedure: ENGINEER will reinspect the Work upon receipt of notice that the Work, including inspection list items from earlier inspections, has been completed, except items whose completion has been delayed because of circumstances acceptable to ENGINEER.
1. Upon completion of reinspection, ENGINEER will prepare a certificate of final acceptance, or advise CONTRACTOR of Work that is incomplete or of obligations that have not been fulfilled but are required for final acceptance.
 2. If necessary, reinspection will be repeated.

1.05 SUBMITTALS

- A. Submit written warranties to ENGINEER prior to the date certified for Substantial Completion. If ENGINEER's Certificate of Substantial Completion designates a commencement date for warranties other than the date of Substantial Completion for the Work, or a designated portion of the Work, submit written warranties upon request of ENGINEER.
- B. When a designated portion of the Work is completed and occupied or used by OWNER, by separate agreement with CONTRACTOR during the construction period, submit properly executed warranties to ENGINEER within 15 days of completion of that designated portion of the Work.
- C. When a special warranty is required to be executed by CONTRACTOR, or CONTRACTOR and a subcontractor, supplier, or manufacturer, prepare a written document that contains appropriate terms and identification, ready for execution by the required parties. Submit a draft to OWNER through ENGINEER for approval prior to final execution.
- D. Refer to individual Sections of Divisions 2 through 16 for specific content requirements, and particular requirements for submittal of special warranties.

1.06 RECORD DOCUMENT SUBMITTALS

- A. Record Drawings:
 1. Maintain a clean, undamaged set of blue or black line white-prints of Contract Drawings. Mark the set to show the actual installation where the installation varies substantially from the Work as originally shown.

2. Mark whichever Drawing is most capable of showing conditions fully and accurately. Where Shop Drawings are used, record a cross-reference at the corresponding location on Contract Drawings. Give particular attention to concealed elements that would be difficult to measure and record at a later date.
 3. Mark record sets with red erasable pencil; use other colors to distinguish between variations in separate categories of the Work.
 4. Mark new information that is important to OWNER, but was not shown on Contract Drawings or Shop Drawings.
 5. Note related Change Order numbers where applicable.
 6. Organize Record Drawing sheets into manageable sets, bind with durable paper cover sheets, and print suitable titles, dates, and other identification on the cover of each set.
- B. Miscellaneous Record Submittals: Refer to other Specification Sections for requirements of miscellaneous record keeping and submittals in connection with actual performance of the Work.
1. Immediately prior to the date or dates of Substantial Completion, complete miscellaneous records and place in good order, properly identified and bound or filed, ready for continued use and reference. Submit to ENGINEER for OWNER's records.
- C. Operation and Maintenance Manuals: Submit in accordance with requirements of Section 01600, operation and maintenance manuals for items included under this Section.

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

3.01 COMPONENT ACCEPTANCE

- A. Component Acceptance Certificate: For each item of equipment incorporated into the Project, ENGINEER will issue a Component Acceptance Certificate as shown in Section 00625.
- B. The certificate will certify that the equipment installation is complete, that manufacturer-provided inspection and start-up services and training have taken place, and that OWNER has beneficial use of the equipment.
- C. The data on the Component Acceptance Certificate may be used to establish the time of beginning for the warranty period for that piece of equipment, if OWNER begins to use it at that time.

3.02 FINAL CLEANING

- A. General cleaning during construction is required by the General Conditions and included in Section 01500.
- B. Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to the condition expected in a normal, commercial building cleaning and maintenance program. Comply with manufacturer's instructions.

- C. Complete the following cleaning operations before requesting inspection for Certification of Substantial Completion.
1. Remove labels that are not permanent labels.
 2. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compound and other substances that are noticeable vision-obscuring materials. Replace chipped or broken glass and other damaged transparent materials.
 3. Clean exposed exterior and interior hard-surfaced finishes to a dust-free condition, free of stains, films, and similar foreign substances. Restore reflective surfaces to their original reflective condition. Leave concrete floors broom clean. Vacuum carpeted surfaces.
 4. Wipe surfaces of mechanical and electrical equipment. Remove excess lubrication and other substances. Clean plumbing fixtures to a sanitary condition. Clean light fixtures and lamps.
 5. Clean Site, including landscape development areas, of rubbish, litter, and foreign substances. Sweep paved areas broom clean; remove stains, spills, and other foreign deposits. Rake grounds that are neither paved nor planted to a smooth even-textured surface.
- D. Removal of Protection: Remove temporary protection and facilities installed for protection of the Work during construction.
- E. Comply with regulations of authorities having jurisdiction and safety standards for cleaning.
1. Do not burn waste materials. Do not bury debris or excess materials on OWNER's property.
 2. Do not discharge volatile, harmful, or dangerous materials into drainage systems.
 3. Remove waste materials from Site and dispose of in a lawful manner.
- F. Where extra materials of value remaining after completion of associated Work have become OWNER's property, arrange for disposition of these materials as directed.

END OF SECTION

DIVISION 2
(NOT USED)

DIVISION 3

CONCRETE

SECTION 03310 - CONCRETE WORK

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes: Labor, materials, and equipment necessary for fabrication, production, installation, and erection of items specified in this Section as shown on Drawings or listed on Schedules.
- B. Related Documents: Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, including Section 01600, apply to Work of this Section.
- C. Products Installed but not Furnished under this Section:
 - 1. Anchor bolts.
 - 2. Miscellaneous metal embedments.

1.02 REFERENCES

- A. ASTM:
 - 1. A 185 Steel Welded Wire, Fabric, Plain, for Concrete Reinforcement.
 - 2. A 497 Welded Deformed Steel Wire Fabric for Concrete Reinforcement.
 - 3. A 615 Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.
 - 4. C 31 Test Methods of Making and Curing Concrete Test Specimens in the Field.
 - 5. C 33 Concrete Aggregates.
 - 6. C 39 Test Method for Compressive Strength of Cylindrical Concrete Specimens.
 - 7. C 94 Ready-Mixed Concrete.
 - 8. C 143 Test Method for Slump of Hydraulic Cement Concrete.
 - 9. C 150 Portland Cement.
 - 10. C 157 Test Method for Length Change of Hardened Hydraulic Cement Mortar and Concrete.
 - 11. C 171 Sheet Materials for Curing Concrete.
 - 12. C 172 Practice for Sampling Freshly Mixed Concrete.
 - 13. C 173 Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method.
 - 14. C 231 Test Method for Air Content of Freshly Mixed Concrete by Pressure Method.
 - 15. C 260 Air-Entraining Admixtures for Concrete.
 - 16. C 309 Liquid Membrane-Forming Curing Compounds for Curing Concrete.
 - 17. C 494 Chemical Admixtures for Concrete.
 - 18. C 595 Blended Hydraulic Cements.
 - 19. C 618 Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Portland Cement Concrete.
 - 20. C 845 Expansive Hydraulic Cement.
 - 21. C 881 Epoxy-Resin-Base Bonding Systems for Concrete.
 - 22. C 989 Ground Iron Blast-Furnace Slag for Use in Concrete and Mortars.
 - 23. C 1107 Packaged Dry, Hydraulic-Cement Grout (Nonshrink).
 - 24. C 1240 Silica Fume for Use as a Mineral Admixture in Hydraulic Cement Concrete.
 - 25. D 471 Test Method for Rubber Property – Effect of Liquids.

B. MDOT: Standard Specifications for Construction.

C. ACI:

1. 211.1 Standard Practice for Selecting Proportions for Normal, Heavyweight and Mass Concrete.
2. 222.1 Provisional Standard Test Method for Water-Soluble Chloride Available for Corrosion of Embedded Steel in Mortar and Concrete Using the Soxhlet Extractor.
3. 301 Specification for Structural Concrete.
4. 304R Guide for Measuring, Mixing, Transporting, and Placing Concrete.
5. 305R Hot Weather Concreting.
6. 306R Cold Weather Concreting.
7. 309R Guide for Consolidation of Concrete.
8. 318R Building Code Requirements for Structural Concrete and Commentary.
9. 347R Guide to Formwork for Concrete.
10. 350R Environmental Engineering Concrete Structures and Commentary.
11. 503R Use of Epoxy Compounds with Concrete.
12. SP-66 ACI Detailing Manual.

D. CRSI:

1. Manual of Standard Practice.
2. Placing Reinforcing Bars.

1.03 SUBMITTALS

A. Shop Drawings: Submit in accordance with Section 01330, Shop Drawings covering the items included under this Section.

1. Shop Drawings of Reinforcement: Submit original shop drawings for fabrication, bending, and placement of concrete reinforcement. Comply with Reinforcement Shop Drawing Checklist below.
 - a. Reinforcement Shop Drawing Checklist:
 - 1) Specify ASTM number and grade of reinforcing.
 - 2) Show bar spacings and quantities.
 - 3) Specify lap lengths using table in Tetra Tech, Inc. Structural Standard Details.
 - 4) Specify whether bars are inside and outside or near face and far face on walls.
 - 5) Specify clear coverages per Placing Reinforcement Specification in Part 3.
 - 6) Specify bar support spacings per Tetra Tech, Inc. Standard Detail for Concrete Slabs.
 - 7) Show stirrup spacing.
 - 8) Use closed stirrups and ties with 135-degree hooks.
 - 9) Submit Bar Bending Schedule on Drawings.
 - 10) Reference major Contract Drawings. Use same section cut numbers and letters when practical.
 - 11) Show details for additional reinforcing items. Examples are reinforcing around openings, control joints, equipment pads, masonry reinforcement.
 - 12) Show numeric elevation references on sections.
 - 13) Locate expansion and control joints.
 - 14) Organize and present sheets in logical sequence.
 - 15) Submit "small" submittal packages when practical.
 - 16) Immediately contact ENGINEER if Contract Documents are unclear.

B. Product Data: Submit data for proprietary materials and items, including admixtures, patching compounds, curing compounds, and other materials installed under this Section.

- C. Submit samples of materials as requested by ENGINEER, including names, sources, and descriptions.
- D. Mix Designs: Submit the following for all concrete classes:
 - 1. Water/cement ratio (total gallons of water per cubic yard).
 - 2. Brand, type, and quantity of cement.
 - 3. Type and quantity of aggregates.
 - 4. Type and quantity of admixtures.
 - 5. Type, composition, and quantity of fly ash, slag (GGBFS), or silica fume.
 - 6. Unit weight (wet density).
 - 7. Composition strength based on 28-day compression test.
- E. Submit laboratory test reports for concrete mix design, aggregates (particularly deleterious materials in coarse aggregate) and fly ash, slag (GGBFS) and silica fume (if used) 4 weeks before scheduled pouring.
- F. Quality Assurance Submittals:
 - 1. Submit written reports to ENGINEER documenting testing and inspection results. Prepare report as noted in Section 01450.
 - 2. Submit mill test reports on reinforcement.
 - 3. Submit materials certificates in lieu of laboratory test reports on other materials. Manufacturer and CONTRACTOR shall sign material certificates certifying that each material item complies with, or exceeds, specified requirements. Submit certification from admixture manufacturers that chloride content complies with specification requirements.

1.04 PROJECT CONDITIONS

- A. Protection of Footings against Freezing: Cover completed Work at footing level with sufficient temporary or permanent cover to protect footings and adjacent subgrade against possibility of freezing. Maintain cover for curing period or until temperatures cannot affect concrete footings.
- B. Protect adjacent finish materials against spatter during concrete placement.

1.05 OWNER'S INSTRUCTIONS

- A. Concrete Testing Service: Engage testing laboratories acceptable to ENGINEER to do material evaluation tests and to design concrete mixes.
- B. Materials and installed Work may require testing and retesting at any time during progress of Work. Tests, including retesting of rejected materials for installed Work, shall be done at CONTRACTOR's expense.

PART 2 - PRODUCTS

2.01 FORM MATERIALS

- A. Forms for Smooth Form Finish Concrete: Plywood, metal, metal-framed plywood faced, or other acceptable panel materials, to achieve continuous, straight, smooth, exposed surfaces. Furnish largest practicable sizes to minimize joints and to conform to joint system shown on Drawings.

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- B. Forms for Rough Form Finish Concrete: Plywood, lumber, metal, or other acceptable material. Use lumber dressed on two edges and one side for tight fit.
- C. Forms for Textured Finish Concrete: Use units with face design, size, arrangement, and configuration to match ENGINEER's control sample. Provide solid backing and form supports to stabilize textured form liners.
- D. Forms for Cylindrical Columns and Supports: Metal, fiberglass-reinforced plastic or paper, or fiber tubes. Construct paper or fiber tubes of laminated plies using water-resistant adhesive with wax-impregnated exterior for weather and moisture protection. Provide units with sufficient wall thickness to resist loads imposed by wet concrete without deformation.
- E. Form Coatings: Commercial formulation form-coating compounds with no more than 350 mg/ltr volatile organic compounds (VOCs) that do not bond with, stain, or adversely affect concrete surfaces, or prevent good bonding with later concrete surface treatments.
- F. Forms Ties: Factory fabricated, adjustable length, removable or snap-off metal form ties, designed to prevent form deflection and to prevent spalling concrete upon removal. Provide units which shall leave no metal closer than 1-1/2 inches to surface.
 - 1. Provide ties which, when removed, leave holes no larger than 7/8-inch or less than 1/2-inch in diameter in concrete surface.

2.02 REINFORCING MATERIALS

- A. Reinforcing Bars: ASTM A 615, Grade 60, deformed.
- B. Welded Wire Fabric: ASTM A 185.
- C. Welded Deformed Steel Wire Fabric: ASTM A 497.
- D. Supports for Reinforcement: Bolsters, chairs, spacers, and other devices for spacing, supporting and fastening reinforcing bars and welded wire fabric in place. Use wire bar supports complying with CRSI specifications. The use of bricks is not permitted.
 - 1. For slabs-on-grade, use supports with sand plates or horizontal runners where base material does not support chair legs.
 - 2. For exposed-to-view concrete surfaces, where support legs are in contact with forms, use supports with legs that are plastic-protected (CRSI, Class 1) or stainless steel protected (CRSI, Class 2).

2.03 CONCRETE MATERIALS

- A. Portland Cement: ASTM C 150, Type I, except use Type III where applications require high-early-strength or Type II where required by ENGINEER for corrosive environments.
- B. Belnded Cement: ASTM C 595 Type IL
- C. Use one brand of cement throughout Project, unless otherwise acceptable to ENGINEER.
- D. Fly Ash: ASTM C 618, Type C or Type F (corrosive environments) with loss on ignition not more than 6 percent.

- E. Ground Granulated Blast-Furnace Slag: ASTM C 989.
- F. Silica Fume: ASTM C 1240.
- G. Aggregates: ASTM C 33. Use aggregates from single source for exposed concrete.
 - 1. Fine aggregate: MDOT 2NS.
 - 2. Coarse aggregate: MDOT 6AA or 31A.
- H. Water: Potable.
- I. Nonstructural Fiber Reinforcement: Monofilament Polypropylene, Type F1 fibers designed as secondary reinforcing. Fibers to comply with ASTM C 1116, Type III, not less than 3/4-inch long.
- J. Air-Entraining Admixture: ASTM C 260, and certified by manufacturer to be compatible with other admixtures.
- K. Water-Reducing Admixture: ASTM C 494, Type A.
- L. High-range Water-Reducing Admixture (Superplasticizer): ASTM C 494, Type F or Type G.
- M. Water Reducing, Nonchloride Accelerator Admixture: ASTM C 494, Type E.
- N. Water Reducing, Retarding Admixture: ASTM C 494, Type D.
- O. Prohibited Admixtures: Calcium chloride thiocyanates or admixtures containing more than 0.1 percent chloride ions.
- P. Potable Water Structures: For surfaces in contact with potable water, use only materials approved by Department of Public Health of the state that has jurisdiction.
- Q. For duct bank concrete add red dye during batching.

2.04 ACCESSORIES

- A. Granular Base: Evenly graded fine aggregate to provide smooth and even surface below slabs on grade. Minimum 6-inch thickness or as noted on Drawings.
- B. Nonshrink Grout: ASTM C 1107, factory pre-mixed, cementitious natural aggregate grout.
- C. Moisture-Retaining Cover: Waterproof paper, polyethylene film, or polyethylene-coated burlap complying with ASTM C 171.
- D. Transparent Membrane-Forming Curing Compound: Liquid membrane-forming curing compound complying with ASTM C 309, Type 1, Class B. Formed membrane shall be suitable for later application of cementitious coating or topping.

- E. Epoxy Bonding Agent: ASTM C 881, two-component material suitable for use on dry or damp surfaces. Provide material Type, Grade, and Class to suit Project requirements.
- F. Mechanical Anchors: Manufactured using corrosion-resistant materials.
- G. Adhesive Anchoring System: ASTM C 881, Type IV, Grade 3. Provide material Class to suit Project requirements.

2.05 PROPORTIONING AND DESIGN OF MIXES

- A. Prepare design mixes for each concrete class and strength by either laboratory trial batch or field experience methods as specified in ACI 301. If trial batch method is used, use independent testing facilities acceptable to ENGINEER for preparing and reporting proposed mix designs. Testing facility shall not be identical to that used for field quality control testing.
- B. Fly ash shall be used to partially supplant cement content in Class A and Class S concrete, unless noted otherwise, and is optional in other classes. Replacement quantity of cement content by weight shall be not less than 15 percent for Class A and Class S concrete or more than 25 percent for all classes except Class F.
- C. For concrete Class A, concrete mix design with fly ash and silica fume shall be maximum 30 percent of cement content by weight, and shall constitute no more than 20 and 10 percent, respectively, of the total weight of cementitious materials.
- D. Ground granulated blast furnace slag (GGBFS) shall only be permitted for mass concrete placement and as approved by ENGINEER. Replacement quantity of cement content weight shall not be less than 35 percent or more than 50 percent.
- E. Coarse aggregate shall be MDOT 6AA, except for Class G concrete which shall use MDOT 31A.
- F. Design mixes to provide normal weight concrete for following classes and properties:
 - 1. Locations for concrete classes are as follows:
 - a. Class A Structural concrete (slabs, foundations, and equipment bases).
 - b. Class B Duct banks (unless otherwise indicated on Drawings).

2. Properties for concrete classes are as follows:

Concrete Class		A	B
28-Day* Compressive Strength (f'c), psi		4,500	3,000
Water/Cement Ratio by weight, maximum		0.45	0.75
Air Content, percent by volume		6±1.5	NA
Slump at point of placement, inches.	WR**	2-4	3-5
	MRWR	4-6	NA
	HRWR	6-8	NA

* 7-day compressive strength for high-early-strength concrete.

56-day compressive strength for mass concrete with ground granulated blast furnace slag.

** Slump prior to the addition of mid-range or high-range water reducers.

3. Adjustment of Concrete Mixes: Mix designs may be adjusted when characteristics of materials, job conditions, weather, test results, or other circumstances warrant, when approved by ENGINEER, at no additional cost to OWNER. Submit laboratory test data for revised mix design and strength results to ENGINEER before using in work.
4. Admixtures:
- Use water-reducing admixture or high range water-reducing admixture (superplasticizer) in concrete for placement and workability.
 - Use nonchloride accelerating admixture in concrete slabs placed at ambient temperatures below 50 degrees F (10 degrees C).
 - Add air-entraining admixture at manufacturer's prescribed rate to result in placed concrete having total air content specified.

2.06 CONCRETE MIXING

- A. Ready-Mix Concrete: Comply with ASTM C 94 requirements and as specified in this Section.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Coordinate installation of joint materials, perimeter insulation, and vapor retarders with placement of forms and reinforcing steel.

3.02 FORMS

- A. Design, build, support, brace, and maintain formwork to support vertical and lateral, static, and dynamic loads applied to formwork until concrete structure can support applied loads. Construct formwork so that concrete members and structures are of correct size, shape, alignment, elevation, and position. Deflection of form-facing material between supports, and deflection of form supports shall not exceed 1/4 inch per 10 feet of span.

- B. Design formwork to be removable without impact, shock, or damage to cast-in-place concrete surfaces and adjacent materials.
- C. Construct forms to sizes, shapes, lines, and dimensions shown, and to obtain accurate alignment, location, grades level and plumb for work in finished structures. Provide for openings, offsets, sinkages, keyways, recesses, moldings, rustications, reglets, chamfers, blocking, screeds, bulkheads, anchorages and inserts, and other features in Work. Use selected materials to obtain specified finishes. Solidly butt joints and provide backup at joints to prevent leakage of cement paste.
- D. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush plates or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces where slope is too steep to place concrete with bottom forms only. Kerf wood inserts for forming keyways, reglets, and recesses to prevent swelling and for easy removal.
- E. Chamfer exposed corners and edges, 3/4 inch minimum, using wood, metal, PVC or rubber chamfer strips fabricated to produce uniform smooth lines and tight edge joints.
- F. Provisions for Other Trades: Provide openings in concrete formwork to accommodate work of other trades. Determine size and location of openings, recesses and chases from trades providing these items. Accurately place and securely support items built into forms.
- G. Cleaning and Tightening: Thoroughly clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, or other debris just before placing concrete. Retighten forms and bracing after concrete placement to eliminate mortar leaks and to maintain proper alignment.

3.03 PLACING REINFORCEMENT

- A. Comply with CRSI recommended practice for "Placing Reinforcing Bars," for details and methods of reinforcement placement and supports, and as specified in this Section.
- B. Clean reinforcement of loose rust and mill scale, earth, ice, and other materials which reduce or destroy bond with concrete.
- C. Accurately position, support, and secure reinforcement against displacement by formwork, construction, or concrete placement operations. Locate and support reinforcing by metal chairs, runners, bolsters, spacers, and hangers.
- D. Place reinforcement to obtain clear cover space for concrete protection:
 - 1. Footings and slabs cast over mud mats, and walls, both interior and exterior unless noted otherwise: 2 inches.
 - 2. Footings and slabs cast against and permanently exposed to earth: 3 inches.
- E. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position during concrete placement operations. Direct wire tie ends into concrete, not toward exposed concrete surfaces.
- F. Field bending of reinforcement:
 - 1. Field bending of plain reinforcement shall be performed using an approved and appropriate sized portable hydraulic device that makes ACI-approved radius bends. No other field bending method shall be permitted.

- G. Install welded wire fabric in as long lengths as practical. Lap adjoining pieces one full mesh and lace splices with wire.

3.04 INSTALLATION OF EMBEDDED ITEMS

- A. Set and build into Work anchorage devices and other embedded items required for other work that are attached to, or supported by, cast-in-place concrete. Use setting drawings, diagrams, instructions and directions provided by suppliers of attachment items.
- B. Edge Forms and Screed Strips for Slabs: Set edge forms or bulkheads and intermediate screed strips for slabs to obtain set elevations and contours in finished slab surface. Provide and secure units sufficiently strong to support screed strips by use of strike-off templates or accepted compacting screeds.
- C. Conduits and pipes of aluminum shall not be embedded in structural concrete unless they are effectively coated or covered to prevent aluminum-concrete reaction or electrolytic action between aluminum and steel.

3.05 PREPARATION OF FORM SURFACES

- A. Clean re-used forms of concrete matrix residue, repair and patch to return forms to acceptable surface condition.
- B. Coat contact surfaces of forms with form-coating compounds before placing reinforcement.
- C. Thin form-coating compounds only with acceptable thinning agents, quantity, and under conditions of form-coating compound manufacturer's directions. Do not allow excess form-coating material to accumulate in forms or to come into contact with in-place concrete surfaces against which fresh concrete is placed. Apply in compliance with manufacturer's instructions.
- D. Coat steel forms with non-staining, rust-preventive form oil to protect against rusting. Rust-stained steel formwork is not acceptable.

3.06 CONCRETE PLACEMENT

- A. Before placing concrete, inspect and complete formwork installation, reinforcing steel, waterstop installation, and other embedded or cast-in items.
 - 1. Notify other crafts to permit installation of their work.
 - 2. Cooperate with other trades in setting their work.
 - 3. Moisten wood forms immediately before placing concrete where form coatings are not used.
 - 4. Apply temporary protective covering to lower 2 feet of finished walls where adjacent floor slabs are poured to guard against spattering during slab placement.
- B. Comply with ACI 304R and as specified in this Section.
- C. Discharge Concrete at Site within 1-1/2 hours after cement is added to water or aggregates. When air temperature exceeds 85 degrees F, the discharge time shall be less than 45 minutes. The 45-minute requirement may be waived with the use of a water reducing, retarding admixture and approval of ENGINEER.

- D. Provide trip ticket in duplicate for each ready-mixed concrete load delivered, stating truck number, Project name, CONTRACTOR and producer, batching time, total yards of concrete and material contained therein. Show ticket to ENGINEER upon request. Fill in concrete discharge time and turn over to ENGINEER trip ticket copies at end of each day.
- E. Deposit concrete continuously or in layers so that no concrete is placed on concrete which has hardened sufficiently to cause seams or planes of weakness. If section cannot be placed continuously, provide construction joints as specified. Deposit concrete as nearly as practical to its final location to avoid segregation.
- F. When depositing by chute, provide equipment of size and design to ensure continuously flowing concrete. Provide discharge end of chute with baffle plate to prevent segregation. Position chute so that concrete need not flow more than 5 feet horizontally.
- G. Do not drop concrete from chute end distances greater than 3 times the deposited layer thickness, nor more than 5 feet. Where distance from chute end to surface of concrete exceeds these distances, use spout and maintain lower end as near to deposit surface as practical. When operations are intermittent, discharge chutes into hoppers.
- H. Placing Concrete in Forms: Deposit concrete in forms in horizontal layers not deeper than 24 inches to avoid inclined construction joints. Where placement involves several layers, place each layer while preceding layer is still plastic to avoid cold joints.
 - 1. Fill bottom of wall space with 2 to 4 inches of cement slurry immediately before depositing concrete in walls. Use cement slurry composed of 1 part Portland cement, 2 parts fine aggregate, and sufficient water (but not to exceed 0.45 parts) for 7-inch slump mixture.
 - 2. Consolidate placed concrete by mechanical vibrating equipment supplemented by hand spading, rodding, or tamping. Use equipment and procedures for concrete consolidation in accordance with ACI recommended practices.
 - 3. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations not farther than visible machine effectiveness. Place vibrators to rapidly penetrate placed layer and at least 6 inches into preceding layer. Do not insert vibrators into concrete layers that have begun to set. At each insertion, limit duration to time necessary to consolidate concrete and complete reinforcement embedment and other embedded items without causing mix segregation. Keep vibrators away from waterstops to prevent displacement.
- I. Placing Concrete Slabs: Deposit and consolidate concrete slabs in continuous operations between construction joints until panel or section placement is complete.
 - 1. Consolidate concrete during placing operations so that concrete is thoroughly worked around reinforcement and other embedded items and into corners.
 - 2. Bring slab surfaces to correct level with straightedge and strikeoff. Use bull floats or darbies to smooth surface, free of humps or hollows. Do not disturb slab surfaces before beginning finishing operations.
 - 3. Maintain reinforcing in proper position during concrete placement operations.
 - 4. Moisten soil when depositing concrete directly on granular soil.
- J. Cold Weather Placing: Protect concrete work from physical damage or reduced strength attributed to frost, freezing actions, or low temperatures by using techniques in ACI 306R and as specified in this Section.
 - 1. When air temperature has fallen to, or is to fall below 40 degrees F, uniformly heat water and aggregates before mixing to obtain concrete mixture temperature not less than 50 degrees F, and not more than 80 degrees F at placement point.

2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
 3. Do not use calcium chloride, salt and other materials containing antifreeze agents or chemical accelerators, unless otherwise accepted in mix designs.
- K. Hot Weather Placing: When air temperature is above 85 degrees F, conditions could exist that would seriously impair quality and concrete strength; place concrete in compliance with ACI 305R and as specified in this Section.
1. Cool ingredients before mixing to maintain concrete temperature at time of placement below 85 degrees F. Chill mixing water or use chopped ice to control temperature. If using ice, water equivalent of ice is included in total mixing water quantity. Using liquid nitrogen to cool concrete is CONTRACTOR's option.
 2. Cover reinforcing steel with water-soaked burlap, if steel becomes too hot, to reduce steel temperature so not to exceed ambient air temperature immediately before embedment in concrete.
 3. Fog spray forms, reinforcing steel, and subgrade just before placing concrete.
 4. Use water-reducing retarding admixture (Type D) when required by high temperatures, low humidity, or other adverse placing conditions.

3.07 FINISH OF FORMED SURFACES

- A. Rough Form Finish: Use for formed concrete surfaces not exposed to view in finish Work during normal operation or maintenance, or by other construction and not covered with coating or covering material applied directly to concrete. This concrete surface has texture imparted by form-facing material. Tie holes and defective areas are repaired and patched, and fins and other projections exceeding 1/4-inch in height are rubbed down or chipped off.
- B. Smooth Form Finish: Use for formed concrete surfaces exposed-to-view, during normal operation or maintenance, or are covered with coating or covering material applied directly to concrete, including waterproofing, dampproofing, painting, or other similar system. This is as-cast concrete surface obtained with selected form material, arranged orderly and symmetrically with minimum seams. Repair and patch defective areas. Remove and smooth fins or other projections completely. Fill major air void holes.
- C. Grout Cleaned Finish: Provide grout-cleaned finish to scheduled formed concrete surfaces that are painted, stained, or waterproofed after receiving smooth form finish treatment.
1. Combine 1 part Portland cement to 1-1/2 parts fine sand by volume, and mix with water to consistency of thick paint. Proprietary additives may be used at CONTRACTOR's option. Blend standard Portland cement and white Portland cement, quantities determined by trial patches, so that dry grout color matches adjacent surfaces.
 2. Thoroughly wet concrete surfaces and apply grout to coat surfaces and fill small holes. Remove excess grout by scraping and rubbing with clean burlap. Keep damp by fog spray for 36 hours after rubbing.
- D. Related Unformed Surfaces: At horizontal offsets and similar unformed surfaces occurring adjacent to formed surfaces, strike-off smooth and finish with texture matching adjacent formed surfaces. Continue surface treatment of formed surfaces uniformly across adjacent unformed surfaces unless shown otherwise.

3.08 MONOLITHIC SLAB FINISHES

- A. Float Finish: Apply float finish to monolithic slab surfaces to receive trowel finish and other finishes as specified, and slab surfaces which are covered with membrane or elastic waterproofing, membrane or elastic roofing, or sand-bed terrazzo, and as otherwise shown.
 - 1. After screeding, consolidating, and leveling concrete slabs, do not work surface until ready for floating. Begin floating when surface water has disappeared or when concrete has stiffened sufficiently to permit power-driven float operation. Consolidate surface with power-driven floats, or by hand-floating if area is small or inaccessible to power units.
 - 2. Check and level surface plane to tolerances of floor flatness (FF) of 18 and floor levelness (FL) of 15 in accordance with ASTM E 1155.
 - 3. Cut down high spots and fill low spots.
 - 4. Uniformly slope surfaces to drains. Immediately after leveling, refloat surface to uniform, smooth, granular texture.
- B. Trowel Finish: Apply trowel finish to monolithic slab surfaces exposed-to-view.
 - 1. After floating, begin first trowel finish operation using power-driven trowels. Begin last troweling when surface produces ringing sound when trowel moves over surface. Consolidate concrete surface by final hand-troweling operation, free of trowel marks, uniform in texture and appearance.
 - 2. Check and level surface plane to tolerances of floor flatness (FF) of 20 and floor levelness (FL) of 17 in accordance with ASTM E 1155.
 - 3. Grind smooth surface defects that would telegraph through applied floor covering system.
- C. Non-slip Broom Finish: Apply non-slip broom finish to exterior concrete pads, and elsewhere as noted.
 - 1. Immediately after float finishing, slightly roughen concrete surface by brooming with fiber bristle broom perpendicular to main traffic route. Coordinate required finish with ENGINEER before application.

3.09 CONCRETE CURING AND PROTECTION

- A. Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.
- B. Start curing as soon as free water has disappeared from concrete surface after placing and finishing. Maintain curing as follows:
 - 1. All concrete unless otherwise noted: 7 days.
 - 2. High-early-strength concrete: 3 days.
- B. Curing Methods: Cure concrete for water-retaining structures by moist curing. Cure concrete for other structures by curing compound, moist curing, moisture-retaining cover curing, or combinations thereof.
- C. Provide Moist Curing by following methods:
 - 1. Keep concrete surface continuously wet by covering with water.
 - 2. Continuous water-fog spray.
 - 3. Covering concrete surface with specified absorptive cover, thoroughly saturating cover with water and keeping continuously wet. Place absorptive cover to cover concrete surfaces and edges, with 4 inches lap over adjacent absorptive covers.

- D. Provide Moisture-Retaining Cover Curing as follows:
 - 1. Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practical width with sides and ends lapped 3 inches and sealed by waterproof tape or adhesive.
 - 2. Immediately repair holes or tears during curing period using cover material and waterproof tape.
- E. Provide Curing Compound as follows:
 - 1. Apply specified curing compound to concrete slabs as soon as last finishing operations are complete (within 2 hours). Apply uniformly in continuous operation by power-spray or roller according to manufacturer's directions. Recoat areas subjected to heavy rainfall within 3 hours after initial application. Maintain coating continuity and repair damage during curing period.
 - 2. Transparent curing compound shall be used for structural concrete (Class A concrete).
- F. Curing Formed Surfaces: Cure formed concrete surfaces, including beam undersides, supported slabs and other similar surfaces by moist curing with forms in place for full curing period. If form removal occurs before curing period is up, continue curing by methods specified above as applicable.
- G. Curing Unformed Surfaces: Cure unformed surfaces, including slabs, floor topping, and other flat surfaces, by application of appropriate curing method.

3.10 FORM REMOVAL

- A. Vertical Forms not supporting concrete weight may be removed when concrete has sufficiently set to resist damage from removal operation.
- B. Other forms shall be left in place until concrete has attained strength to support its own weight and construction live loads, unless removed in sections, and each structural section immediately reshored.

3.11 RE-USE OF FORMS

- A. Clean and repair surfaces of forms to be re-used in Work. Split, frayed, delaminated, or damaged form-facing materials are not acceptable for exposed surfaces. Apply new form coating compound as specified for new formwork.
- B. When extending forms for successive concrete placement, thoroughly clean surfaces, remove fins and laitance, and tighten forms to close joints. Align and secure joint to avoid offsets. Do not use "patched" forms for exposed concrete surfaces.

3.12 MISCELLANEOUS CONCRETE ITEMS

- A. Fill-in holes and openings left in concrete structures for work by other trades, unless otherwise shown or directed. Do fill in after other trades' work is in place. Mix, place, and cure concrete to blend with in-place construction. Provide other miscellaneous concrete filling shown to complete Work.
- B. Bonding New to Old Concrete: Where shown on Drawings, existing concrete surfaces against which new concrete is placed shall be thoroughly cleaned and brush-coated with bonding agent. Follow manufacturer's directions, especially on material working time.

- C. Equipment Bases and Foundations: Provide machine and equipment bases and foundations as shown on Drawings. Set anchor bolts for machines and equipment to template at correct elevations, complying with approved Shop Drawings from manufacturer-furnishing machines and equipment.
 - 1. Grout baseplates and foundations using specified and approved nonshrink grout.

3.13 CONCRETE SURFACE REPAIRS

- A. Patching Defective Areas: Repair and patch defective areas with cement mortar immediately after form removal.
 - 1. Cut out honeycomb, rock pockets, voids over 1/4-inch in dimension, and holes left by tie rods and bolts, down to solid concrete but no less than 1 inch deep. Make cuts perpendicular to concrete surface. Thoroughly clean, dampen with water, and brush-coat patched area with specified bonding agent. Place patching mortar after bonding compound has set as recommended by manufacturer.
 - 2. For exposed to view surfaces, blend white Portland cement and standard Portland cement so, when dry, patching mortar matches surrounding color. Provide test areas at inconspicuous location to verify mixture and color match before proceeding with patching. Compact mortar in place and strike-off slightly higher than surrounding surface.
- B. Repair of Formed Surfaces: Remove and install new concrete having defective surfaces if defects are irreparable to satisfaction of ENGINEER. Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycomb, rock pockets; fins, and other projections on surface, and stains and other discolorations that cannot be removed by cleaning. Flush out form tie holes, fill with dry pack mortar, or precast cement cone plugs secured in place with bonding agent.
 - 1. Repair concealed formed surfaces, where practical, containing defects which affect concrete durability. If defects are irreparable, remove and install new concrete.
- C. Repair of Unformed Surfaces: Test unformed surfaces for smoothness and verify surface plane to tolerances specified for each surface and finish. Correct low and high areas as specified in this Section. Test unformed surfaces sloped to drain for slope trueness using templates having required slope.
 - 1. Repair finished unformed surfaces containing defects which affect concrete durability. Defects include crazing, cracks more than 0.01-inch wide or which penetrate to reinforcement or completely through nonreinforced sections regardless of width, spalling, pop-outs, honeycomb, rock pockets, and other objectionable conditions.
 - 2. Correct high areas in unformed surfaces by grinding, after concrete has cured 14 days.
 - 3. Correct low areas in unformed surfaces during or immediately after surface finishing operations by cutting out low areas and replacing with fresh concrete. Finish repaired areas to blend into adjacent concrete. Proprietary patching compounds may be used when acceptable to ENGINEER.
 - 4. Repair defective areas, except random cracks and single holes not exceeding 1-inch diameter, by cutting out and replacing with fresh concrete. Remove defective areas to sound concrete with clean, square cuts and expose reinforcing steel with 3/4-inch clearance around. Dampen concrete surfaces in contact with patching concrete and apply bonding compound. Mix patching concrete to provide same concrete type or class as original concrete. Place, compact and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.
- D. Repair isolated random cracks and single holes not over 1-inch in diameter by dry-pack method. Groove top of cracks and cut out holes to sound concrete. Clean out dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding compound. Mix dry-pack, consisting of 1 part Portland cement to 2-1/2 parts fine aggregate passing No. 16 mesh sieve, using only enough water as

specified for handling and placing. Place dry-pack after bonding compound has set per manufacturer's instructions. Compact dry-pack mixture in place and finish to match adjacent concrete. Keep patched area continuously moist for not less than 72 hours.

- E. Structural Repairs: Do structural repairs with prior approval by ENGINEER for method and procedure using specified epoxy adhesive and mortar.
- F. Repair Methods: ENGINEER may allow use of other nonspecified methods subject to review and acceptance by ENGINEER.

3.14 QUALITY CONTROL TESTING DURING CONSTRUCTION

- A. Provide qualified personnel and employ testing laboratory, approved by ENGINEER, to do tests and to submit test reports.
- B. Sampling Fresh Concrete: ASTM C 172, except modified for slump and air-content tests to comply with ASTM C 94.
 - 1. Slump: ASTM C 143, one each time compression test specimens are made; additional tests when concrete consistency seems to have changed.
 - 2. Air Content: ASTM C 231, pressure method, one each time compression test specimens made.
 - 3. Concrete Temperature: Test hourly when air temperature is 40 degrees F and below, and when 80 degrees F and above; and each time compression test specimens are made.
 - 4. Compression Test Specimen: ASTM C 31, four standard cylinders for each compressive strength test set, unless otherwise directed. Mold and store cylinders for laboratory-cured test specimens.
 - 5. Compressive Strength Tests: ASTM C 39, one set for each day's pour exceeding 5 cubic yards plus additional set for each 100 cubic yards over and above first 50 cubic yards of each concrete class placed in 1 day; 1 specimen tested at 7 days, 2 specimens tested at 28 days, and 1 specimen retained in reserve for later testing if required.
- C. Test Results: Report test results in writing to ENGINEER and CONTRACTOR within 24 hours after tests. Compressive strength test reports shall contain Project identification name and number, concrete placement date, concrete testing service name, concrete type and class, location of concrete batch in structure, design compressive strength at 28 days, concrete mix proportions and materials; compressive breaking strength and break type for both 7-day tests and 28-day tests.
- D. Acceptance: Concrete strength shall be considered satisfactory if averages of 3 consecutive strength test results equal or exceed specified 28-day compressive strength (f'c), and no individual strength test result falls below specified compressive strength by more than 500 psi.
- E. Failure to Meet Requirements:
 - 1. Should 7-day compressive strengths shown by test specimens fall below 65 percent of required 28-day strength (f'c), ENGINEER will have the right to require changes in proportions for remaining Work. Furthermore, ENGINEER will have the right to require additional curing, as specified in this Section, on those portions or structures represented by failed test specimens.
 - 2. Should 28-day compressive strengths (f'c) test results fail to meet required strength, core-boring tests conforming to ASTM Standard C 42 shall be made at CONTRACTOR's expense within 60 days of that concrete placement.
- F. At locations where concrete quality is deemed questionable by ENGINEER, core-boring tests shall also be made at CONTRACTOR's expense.

- G. Concrete is acceptable if average strength of 3 cores is at least 85 percent and no single core is less than 75 percent of required minimum allowable 28-day compressive strengths (f'_c). If core-boring test results fail to meet strength requirements, ENGINEER will have right to require strengthening or replacing those portions of structures which failed to develop specified strength.
- H. Provide additional curing when ordered by ENGINEER because of failure to meet requirements. It shall be done at CONTRACTOR's expense, and no claim for extra compensation for additional curing will be allowed. Additional curing shall extend period of protection. Additional curing is limited to 60 days.
- I. Additional Tests: Testing service shall make additional in-place concrete tests when test results suggest specified concrete strengths and other characteristics have not been attained. Testing service may conduct tests to determine adequacy by cored cylinders complying with ASTM C 42, or by other approved methods. CONTRACTOR shall pay for additional tests when unacceptable concrete is verified.

END OF SECTION

SECTION 03930 - REPAIR OF EXISTING CONCRETE STRUCTURES

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes: Extent of repair of existing concrete structures shown on Drawings and specified, and includes patching loose, spalled, and unsound concrete, grouting cracks, removing debris resulting from Work, and other Work required to produce a neat and complete job.
- B. Related Documents: Drawings and general provisions of Contract, including General Conditions and Division 1, apply to Work of this Section.

1.02 METHODS OF PAYMENT

- A. Repair over 2 inches Deep: Measure surface area and average depth after surface preparation and prior to beginning actual repair. ENGINEER, with CONTRACTOR, will determine the volume of each location for repair. These measurements shall be done to the nearest inch, and then totaled for comparison with the quantity shown on Drawings. The difference in quantities over or under those shown, will be included in a Change Order increasing or decreasing the Contract Price noted on Bid Form.
- B. Repair Equal to or Less than 2 Inches Deep: Work shall be paid for by the square foot of surface area repaired. Measure surface area after surface preparation and prior to beginning actual repair. ENGINEER, with CONTRACTOR, will determine the surface area of each location or fraction of each location for repair that is equal to or less than 2 inches deep. These measurements shall be done to the nearest 0.1 square foot and then totaled for comparison with the quantity shown on Drawings. The difference in quantities over or under those shown shall be included in a Change Order increasing or decreasing the Lump Sum Bid Price noted on Bid Form.
- C. Pressure Injection of Epoxy Resin: Work will be paid for by the linear foot of crack injected. These measurements shall be done to the nearest linear foot and then totaled for comparison with the quantity shown on Drawings. The difference in quantities over or under those shown shall be included in a Change Order increasing or decreasing the Lump Sum Bid Price noted on Bid Form.
- D. Pressure Injection of Hydrophilic Grout: Work will be paid for by the linear foot of crack injected. These measurements shall be done to the nearest linear foot and then totaled for comparison with the quantity shown on Drawings. The difference in quantities over or under those shown shall be included in a Change Order increasing or decreasing the Lump Sum Bid Price noted on Bid Form.

1.03 SUBMITTALS

- A. Shop Drawings: Submit in accordance with Section 01330, Shop Drawings covering the items included under this Section. Shop Drawing submittals shall include:
 - 1. Product data for proprietary materials and items, including patching compounds and others requested by ENGINEER.
 - 2. Samples of materials as requested by ENGINEER, including names, sources, and descriptions.

- B. Material certificates in lieu of laboratory test reports on other materials. Manufacturer and CONTRACTOR shall sign material certificates certifying that each material item complies with, or exceeds, specified requirements.
- C. Qualification Data for Installers.
 - 1. Manufacturer's certificates that the installer's workers are trained and qualified for each type of product.
 - 2. Satisfactory experience record including references from previous applications of the specified materials for repairs of a similar type and under similar conditions.
- D. Repair Plan: Submit before Work begins.

1.04 REFERENCES

- A. Codes and Standards:
 - 1. Comply with provisions of following codes, specifications, and standards, except where more stringent requirements are shown or specified:
 - a. ACI 224, Causes, Evaluation, and Repair of Cracks.
 - b. ACI 201, Chapter 6, "Repair of Concrete."
 - c. ACI 301, Specifications for Structural Concrete for Buildings.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Each product manufacturer shall employ factory-trained technical representatives who are available for consultation and Project-site inspection and assistance at no additional cost.
- B. Installer Qualifications: Entity qualified in the field of concrete repair with a minimum of 5-years experience and employs installers and supervisors who are trained and approved by product manufacturers to apply products used.
- C. Repair Plan: Prepare a written plan for repair of cast-in-place concrete, including each phase or process, protection of surrounding materials during operations, and control of debris and runoff during Work. Describe in detail materials, methods, equipment, and sequence of operations to used for each phase of the Work.
- D. Materials and installed work may require testing and retesting at any time during progress of Work. Tests, including retesting of rejected materials for installed Work, shall be done at CONTRACTOR's expense.
- E. Materials and installed work may require testing and retesting at any time during progress of Work. Tests, including retesting of rejected materials for installed Work, shall be done at CONTRACTOR's expense.

1.06 DELIVERY, STORAGE AND HANDLING

- A. Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.
- B. Comply with manufacturer's written instructions for minimum and maximum temperature requirements and other conditions for storage.

- C. Store tightly sealed materials off ground and away from moisture, direct sunlight, extreme heat, or freezing temperatures.

1.07 FIELD CONDITIONS

- A. Cold-Weather Requirements for Cementitious Materials: Do not apply unless concrete-surface and air temperatures are above 40-degrees F and will remain so for at least 48 hours after completion of Work.
- B. Hot-Weather Requirements for Cementitious Materials: Protect repair work when temperature and humidity conditions produce excessive evaporation of water from patching materials. Provide artificial shade and wind breaks, and use cooled materials as required. Do not apply to substrates with temperatures 90-degrees F and above.
- C. Protect adjacent finish materials against spatter during patching operations.

PART 2 - PRODUCTS

2.01 PATCHING MATERIALS

- A. Patching up to 2-inch Deep: Cement-polymer patching mortar with an integral corrosion inhibitor suitable for the particular patching application.
- B. Patching over 2-inches Deep: Class A concrete with the use of an epoxy bonding agent applied at the bonding surfaces, unless otherwise noted.
- C. Epoxy Bonding Agent: Epoxy-modified cementitious material with integral corrosion inhibitor.
- D. Epoxy Gel Adhesive: Moisture-tolerant 2-component epoxy adhesive conforming to ASTM Specification C 881.
- E. Epoxy Injection Resin: Moisture-insensitive 2-component epoxy-resin system conforming to ASTM Specification C 881, Type I. Provide Grade and Class to suit Project requirements.
- F. Grouting of Non-structural and Leaking Cracks: Moisture reactive (hydrophilic) TDI (toluene diisocyanate) based polyurethane chemical grout. For structures in contact with potable water, chemical grout shall be NSF 61 approved.

2.02 REINFORCING MATERIALS

- A. Reinforcing Bars: ASTM A 615, Grade 60, deformed.

PART 3 - EXECUTION

3.01 GENERAL

- A. All workers shall have sufficient experience on concrete repair work to be familiar with the use of these materials and methods of operation.

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- B. To ensure the quality of the finished work, ENGINEER may require CONTRACTOR to replace workers who, in ENGINEER's judgment, are not capable or qualified to perform this Work. CONTRACTOR, upon receipt of the written notification from ENGINEER, shall immediately comply with this request at no additional cost to OWNER.

3.02 PREPARATION

- A. Ensure that supervisory personnel are on-site and on duty when concrete repair work begins and during its progress.

3.03 PATCHING

- A. Locate areas of deteriorated or delaminated concrete using hammer or chain-drag sounding and mark boundaries. Mark areas for removal by simplifying and squaring off boundaries.
- B. Square cut perimeter of areas to be patched to a minimum depth of 1/4-inch. Remove deteriorated or unsound concrete as required to reach sound concrete. Removal shall be to a minimum depth of 1/4-inch.
- C. Thoroughly clean by sandblasting all corroded and rusted reinforcement. Wherever a reinforcing bar has lost more than 30 percent of its cross-sectional area, place a new bar of the same size parallel to it using 24-bar diameters lapped length at each end. When a bar has exposed 50 percent or more of its perimeter, chip out the concrete around the bar to provide a minimum of 1-inch gap all around so the bar can be completely encased in new mortar.
- D. Test areas where concrete has been removed by tapping with a hammer, and remove additional concrete until unsound and disbonded concrete is completely removed.
- E. After concrete removal, mechanically prepare concrete surface to obtain a minimum surface profile of 1/16-inch +/-.
- F. Thoroughly clean dirt, oil, dust, or foreign matter from repair surfaces. Dampen concrete substrate to a saturated surface dry condition. Coat substrate with bonding agent.
- G. The patching material must be applied within the working time of the bonding agent. Use bonding agent only on surfaces not requiring formwork or when the patching material can be applied within manufacturer's recommended working time.
- H. Prepare the cement mortar per manufacturer's recommendations. Apply mortar with a spatula pressed tight against existing surfaces and filling all voids. Build up mortar to original lines in one or more layers, with each layer thickness not to exceed that recommended by the manufacturer, and finished smooth with a steel trowel.

3.04 PRESSURE INJECTION OF CRACKS

- A. Drilling Injection Holes:
 - 1. Pressure injection of epoxy resin: Drill holes into face of crack.
 - 2. Pressure injection of hydrophilic grout: Drill injection holes along the sides of the cracks set at an angle of 45-degrees from the surface of the concrete so the holes intersect the crack near the mid-section of the concrete. Alternate holes from one side of crack to the other.

3. Minimum hole spacing should equal thickness of the concrete to be repaired.
- B. Flush drilling dust out of out of injection holes by use of water and a flushing wand that reaches the back of the hole. Install injection packers or ports in the injection holes. Mechanically clean and surface seal cracks wider than 1/8-inch with hydraulic cement or epoxy gel adhesive.
- C. Thoroughly flush cracks with potable water prior to grout injection.
- D. Inject chemical grout, maintaining slow, steady pressure until crack is filled. In slabs, injection shall start at the first packer or port that was flushed with water. In walls, injection shall start at the lowest packer or port. Move to next adjacent packer or port when the injection material appears from adjacent packers or ports. Reinject first packer or port after pumping a number of locations.
- E. Remove injection packers or ports and patch injection holes with patching mortar. Remove excess cured grout, hydraulic cement, or epoxy gel and clean surface.

3.05 PLACING REINFORCEMENT

- A. Comply with Concrete Reinforcing Steel Institute's recommended practice for "Placing Reinforcing Bars" for details and methods of reinforcing placement and supports.
- B. Clean reinforcement of loose rust and mill scale, earth, ice, and other materials that reduce or destroy bond to patching material.
- C. Accurately position, support, and secure reinforcement against displacement by construction or patching operations. Locate and support reinforcing by metal chairs, runners, bolsters, spacers, and hangers.
- D. Place reinforcement to obtain minimum coverings for reinforcement protection. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position during patching operations. Set wire ties to direct ends into concrete, not toward exposed surfaces.

3.06 SURFACE FINISHES

- A. Patching: Provide finish to match adjacent concrete surfaces unless otherwise noted.

3.07 CURING AND PROTECTION

- A. Protect freshly placed material from premature drying and excessive cold or hot temperatures.
- B. Patching up to 2 Inches Deep: Perform curing as recommended by patching mortar manufacturer.
- C. Patching over 2 Inches Deep: Perform curing of Class A concrete as specified in Section 03315.

3.08 REPAIR OF DEFECTS

- A. Repair patch areas that lack uniformity or have honeycomb, rock pockets, voids over 1/4-inch in diameter, and holes left by tie rods and bolts.

END OF SECTION

DIVISION 4
(NOT USED)

DIVISION 5
(NOT USED)

DIVISION 6
(NOT USED)

DIVISION 7

THERMAL AND MOISTURE PROTECTION

SECTION 07140 - FLUID-APPLIED WATERPROOFING

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes: Extent of fluid-applied waterproofing Work on concrete surfaces as described below.
 - 1. Inside face of below grade vault walls and floors. Walls shall be coated from the top to the bottom of the wall and the entire floor of the vault. See drawings.
- B. Type of fluid applied waterproofing required for Project includes:
 - 1. One-part or two-part urethane-based or polyurethane-based type.
- C. Related Documents: Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1, General Requirements, Specification Sections, apply to Work of this Section.

1.02 REFERENCES

- A. Reference Standards:
 - 1. ASTM C 836 High Solids Content, Cold Liquid-Applied Elastomeric Waterproofing Membrane for use with Separate Wearing Course.
 - 2. ASTM D 4258 Practice for Surface Cleaning Concrete for Coating.
 - 3. ASTM D 4259 Practice for Abrading Concrete.
 - 4. ASTM D 4263 Test Method for Indicating Moisture in Concrete by the Plastic Sheet Method.
 - 5. ICRI 03732 Selecting and Specifying Concrete Surface Preparation for Sealers, Coatings, and Polymer Overlays.

1.03 SUBMITTALS

- A. Shop Drawings: Submit in accordance with Division 1, General Requirements, Shop Drawings covering the items included under this Section. Shop Drawing submittals shall include:
 - 1. Product Data: Manufacturer's specifications, installation instructions, general recommendations, and proposed details for each waterproofing material required. Include data substantiating that materials comply with requirements. Sample of coating system applied to 1/4-inch plywood or similar rigid base. Submit 2 samples of each color and system to be used.
 - 2. Certification: Applicator must submit a document providing proof of certification by the manufacturer of the primary materials.
- B. Operation and Maintenance Manuals: Submit in accordance with requirements of Section 01600, operation and maintenance manuals for items included under this Section. Identify common causes of damage with instructions for temporary patching until permanent repair can be made.
- C. Warranty: Submit warranties covering the items included under this Section.

1.04 QUALITY ASSURANCE

- A. Source Quality Control: Obtain primary waterproof materials of each type required from single manufacturer with not less than 3 years of successful experience in supplying principal materials for

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fluid-applied waterproofing work. Provide secondary materials only as recommended by manufacturer of primary materials.

- B. Installer Qualifications: A qualified installer who is certified, authorized, approved, or licensed by the waterproofing manufacturer to install manufacturer's products.
- C. Pre-Application Conference: Approximately 2 weeks prior to scheduled commencement of fluid-applied waterproofing installation, meet at Site with Installer, Installers of deck or substrate construction to receive work, installers of other work in and around waterproofing work which must precede, follow or penetrate waterproofing work (including mechanical work if any), ENGINEER, OWNER, and waterproofing material manufacturer's representative. Record (CONTRACTOR) discussions of conference, together with decisions and agreements (or disagreements) reached. Furnish copy of record to each party attending. Review methods and procedures related to Work including, but not necessarily limited to, the following:
 - 1. Tour Site areas to be waterproofed. Inspect and discuss condition of substrate, drains, curbs, penetrations, and other preparatory Work performed by other trades.
 - 2. Review waterproofing requirements (Drawings, Specifications, and other Contract Documents).
 - 3. Review required submittals, both completed and yet to be completed.
 - 4. Review and finalize Construction Schedule related to waterproofing Work, and verify availability of materials, Installer's personnel, and equipment and facilities needed to make progress and avoid delays.
 - 5. Review required inspection, testing, and certifying procedures.

1.05. PROJECT CONDITIONS

- A. Substrate: Proceed with Work of this Section only after substrate construction and penetrating Work have been completed. Prepare surfaces per manufacturers recommendations.
- B. Weather: Proceed with Work of this Section only when existing and forecasted weather conditions will permit Work to be performed in accordance with manufacturer's recommendations.
- C. Ventilation: Provide adequate ventilation to prevent accumulation of hazardous fumes during application of solvent-based components in enclosed spaces, and maintain ventilation until coatings have thoroughly cured.

1.06. WARRANTY

- A. Special Warranty: Provide warranties covering the items included under this Section of the Contract. The special warranty shall be jointly warranted by manufacturer and applicator. The warranty shall repair or replace defective components that fail in materials or workmanship within special warranty period.
 - 1. Warranty Period: 3 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Subject to compliance with specified requirements, manufacturers offering products which may be incorporated in Work include:
 - 1. Fluid Applied Waterproofing:

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- a. Neogard Corp.
- b. BASF Construction Chemicals LLC.
- c. Tremco.

2.02 MATERIALS

- A. Compatibility: Provide products which are recommended by manufacturer to be fully compatible with indicated substrates and similar proven compounding provisions.
- B. Urethane-Based, One-Part Waterproofing: (Poly)urethane rubber-based liquid membrane material, self-bonding to normal substrates, compounded specifically for application method to be used (by hand or spray) and for slope of substrate, not less than 6-month shelf life in uncured state, tested by manufacturer to comply with requirements of ASTM C 836.
- C. Available products for inside surfaces (walls and floor) of vault not in contact with potable water, NOT exposed to view or UV light, subject to compliance with the following requirements: Able to resist hydrogen sulfide gas, 20 percent sulfuric acid, abrasion resistance: 6mg maximum with 1,000 revolutions with CS-17, 1,000 gm wheel, and minimum 300 percent elongation, permeance: maximum 0.05 perms.
 1. CIM 1000, C.I.M. Industries (**Basis of Design**).
 2. Elasto-Shield 262, Tnemec Company, Inc.
 3. Envirolastic AR425, Sherwin-Williams Company.
- D. The membrane shall have the ability to span 1/16-inch cracks in concrete substrate. Color shall be as selected by ENGINEER.
- E. Miscellaneous Materials:
 1. Primer, Filler, Sealer: As recommended by manufacturer of fluid-applied waterproofing compound and as indicated.
 2. Flashings, Cant Strips, and Accessories: As recommended by manufacturer of waterproofing compound and as indicated.

PART 3 - EXECUTION

3.01 ACCEPTABLE INSTALLERS

- A. Installer Qualifications: A firm which has specialized in installation of types of waterproofing required for project for not less than 3 years and which is acceptable to manufacturers of primary materials. List of at least 5 projects of a similar nature by applicator which have been installed, identified with project name, location, date, and description.
 1. Assign Work closely associated with waterproofing including, but not limited to, waterproofing accessories, flashings used in conjunction with waterproofing for undivided responsibility.

3.02 CONDITION OF SURFACES

- A. Before coating Work is commenced, surface shall be inspected and treated as necessary to remove laitance, loose material on the surface, grease, oil, and other contaminants which will affect bond of the coating. Surfaces shall be left broom or vacuum clean.
- B. Concrete surfaces shall be visibly dry, less than 5 percent moisture, and free of contaminants.

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- C. Verify that curing methods used for concrete are compatible with coating system.
- D. Metal surfaces shall be dry, clean, free of grease, oil, dirt, rust, and corrosion and other coatings and contaminants which could affect bond of coating system, and without sharp edges or offsets at joints.
- E. Commencement of coating installation implies acceptance of substrate area as suitable to accept coatings.

3.03 PREPARATION OF SUBSTRATE

- A. Thoroughly clean all surfaces to receive coating materials in strict accordance with manufacturer's instructions and recommendations.
- B. Remove oil, grease, bitumen, form release agents, paints, curing compounds, and other penetrating contaminants or film forming coatings from concrete.
 - 1. Abrasive blast clean concrete surfaces uniformly to expose top surface of fine aggregate according to ASTM D 4259 with a self-contained, recirculating, blast-cleaning apparatus. Remove material to provide a sound surface free of laitance, glaze, efflorescence, curing compounds, concrete hardeners, or form-release agents. Remove remaining loose material and clean surfaces according to ASTM D 4258.
- C. Remove fins, ridges, and other projections and fill honeycomb, aggregate pockets, and other voids.
- D. Rout or saw-cut all cracks exceeding 1/16 inch in width and fill with sealant.
- E. The wall and dome system shall have sealant coves provided at all penetrations and changes of planes.
- F. Install cant strips and similar accessories as shown and as recommended by prime materials manufacturer even though not shown.
- G. Fill voids, seal joints, and apply bond breakers as recommended by prime materials manufacturer with particular attention at construction joints.
- H. Repair concrete to be free of holes. Fully open bug holes before repair. Repair defects in the concrete surface, such as bug holes, air pockets, and honeycomb, by filling and smoothing off with patching material, epoxy patching compound, or grout. Abrasive blast prepared surfaces.
- I. Prime substrate as recommended and (only if recommended) by prime materials manufacturer.
- J. Mask off or use drop cloths on adjoining surfaces not to receive fluid-applied waterproofing to effectively prevent spillage or overspray of liquid materials outside membrane area.
- K. Do not apply primer or waterproofing to concrete surface unless 2 or more moisture tests indicate moisture levels of 5 percent or less in accordance with:
 - 1. Plastic Sheet Method, ASTM D 4263.
 - a. Pass a 16-hour plastic sheet test (no condensation) prior to application of coating system. Sheet shall be taped to concrete on all edges.
 - 2. Relative Humidity Test.

3. Calcium Chloride Test.
 4. Gel Bridge Test.
 5. Radio Frequency Test (as outlined in 'Drying Concrete' by Lew Harriman, in the March 1995 issue of "The Construction Specifier Magazine").
- L. Concrete surface shall have a cement paste removed to expose aggregate tops and shall have a profile of ICRI CSP 4 to 6 in accordance with ICRI 03732. Repair surface profiles greater than 1/4 inch with patching material to a profile less than 1/8 inch.

3.04 INSTALLATION

- A. Comply with manufacturer's instructions except where more stringent requirements are shown or specified and except where Project conditions require extra precautions or provisions to ensure satisfactory performance of Work.
- B. Start installation of waterproofing membrane only in presence and with advice of manufacturer's technical representative.
- C. Apply uniform coating of waterproofing to substrate and adjoining surfaces indicated to receive membrane.
 1. Apply coating either by hand or by machine spray complying with manufacturer's recommendations regarding horizontal and vertical surfaces.
- D. Flashings: Provide fluid-applied integral flashings at all locations where horizontal surface abuts a vertical surface. Fluid applied flashings shall be installed at a dry film thickness as recommended by manufacturer. Use nonflowing type coating.
- E. All locations of potential high movement, such as wall/slab intersections which are not structurally and rigidly connected, provide 12-inch minimum width of pre-cured sheet flashing or reinforce coating with 1 layer of uncoated, woven fiberglass cloth. Where sheet flashings are used, they shall be free or unbonded to the substrate within 2 inches vertically and horizontally from meeting angle but shall be fully bonded for not less than 2 inches on vertical surface and 4 inches on horizontal surface. Do not use pre-cured sheet flashings over expansion joints in horizontal surfaces.
- F. Primer and Detail Work:
 1. Primer: Prime all concrete, masonry, and metal surfaces at manufacturer's recommended rate. Concrete primer shall be allowed to completely dry but shall not be applied more than 8 hours preceding application of coating. Metal primer may be applied up to 9 days prior to application of coating. Prime silicon carbide or silica sand.
- G. Membrane System:
 1. Inside surfaces of containment tanks NOT in contact with potable water and NOT exposed to view or UV light:
 - a. CIM 1000: One coat at 40 mils DFT (minimum of 2 passes in different directions).
 - b. Elasto-Shield 262: One coat at 60 mils DFT (minimum of 2 passes in different directions).
 - c. Envirolastic AR 425: One coat at 60 mils DFT (minimum of 2 passes in different directions).
 2. Exterior surfaces NOT exposed to UV light:
 - a. HLM 5000 System: One coat at 55 mils DFT.
 - b. Perma-Guard III System: Two coats, total DFT at 55 mils.
 - c. Tremproof 250GC System: One coat at 60 mils DFT.

- H. Cleaning: Clean stains from adjacent surfaces per manufacturer's recommendations. Remove foreign matter from finished coating surfaces.

3.05 PERFORMANCE REQUIREMENTS

- A. It is required that fluid-applied waterproofing membrane be watertight and not deteriorate in excess of limitations published by manufacturer.

END OF SECTION

DIVISION 8
(NOT USED)

DIVISION 9

FINISHES

SECTION 09401 - PORTLAND CEMENT TERRAZZO FLOORING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes poured-in-place portland cement terrazzo flooring.
- B. Terrazzo flooring shall match existing Terrazzo flooring in appearance and color.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: Include terrazzo installation requirements. Include plans, elevations, sections, component details, and attachments to other work.
- C. Samples: For each exposed product and for each color and texture specified.

1.3 CLOSEOUT SUBMITTALS

- A. Maintenance data.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: An installer who is a contractor member of NTMA.
- B. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1.5 FIELD CONDITIONS

- A. Environmental Limitations: Maintain temperature above 50 deg F (10 deg C) for 48 hours before and during terrazzo installation.
- B. Control and collect water and dust produced by grinding operations. Protect adjacent construction from detrimental effects of grinding operations.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. NTMA Standards: Comply with NTMA's "Terrazzo Specifications and Design Guide" and with written recommendations for terrazzo type indicated unless more stringent requirements are specified.
- B. FloorScore Compliance: Terrazzo floors shall comply with requirements of FloorScore Standard.
- C. Low-Emitting Materials: Flooring system shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.2 PORTLAND CEMENT TERRAZZO

- A. Portland Cement Terrazzo System: Monolithic.
 - 1. Underbed: Comply with NTMA's "Terrazzo Specifications and Design Guide" for terrazzo system indicated for component proportions and mixing.
 - 2. Topping: Comply with NTMA's "Terrazzo Specifications and Design Guide" for terrazzo system indicated for matrix and aggregate proportions and mixing.
 - a. Terrazzo Topping Thickness: ½"
 - b. Mix Color and Pattern: match existing adjacent at area of repairs
- B. Materials:
 - 1. Portland Cement: ASTM C 150, Type 1.
 - a. Color for Exposed Matrix: As required by mix indicated and to match existing.
 - 2. Water: Potable.
 - 3. Sand: ASTM C 33/C 33M.
 - 4. Aggregates: Comply with NTMA gradation standards for mix indicated and contain no deleterious or foreign matter.
 - a. Abrasion and Impact Resistance: Less than 40 percent loss per ASTM C 131 and ASTM C 535.
 - b. 24-Hour Absorption Rate: Less than 0.75 percent.
 - c. Dust Content: Less than 1.0 percent by weight.
 - 5. Matrix Pigments: Pure mineral or synthetic pigments, alkali resistant, durable under exposure to sunlight, and compatible with terrazzo matrix. Shall match existing.
 - 6. Bonding Agent: Neat portland cement, or epoxy or acrylic bonding agents formulated for use with topping indicated.

7. Underbed Reinforcement: Galvanized welded-wire reinforcement, wire 2 by 2 inches (51 by 51 mm) by 0.062 inch (1.57 mm) in diameter, complying with ASTM A 185/A 185M and ASTM A 82/A 82M, except for minimum wire size.
8. Isolation Membrane: Polyethylene sheeting, ASTM D 2103, Type 13300, 4 mils (0.1 mm) thick; or unperforated asphalt felt, ASTM D 226, Type I (No. 15).

2.3 STRIP MATERIALS

- A. Standard Divider Strips: One-piece, flat-type strips for grouting into sawed joints prepared in substrate.
 1. Material: Brass.
 2. Depth: 3/4 inch (19 mm).
 3. Width: 1/4 inch (6.4 mm).
- B. Control-Joint Strips: Separate, double L-type angles, positioned back to back, that match material and color of divider strips and in depth required for topping thickness indicated.
- C. Accessory Strips: Match divider-strip width, material, and color unless otherwise indicated. Use the following types of accessory strips as required to provide a complete installation:
 1. Base-bead strips for exposed top edge of terrazzo base.
 2. Edge-bead strips for exposed edges of terrazzo.

2.4 MISCELLANEOUS ACCESSORIES

- A. Strip Adhesive: Recommended by manufacturer for this use.
 1. Adhesives shall have a VOC content of 70 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
 2. Adhesives shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- B. Strip Anchoring Devices: Provide mechanical anchoring devices or adhesives for strip materials as recommended by manufacturer and as required for secure attachment to substrate.
- C. Isolation and Expansion-Joint Material: Closed-cell polyethylene foam, nonabsorbent to liquid water and gas, and non-outgassing in unruptured state; butyl rubber; rubber; or cork; minimum 1/2 inch (12.7 mm) wide.
- D. Portland Cement Terrazzo Cleaner: Chemically neutral cleaner with pH factor between 7 and 10 that is biodegradable, phosphate free, and recommended by cleaner manufacturer for use on terrazzo type indicated.
- E. Sealer: Slip- and stain-resistant, penetrating-type sealer that is chemically neutral; does not affect terrazzo color or physical properties; is recommended by sealer manufacturer; and complies with NTMA's "Terrazzo Specifications and Design Guide" for terrazzo type indicated.

1. Surface Friction: Not less than 0.6 according to ASTM D 2047.
2. Acid-Base Properties: With pH factor between 7 and 10.
3. Sealers shall have a VOC content of 200 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

PART 3 - EXECUTION

3.1 PREPARATION

- A. Clean substrates of substances, including oil, grease, and curing compounds, that might impair terrazzo bond. Provide clean, dry, and neutral substrate for terrazzo application.
 1. Roughen concrete substrates before installing terrazzo system according to NTMA's written recommendations.
- B. Verify that concrete substrates are dry and moisture-vapor emissions are within acceptable levels according to manufacturer's written instructions.
 1. Moisture Testing: Test for moisture content by method recommended in writing by terrazzo manufacturer. Proceed with installation only after substrates pass testing.

3.2 INSTALLATION

- A. Comply with NTMA's written recommendations for terrazzo and accessory installation.
- B. Installation Tolerance: Limit variation in terrazzo surface from level to 1/4 inch in 10 feet (6.4 mm in 3 m); noncumulative.
- C. Underbed:
 1. Comply with NTMA's "Terrazzo Specifications and Design Guide" for underbed installation.
 2. Cover entire surface to receive terrazzo with dusting of sand.
 3. Install isolation membrane over sand, overlapping ends and edges a minimum of 3 inches (75 mm).
 4. Install welded-wire reinforcement, overlapping at edges and ends at least two squares. Stop mesh a minimum of 1 inch (25 mm) short of expansion joints.
 5. Place underbed and screed to elevation indicated below finished floor elevation.
- D. Strip Materials:
 1. Divider and Control-Joint Strips:
 - a. Locate divider strips directly over control joints, breaks, and saw cuts in concrete slabs.
 - b. Install control-joint strips back to back and directly above concrete-slab control joints.

- c. Install control-joint strips with 1/4-inch (6.4-mm) gap between strips, and install sealant in gap.
 - d. Install strips in adhesive setting bed without voids below strips, or mechanically anchor strips as required to attach strips to substrate, as recommended by strip manufacturer.
- 2. Accessory Strips: Install as required to provide a complete installation.
- E. Terrazzo Installation: Pour in place and seed additional aggregates in matrix to uniformly distribute granular material and produce a surface with a minimum of 70 percent aggregate exposure. Cure and finish portland cement terrazzo according to NTMA's "Terrazzo Specifications and Design Guide" for terrazzo type indicated.
- F. Repair: Cut out and replace terrazzo areas that evidence lack of bond with substrate or underbed, including areas that emit a "hollow" sound if tapped. Cut out terrazzo areas in panels defined by strips and replace to match adjacent terrazzo, or repair panels according to NTMA's written recommendations, as approved by Architect.

3.3 CLEANING AND PROTECTION

- A. Terrazzo Cleaning:
 - 1. Remove grinding dust from installation and adjacent areas.
 - 2. Wash surfaces with cleaner immediately after final cleaning of terrazzo flooring according to NTMA's written recommendations and manufacturer's written instructions; rinse surfaces with water and allow them to dry thoroughly.
- B. Sealing:
 - 1. Seal surfaces according to NTMA's written recommendations.
 - 2. Apply sealer according to sealer manufacturer's written instructions.
- C. Protection: Provide final protection and maintain conditions, in a manner acceptable to Installer, that ensure that terrazzo is without damage or deterioration at time of Substantial Completion.

END OF SECTION

SECTION 09900 - PAINTING

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes: Field painting as shown and/or herein required. See specific items not requiring field painting under Work Not Included.
- B. In general, exposed surfaces of factory and/or shop-primed work that are delivered to Site without a final finish shall be painted. The shop priming and intermediate shop coatings shall not be considered as included in the number of field coats specified under Part 2, Field Painting Systems Article, Finish Paints paragraph in this Section.
- C. Ferrous metal surfaces, excluding stainless steel surfaces that will be exposed in the completed Work, shall be sandblasted either at the point of fabrication or under this Section prior to placement of primers. Field fabrication, including welds and cuts, shall be sandblasted, primed, and painted as herein specified.
- D. Ferrous metal items that will be in contact with precast concrete slabs, masonry, etc., shall be finish painted.
- E. Galvanized steel items that are not included under "Work Not Included," shall be prepared, primed, and finish painted as herein specified.
- F. Bruises, mars, and/or scratches in the shop painting due to handling, shall be immediately touched up in the field by CONTRACTOR prior to any storage or installation.
- G. Painting of piping includes pipe hangers, valves, and piping accessories, and also includes surfaces that will be in contact with piping supports. ALL PIPING SHALL BE COMPLETELY PAINTED.
- H. Existing surfaces shall be painted where shown and/or called for. Preparation for repainting and priming shall be as herein specified and shall be as per Flint WPC existing paint specification book
- I. Altered existing Work or damaged surfaces that are a result of the revisions shall be painted under this item of Work. The finishes shall match the existing adjacent coatings and shall be as per Flint WPC existing paint specification book
- J. Miscellaneous equipment shipped to Site with factory-applied coatings as follows, shall be painted under this Work as specified:
 - 1. No Factory Finish: Surface preparation, priming, and finish painting.
 - 2. Prime Coat: Surface preparation, touch-up, and finish painting.
 - 3. Intermediate Coat: Surface preparation, touch-up, and finish painting.
 - 4. Pre-finished Equipment: Touch-up as required. Equipment manufacturer shall furnish necessary touch-up paint.
 - 5. Factory finish coats, not matching the approved finish colors, that are provided in lieu of the shop prime specified shall be properly prepared and receive a final field coat to match the adjacent related Work.

6. Overhead sectional doors with a factory finish shall be field-painted on both interior and exterior exposed surfaces.
- K. Painting as called for on Drawings is for guidance only and does not limit the requirements for painting.
- L. Work Not Included: Unless specifically called for on Drawings or specified in this Section, the following are not included:
 1. Exterior exposed concrete surfaces and exposed concrete surfaces below the ground floor plan.
 2. Nonferrous metals and stainless steel, except copper and brass.
 3. Exterior aluminum siding.
 4. Nonexposed surfaces of treated lumber.
 5. Conduits below the main floor, except in rooms that are painted.
 6. Exterior gratings with a hot-dipped galvanized finish.
 7. Manufacturer's name and identification plates.
 8. All interior and exterior sealant and caulking unless adjacent to latex-coated surfaces and approved by ENGINEER.

1.02 DEFINITIONS

- A. Potable Water Use Defined: Paint or coatings in contact with water anywhere within the potable water system (including intake/treatment/storage/distribution), shall be tested and certified by the National Sanitation Foundation (NSF) or Underwriter's Laboratory (UL) as a protective (barrier) material as per ANSI/NSF Standard 61 (Listed Drinking Water System Components - Health Effects).

1.03 SUBMITTALS

- A. Shop Drawings: Submit in accordance with Section 01330, Shop Drawings covering the items included under this Section. Shop Drawing submittals shall include:
 1. Listing of all materials proposed for use on Work, including designation of the area, primer required, or purpose.
 2. Specification data sheets included for each specific material proposed.
 3. Application instructions included for each specific material proposed.
 4. Color samples.
- B. Furnish ENGINEER, for approval, a schedule for all painting as called for on Painting Schedule and Piping Color Code and Identification subsection.
- C. Warranty: Submit in accordance with requirements of Section 01770, warranties covering the items included under this Section.

1.04 QUALITY ASSURANCE

- A. Single Source Responsibility: Provide primers and undercoat paint produced by the same manufacturer as the finish coats.
- B. CONTRACTOR's Responsibility: It shall be CONTRACTOR's responsibility to check the compatibility of painting materials proposed for this Contract. CONTRACTOR shall coordinate this Work with other trades to ensure compliance with these Specifications.

- C. Acceptability of materials and performance shall be determined by ENGINEER.
- D. Testing or certification may be required to aid ENGINEER's determination of fitness.
 - 1. Expense of testing and certification when required and, unless noted otherwise in the Contract Documents, shall be borne by CONTRACTOR.
 - 2. If destructive testing is required, CONTRACTOR shall repair damaged area. Expense of repair shall be borne by CONTRACTOR.
- E. Request, in writing, a review of each coat by ENGINEER of first finished surface of each type of color, texture, and workmanship. First acceptance of each type and color shall be visibly labeled by ENGINEER with removable labels as Project standard for that type and color of item. Labels shall remain in place until Work is finished.
 - 1. For spray application, paint a surface of 100-square-foot as Project standard.
 - 2. For roller application, apply a 36-square-foot mock-up as Project standard.
- F. All Work may be inspected as to proper surface preparation, pre-treatment, priming, dry film thickness, curing, color, and workmanship. CONTRACTOR shall supply the following applicable standards, test methods, and inspection equipment:
 - 1. SSPC-VIS-1 photographic blast cleaning standards.
 - 2. Inspectors wet film gauge.
 - 3. Inspectors magnetic dry film thickness gauge.
 - 4. Tinkor Razor M-1 low voltage Holiday Detector.
 - 5. Marke 5 Tooke Gauge.

1.05 FIELD PAINTING SUBMITTAL SCHEDULE

- A. Furnish ENGINEER, for approval, prior to commencing any painting, a Schedule similar to that below:

FIELD PAINTING SUBMITTAL SCHEDULE

<u>Item and/or Location</u>	<u>Type Material</u>	<u>Coverage per Coat</u>	<u>Paint Manufacturer</u>
Pre-treatment			
Primers			
Barrier coats			
Sealers			
Filler and leveling coats			
Existing paint, water-base epoxy coated			
Interior concrete floors and walkways, nonslip epoxy coated			
Interior concrete bases, curbs and platforms, epoxy coated			
Interior concrete, epoxy coated			
Interior concrete, latex coated			
Interior concrete block, epoxy coated			
Interior concrete block, latex coated			
Exterior concrete block, stained			
Exterior concrete block, elastomeric coated			
Interior nonsubmerged metal, epoxy coated			
Interior nonsubmerged metal, alkyd coated			
Exterior nonsubmerged metal, polyurethane coated			
Nonpotable submerged and intermittently submerged metal, coal-tar epoxy coated			
Potable submerged and intermittently submerged metal, epoxy coated			
Interior wood, alkyd coated			
Interior wood, stained			
Exterior wood, stained			
Exterior wood, latex coated			
Exterior PVC, vinylester, fiberglass, polyurethane coated			
Interior PVC, vinylester, fiberglass, epoxy coated			
Insulated piping, latex coated			
Interior plaster and drywall, latex coated			
Interior plaster and drywall, epoxy coated			
Exterior plaster, latex coated.			

1.06 PROJECT MEETING

- A. Prior to ordering any materials under this Section, CONTRACTOR, ENGINEER, painting subcontractor, and paint manufacturer's representative shall attend a progress meeting to review Work to be performed under this Section.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to Site in manufacturer's original, unopened packages and containers, bearing manufacturer's name and label and the following information:
 - 1. Product name or title of material.
 - 2. Product description (generic classification or binder type).
 - 3. Federal Specification number, if applicable.
 - 4. Manufacturer's stock number and date of manufacture.
 - 5. Contents by volume for pigment and vehicle constituents.
 - 6. Thinning instructions.
 - 7. Application instructions.
 - 8. Color name and number.
- B. Store materials not in use in tightly covered containers in a well-ventilated area at a minimum ambient temperature of 45 degrees F (7 degrees C). Maintain containers used in storage in a clean condition, free of foreign materials and residue.
 - 1. Protect from freezing. Keep storage area neat and orderly. Remove oily rags and waste daily. Take necessary measures to ensure that workers and work areas are protected from fire and health hazards resulting from handling, mixing, and application.

1.08 PROJECT CONDITIONS

- A. Apply water-based paints only when the temperature of surfaces to be painted and surrounding air temperatures are between 50 degrees F (10 degrees C) and 90 degrees F (32 degrees C).
- B. Apply solvent-thinned paints only when the temperature of surfaces to be painted and surrounding air temperatures are between 45 degrees F (7 degrees C) and 95 degrees F (35 degrees C).
- C. Do not apply paint in snow, rain, fog, or mist, when the relative humidity exceeds 85 percent, at temperatures less than 5 degrees F (3 degrees C) above the dew point, or to damp or wet surfaces.
 - 1. Painting may continue during inclement weather if surfaces and areas to be painted are enclosed and heated within temperature limits specified by the manufacturer during application and drying periods.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Subject to compliance with specified requirements, manufacturers offering products which may be incorporated in Work include:
 - 1. Painting Materials:
 - a. ICI/Devoe Coatings, Louisville, KY.

- b. Carboline Co., St. Louis, MO 63144.
 - c. PPG Industries, Pittsburgh, PA 15222.
 - d. Porter International, Louisville, KY 40203.
 - e. Sherwin-Williams Company, Cleveland, OH 44101.
 - f. Tnemec, North Kansas City, MO 64141.
2. Dry Film Thickness Gauge:
- a. Elcometer.
 - b. Nordstrom.

2.02 MATERIALS

- A. Painting materials shall be those as herein specified under "Field Painting Systems" Article.
- B. The specification designations, manufacturers and/or trade names herein are intended to establish a quality and standard for the materials used.
- C. Colors and sheen, where not specified, shall be selected by ENGINEER.
- D. Oil, turpentine, and other thinners used in the finishing Work shall meet the requirements of the latest appropriate ASTM.

2.03 FIELD PAINTING SYSTEMS

- A. The following systems may vary from the coverages and mil thickness shown if recommended by paint manufacturer and approved in writing by ENGINEER. Number of coats shall be as required to obtain the mil thickness specified.
- B. If no pre-treatment is required by paint manufacturer, the surfaces shall be solvent cleaned (SSPC-SP1); otherwise the surfaces shall be pre-treated as follows:
 - 1. Nonsubmerged Galvanized Metal: Apply 1 brush coat of phosphoric acid.
 - 2. Nonferrous Metals: Apply 1 coat of a 2-component wash primer formulated with a zinc chromate pigmented polyvinyl butyral resin and phosphoric acid at a minimum of 0.3 dry mils and maximum of 0.5 dry mils thickness.
- C. Field Priming and Sealing:
 - 1. Concrete and Concrete Block Primer and Sealer: Apply 1 coat of an approved material.
 - 2. Metal Primer: Apply 1 coat of a universal rust-inhibitive primer which can be used on both submerged and nonsubmerged ferrous metal and has the ability to accept alkyds, epoxy, vinyl, coal tar, chlorinated rubber, emulsion, coal-tar epoxies, epoxy ester, asphalt, and phenolic paints as finish coats. Apply at the rate of 1.5 dry mils or as recommended by manufacturer.
 - 3. Nonsubmerged Galvanized Metal Primer: If the finish paint required is self-priming, no primer is required. Otherwise, apply 1 coat of approved galvanized iron primer that will form a permanent bond coat for the finish coat.
 - 4. Sealant for Bituminous Coated Surfaces: Apply 2.5 dry mils of synthetic alcohol-soluble resin and titanium pigment, or as recommended by manufacturer in writing and approved by ENGINEER.
 - 5. Exterior Wood Primer: Apply 2.0 to 3.5 dry mils of an alkyd-linseed oil mildew-resistant film.
 - 6. Interior Wood Primer: Apply 2.0 to 3.5 dry mils of an oil alkyd undercoater to wood that has a painted finish called for.

D. Finish Paints:

1. Existing Painted Walls, Water-Base Acrylic Epoxy Coated: Apply 2 coats of a water-base acrylic epoxy at 2.0 to 2.5 mils per coat.
2. Interior Concrete Floors, Epoxy Coated: Apply 2 coats of a polyamide-cured epoxy resin finish at 2.0 to 3.0 dry mils minimum per coat. The second coat shall provide a nonslip surface.
3. Interior Concrete, Epoxy Coated: Apply 2 coats of a polyamide-cured epoxy resin finish at 2.5 to 3.5 dry mils minimum per coat.
4. Interior Concrete Curbs and Platforms: Apply 2 coats of a polyamide-cured epoxy resin finish at 2.0 to 3.0 dry mils minimum per coat.
5. Interior Concrete where Hydrostatic Back-pressure is Determined, Latex Coated: Apply 2 coats of an acrylic latex finish at 2.0 to 3.0 dry mil minimum per coat.
6. Exterior Nonsubmerged Poured Concrete, Modified Epoxy Masonry Texture Coating: Apply 1 coat of a modified epoxy masonry texture coating at coverage of 70 to 90 square feet per gallon. Backroll to assure proper penetration into concrete.
7. Interior Concrete Block, Latex Coated: Apply an acrylic emulsion sealer or leveler coat and 2 coats of an acrylic latex finish at 2.0 to 3.0 dry mils per coat.
8. Interior Concrete Block, Epoxy Coated: Apply a modified epoxy sealer at the rate of 60 to 80 square feet per gallon, and 2 coats of a polyamide-cured epoxy resin finish at 2.5 to 3.5 dry mils per coat.
9. Interior Nonsubmerged Metal: In rooms and areas that have the walls finished with latex or alkyd paint, apply 2 coats of a medium to long alkyd resin finish at 2.0 to 3.5 dry mils per coat. All other items of interior nonsubmerged metal that are specified to be painted shall be finished by applying 2 coats of a polyamide-cured epoxy resin finish at 2.0 to 3.0 dry mils per coat.
10. Exterior Nonsubmerged Metal, Polyurethane Coated: Apply 2 coats of a polyamide-cured epoxy resin finish at 2.5 to 3.5 dry mils, and 1 final coat of an aliphatic polyurethane enamel at 2.0 to 3.0 dry mils. The second coat shall have a color close to the final finish.
11. Non-Potable Submerged and Intermittently Submerged Metal, Coal-tar Epoxy Coated: Apply 2 coats of a coal-tar epoxy finish at 8.0 to 10.0 dry mils per coat.
 - a. Spray application is necessary to obtain required film thickness. Spray application shall be made in crosshatches to achieve required dry film thickness. Brush or roller application will require additional coats to obtain the required film thickness at no additional expense to OWNER. Additional coats to meet the dry film thickness requirements must be applied within 24 hours of application of first coat of coal-tar epoxy. CONTRACTOR shall provide adequate protection of adjacent areas to protect against overspray.
12. Potable Submerged and Intermittently Submerged Metal, Epoxy Coated: Apply 2 coats of an epoxy-polyamide or epoxy-polyamine system as approved by the NSF for potable water service conforming to AWWA D102 inside System No. 1.
13. Exterior PVC, Vinylester, or Epoxy Resin Fiberglass: These nonsubmerged materials shall be painted the same system as for exterior nonsubmerged metal. Submerged and intermittently submerged materials shall be painted the same system as for submerged and intermittently submerged metal.
14. Interior PVC, Vinylester, or Epoxy Resin Fiberglass, Epoxy Coated: Apply 2 coats of a polyamide-cured epoxy resin finish at 2.0 to 3.0 dry mils per coat.
15. Insulated Piping, Acrylic Coated: Apply 2 coats of an acrylic enamel at 2.0 to 2.5 dry mils per coat.
16. Interior Plaster and Drywall, Latex Coated: Apply 1 coat of latex primer at 1.5 dry mils minimum, and 2 coats of an acrylic latex finish at 1.0 to 1.5 dry mils.
17. Interior Plaster and Drywall, Epoxy Coated: Apply 1 coat of latex primer at 1.5 dry mils, and 2 coats of polyamide-cured epoxy finish at 2.0 to 2.5 dry mils per coat.

2.04 PIPING COLOR CODE AND IDENTIFICATION

- A. The CONTRACTOR shall contact the ENGINEER for the approved pipe color code and identification nomenclature.
- B. CONTRACTOR shall furnish ENGINEER for approval, prior to commencing any painting, a Schedule showing colors and markings proposed.
- C. Pipe markings and banding shall be placed on exposed pipe by stenciling or other method as approved by ENGINEER. The markings shall include an appropriate name and direction of flow arrow. The markings shall be located at intervals not to exceed 15 feet and shall occur at least once in every room unless otherwise approved by ENGINEER. Letters and arrows shall be white-on-dark colored surfaces and black-on-light colored surfaces, shall be proportioned to the size of the pipe, and shall be located in an area that will facilitate readings.

Size of Identification Letters	
Outside Diameter of Pipe or Covering (inches)	Size of Letters (inches)
3/4 to 1-1/4	1/2
1-1/2 to 2	3/4
2-1/2 to 6	1-1/4
8 to 10	2-1/2
over 10	3-1/2

PART 3 - EXECUTION

3.01 WORKMANSHIP

- A. Workmanship shall be of the best grade with materials evenly spread and smoothly flowed on, without runs or sagging of materials. No adulterations or changes of proportions shall be permitted unless recommended by manufacturer and approved by ENGINEER. Paint shall be applied in strict conformity with the manufacturer's directions.

3.02 EXAMINATION

- A. It is the responsibility of the painter to thoroughly inspect all surfaces prior to the commencement of Work to determine if the Work is ready to be prepared and painted.
- B. Report in writing to ENGINEER, all conditions that may potentially affect the application.
- C. Do not commence until such defects have been corrected.
- D. Start of painting shall be construed as the applicator's acceptance of surfaces and conditions within a particular area.

3.03 PREPARATION

- A. General Procedures: Remove hardware and hardware accessories, plates, machined surfaces, lighting fixtures, and similar items in places that are not to be painted, or provide surface-applied protection prior to surface preparation and painting. Remove these items if necessary for complete painting of the items and adjacent surfaces. Following completion of painting operations in each space or area, removed items shall be reinstalled by workers skilled in the trades involved.
 - 1. Clean surfaces before applying paint or surface treatments. Remove oil and grease prior to cleaning. Schedule cleaning and painting so that dust and other contaminants from the cleaning process will not fall on wet, newly painted surfaces.
- B. Surface Preparation: Prior to applying specific finishes, exposed surfaces requiring field painting shall be properly filled, scraped, sanded, etched, brushed, and/or cleaned as required to provide surfaces free from dirt, loose crystals, rust, scale, oil, and grease.
 - 1. Surfaces shall be prepared in accordance with manufacturer's recommendations. Surfaces shall be inspected and accepted by CONTRACTOR before coatings are applied.
 - 2. No change in treatment of surfaces shall be permitted unless recommended by manufacturer and approved by ENGINEER.
- C. Cementitious Materials Preparation: Prepare concrete, concrete masonry block, cement plaster, and mineral-fiber-reinforcement panel surfaces to be painted. Remove efflorescence, chalk, dust, dirt, grease, oils, and release agents. Roughen, as required, to remove glaze. If hardeners or sealers have been used to improve curing, use mechanical methods of surface preparation.
 - 1. Use abrasive blast-cleaning methods if recommended by the paint manufacturer.
 - 2. Cementitious Work shall be cured at least 28 days before painting.
 - 3. Determine alkalinity and moisture content of surfaces by performing appropriate tests. If surfaces are sufficiently alkaline to cause the finish paint to blister and burn, correct this condition before application. Do not paint surfaces where moisture content exceeds that permitted in manufacturer's printed directions.
 - 4. Hidden dampness (moisture content) shall be checked by using a polyethylene cover test. A heavy gauge plastic film, approximately 18 inches square and 4 mils thick, is securely taped to a small section of the concrete. Pieces of test film should be placed at various locations not exposed to direct sunlight that are likely to be slow drying, such as below grade, low spots in floors, inside corners, and lower wall areas. The polyethylene sheet is checked after 24 hours for beads of moisture. If condensation appears on the back side of the film, or if the concrete under the film appears to be darker, damp or wet, this indicates the presence of moisture in the concrete. Painting shall not be performed until no condensation exists after the 24-hour test period.
 - 5. Steel troweled surfaces shall be acid etched to a "fine sandpaper" finish with a muriatic solution of approximately 10 to 15 percent. Flush the floor with clean water to remove acids, neutralize with ammonia, rinse, allow to dry, and vacuum before painting.
 - 6. Surfaces formed by smooth formwork shall be whipped (brush-off) sandblasted to remove all slag, laitance, form release agents, rough edges, and open air holes. All bug holes shall be filled with non-shrink, nonmetallic grout.
- D. Metals Preparation: Submerged ferrous metals shall have all welds ground smooth to remove spatter, recesses, pinholes, and protrusions. Metal shall be degreased in accordance with SSPC-SP1 and abrasive blast cleaned in accordance with SSPC-SP10, "Near White Abrasive Blast Cleaning."
 - 1. Nonsubmerged ferrous metals shall be degreased in accordance with SSPC-SP1 and sandblasted in accordance with SSPC-SP6, "Commercial Abrasive Blast Cleaning."
 - 2. Nonferrous and galvanized metals shall be degreased in accordance with SSPC-SP1.

3. Submerged galvanized metals shall not be treated.
 4. Steel surfaces that are to be repainted shall be commercial blast cleaned in accordance with SSPC-SP6 until at least 2/3 of each element is free of all visible residues.
- E. Wood Preparation: Wood surfaces to be finished shall be clean, dry, smooth, warm, and in proper condition to receive the finish. Remove surface deposits of sap or pitch by scraping and wiping clean with mineral spirits. Spot coat knots, pitch streaks, and sappy sections with sealer. Fill nail holes and cracks after the primer has dried and sand between coats. Back-prime interior and exterior woodwork.
- F. PVC and FRP Preparation: No special surface treatment is required. Surface shall be clean and dry.
- G. Drywall Construction: Joint compound material shall be sanded to provide a smooth flat surface. Remove dust from surface by wiping with clean rags or other means.

3.04 PRE-TREATMENT OF METAL

- A. Nonsubmerged galvanized metal and nonferrous metal shall be pre-treated. The galvanized pre-treatment shall be allowed 30 minutes for reaction to take place, then the residue shall be removed with a water rinse.

3.05 FIELD PRIMING AND SEALING

- A. In general, metal surfaces requiring field painting shall receive a priming coat before shipment from the shop. Such priming coats shall be compatible to subsequent applied coats.
1. Wherever Work requiring field painting bears no priming coat, or has a damaged shop coat, it shall have the surface prepared as specified and shall receive an approved priming coat, applied before and in addition to the finish coats required.
 2. Concrete surfaces, requiring field painting, shall be primed and sealed if recommended by the manufacturer of the finish paint.

3.06 PAINT MATERIALS PREPARATION

- A. Carefully mix and prepare paint materials in accordance with manufacturer's directions.
1. Maintain containers used in mixing and application of paint in a clean condition, free of foreign materials and residue.
 2. Stir material before application to produce a mixture of uniform density; stir as required during application. Do not stir surface film into material. Remove film and, if necessary, strain material before using.
 3. Use only thinners approved by paint manufacturer and only within recommended limits.

3.07 TINTING

- A. Tint each undercoat a lighter shade to facilitate identification of each coat where multiple coats of the same material are applied. Tint undercoats to match the color of the finish coat but provide sufficient differences in shade of undercoats to distinguish each separate coat.

3.08 APPLICATION

- A. First Field Coat: The first field coat shall be the best suited for use with the surfaces to be covered and with the final coats. Whenever the finish color permits, the first coat shall be slightly tinted to the end that complete coverage of the final coat may be assured.
- B. Finish Coats: Apply in a uniform manner and of the mil thicknesses as specified. Where the mil thickness recommended by manufacturer is in conflict with that thickness specified, the proposed thickness shall be submitted in writing by manufacturer, supported by evaluative data sheets, subject to approval by ENGINEER. Where the mil thickness is omitted, it shall be as recommended by the manufacturer to give an excellent surface finish. Finished surface thickness shall be subject to spot checking by ENGINEER using a wet and/or dry gauge. Deficiencies in required thickness shall be corrected by addition of extra coats at no additional cost to OWNER.
- C. Thinners: Those recommended by manufacturer shall be used and the amounts shall not exceed recommendations by manufacturer.
- D. Caution: Paints shall not be applied on damp surfaces or on preceding coats not thoroughly dried, and shall not be applied on outside surfaces in extreme cold, frosty, foggy, or damp weather unless permitted by the materials manufacturer in the standard application specification. Materials shall not be applied when the temperature is below 50 degrees F. Drying time between coats shall be as recommended by paint manufacturer.
- E. Spraying: Spraying will be permitted only for such Work as approved by ENGINEER.
 - 1. Spraying equipment shall be of a type and capacity adapted to Work and shall be subject to ENGINEER's approval. Spraying equipment, including temporary rigid piping, flexible hose, nozzles, etc., shall be kept in such condition as will ensure against breakdowns and stoppage.
 - 2. Particular care shall be exercised to prevent the soiling or damaging of adjacent Work. Brushing shall immediately follow the spraying when necessary to eliminate wrinkling, blistering, and air holes.
- F. Painting Existing Surfaces: Repainted existing surfaces shall receive a finish to match the existing Work. Where the existing surfaces are irregular, they shall be made smooth with an approved leveler coat.

3.09 PROTECTION, SPECIAL PRECAUTIONS, AND CLEAN UP

- A. Reasonable care shall be used to prevent splattering. Drop cloths and masking materials shall be used to protect surfaces and parts of equipment that are not required to be painted under the Contract. Splashes, drippings, and stains shall be thoroughly removed upon the completion of Work.
- B. Provide "wet paint" signs to protect newly painted finishes. Remove temporary protective wrappings provided by others for protection of their Work after completion of painting operations.
 - 1. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.
- C. Lighting fixtures shall be covered and protected, or removed and replaced upon completion of Work. Electric switch plates, surface hardware, and similar equipment shall be removed, protected and replaced.

- D. Materials shall be stored and mixed in a well-ventilated location as designated or approved by ENGINEER. Paints and related materials shall be stored in an area that is protected in accordance with NFPA Bulletin No. 101. They shall be kept in a neat condition and shall be sealed or covered when not in use. Empty containers shall not be allowed to accumulate on the premises. Oily waste rags, etc., shall be collected each day and destroyed or stored in a tightly covered metal container.
- E. Comply with manufacturer's recommendations regarding environmental conditions under which coatings and coat systems can be applied.
- F. During surface preparation, CONTRACTOR shall take all precautions necessary to protect related Work. Equipment items and Work areas shall be tightly covered so as not to be damaged by the painting operation. Special attention shall be made to protect equipment items during sandblasting operations.
- G. CONTRACTOR shall be responsible for clean up of painting materials upon completion of Work.
- H. As soon as painting Work is accepted by CONTRACTOR, it shall become its responsibility for protection, final cleaning, and touch-up.

END OF SECTION

DIVISION 10
SPECIALTIES

SECTION 10600 - PREFABRICATED ELECTRICAL BUILDING

PART 1 - GENERAL

1.01 SCOPE OF WORK

- A. Furnish, deliver and install one pre-assembled, pre-engineered, rigid frame steel superstructure as shown on the Drawings and specified herein. The superstructure shall be complete when delivered and shall include medium voltage metal clad 5kv switchgear, HVAC, lighting and plumbing, panelboards, breakers, lifting devices, and anchor bolts.
- B. CONTRACTOR shall provide building foundation. Foundation size shall be coordinated with the superstructure design and size.
- C. The superstructure shall be pre-wired at the factory requiring only final connections to electrical distribution equipment provided as part of other specifications. Conduit types and sizes, and conductor types and ampacity ratings shall be in compliance with the National Electrical Code.
- D. The manufacturer shall provide a minimum 4-week advance notice to the Field Representative of the superstructure delivery date.

1.02 QUALITY ASSURANCE

- A. The equipment and materials covered by these Specifications are intended to be standard equipment of proven reliability and as manufactured by reputable manufacturers having experience in the production of such equipment. The equipment furnished shall operate satisfactorily when installed and operated per the manufacturer's recommendations.
- B. CONTRACTOR shall be responsible for full structural coordination of the foundation and structure, as well as full system coordination for items installed within in the superstructure.
- C. Electrical materials and equipment shall be UL listed and shall comply with Division 16 specifications.

1.03 SUBMITTALS

- A. Provide a minimum of three bound submittals in PDF electronic format and hard copy. Submittals shall include full-size drawings of the structure and interior configuration. Drawings shall include structural design, plumbing design, HVAC design, electrical design and controls produced in AutoCAD. The superstructure design shall be specific to this project. All piping and conduit connections shall be dimensioned in the vertical and horizontal planes. Drawings shall be signed and sealed by professional engineers licensed in the State of Michigan.
- B. Provide an installation manual detailing recommended lifting, handling, and anchoring procedures. Provide instructions for any field assembly procedures.

- C. Provide shop drawings and data sheets covering all individual components of the superstructure.
- D. Submit photographic examples of similar structures fabricated by the manufacturer with identical exterior wall coverings (e.g., identical patterns and color) for OWNER review and approval.
- E. Submit color samples for external trim colors for OWNER approval.
- F. Submit color samples for internal trim colors for OWNER approval.
- G. Submit HVAC design calculations and drawings for ventilation/exhaust systems prepared and signed and sealed by a Professional Engineer licensed in the State of Michigan.
- H. Submit plumbing design calculations for the domestic water system, sanitary waste / vent system and water heating sizing as required for the superstructure. Calculations shall be prepared and signed and sealed by a Professional Engineer licensed in the State of Michigan.
- I. The superstructure drawings shall also detail:
 - 1. Locations and method of field connections for CONTRACTOR.
 - 2. Physical installation drawings detailing equipment voltages, ampacities, load calculations, conductor sizes, and conduit fills in accordance with the National Electrical Code.
 - 3. Foundation drawings showing coordinated floor penetration of underground raceways coordinated with actual supplied equipment conduit openings.
 - 4. Shop drawings and detailed wiring control diagrams of all electrical equipment. Panel wiring diagrams shall comply with the submittal requirements.
 - 5. Number, location, size, and material of anchor bolts.
- J. Submit final record drawings after manufacture in AutoCAD native file format.

1.04 CONFORMANCE TO STANDARDS

- A. The manufacture, mounting, and installation of electrical components shall be done in strict accordance with the latest revision of the NEC and NEMA Standards, and any other standards listed in Division 16 to afford a measure of security as to the ability of the Owner to safely operate the equipment. No exceptions to the requirements of these codes and standards will be allowed. Failure to meet these requirements will be cause to remove the equipment and correct the violation.
- B. Provide control panels and panel mounted equipment per requirements specified in Division 13, Division 16 and where shown on contract drawings.

1.05 REFERENCE STANDARDS

- A. ANSI/ASCE-7 "Building Code Requirements for Minimum Design Loads in Buildings and Other Structures".
- B. Americans with Disabilities Act Accessibilities Guidelines (ADAAG)
- C. Occupational Safety and Health Administration (OSHA)

- D. National Fire Protection Association (NFPA)
 - 1. NFPA 90A Standard for the Installation of Air-Conditioning and Ventilating Systems
 - 2. All other applicable NFPA Standards.
- E. American Society of Heating, Refrigeration, and Air Conditioning Engineers (ASHRAE)
 - 1. Standard 62 – Ventilation for Acceptable Indoor Air Quality
 - 2. All other applicable ASHRAE Standards.
- F. Associated Air Balance Counsel (AABC)
- G. National Environmental Balancing Bureau (NEBB)
- H. Sheet Metal and Air Conditioning Contractors National Association (SMACNA)
- I. Air Movement and Control Association (AMCA)
 - 1. AMCA 500 – Test Methods for Louvers, Dampers, and Shutters
 - 2. AMCA 511 – Certified Ratings Program for Air Control Devices
- J. Where reference is made to one of the above standards, the revision in effect at the time of bid opening shall apply.

1.06 SHIPPING AND HANDLING

The building superstructure shall be shipped fully assembled, packaged and protected for domestic truck transportation, capable of being lifted in one piece. All components mounted therein shall be designed for and anchored sufficiently for transportation to the jobsite.

1.07 WARRANTY

- A. The warranty is the responsibility of the superstructure manufacturer, and that warranty shall be provided in written form included with the submittals. The warranty shall at a minimum include:
 - 1. The manufacturer shall provide a two year warranty on the superstructure and associated components provided as part of this specification. The warranty shall begin at the date of substantial completion.
 - 2. The warranty shall include, but not be limited to watertightness of the roof, walls and floor.
 - 3. The 2-year period shall be upheld regardless of any component manufacturer's warranty for equipment and components within the station.
 - 4. The warranty shall provide for replacement and/or repair of faulty or defective components at no cost to the OWNER during the warranty period.
 - 5. Where deemed necessary, the manufacturer will be responsible for the labor of removal and reinstalling the defective or faulty components without cost to the OWNER.
 - 6. No assumption of contingent liabilities for any component failure during warranty is made.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURER

- A. The superstructure shall be provided by Trachte, or an approved equal.

2.02 PRODUCT COORDINATION

- A. The Drawings show the intended layout and approximate dimensions for equipment. The Prefabricated superstructure manufacturer and CONTRACTOR shall coordinate the final dimensions and design of the superstructure foundation and superstructure to accommodate the actual equipment furnished under other divisions of these specifications, plus any other supplied equipment.
- B. The CONTRACTOR shall coordinate with the superstructure manufacturer and provide any mechanical and electrical connections to equipment furnished by the Owner or furnished under other divisions of these specifications.

2.03 SUPERSTRUCTURE FOUNDATION

- A. Provide the superstructure foundation as shown on the contract Drawings.

2.04 SUPERSTRUCTURE

- A. The building size and layout shall be as shown on the Drawings. The building shall have a twelve foot clear interior height. The building and associated systems shall be designed to meet Michigan Building Codes.
- B. Confirm clearances of the equipment provided in the superstructure. Equipment configuration shall be appropriate for national standard-mandated clearances above, below and around equipment to provide safe servicing, removal and reinstallation.
- C. Superstructure
 - 1. Codes and Standards - The structure design and manufacture shall, as a minimum, conform to ASCE (American Society of Civil Engineers) current edition of "Minimum Design Loads for Buildings and Other Structures" and to the MBMA (Metal Building Manufacturers Association) "Recommended Design Practices Manual." Building shall be manufactured and built to satisfy current editions of the International Building Code (IBC), and the National Electrical Code (NEC). Building Manufacturer shall supply plans and calculations stamped by a Registered Professional Engineer for the State where Building to be installed, and is responsible for obtaining any State Industrial Building Commission Approvals and Third Party Inspections if required by the State where building is installed.
 - 2. Loading - The building shall be designed to support the following loads:
 - a. Roof Load - 70 PSF (60 PSF live and 10 PSF dead)
 - b. Ceiling Dead Load - 10 PSF
 - c. Wall Load - 120 mph wind, plus wall mounted equipment.
 - d. Floor Load – 250 PSF (Building walls to be secured and to set on concrete pad. No interior floor is required).
 - e. Seismic Zone: Per UBC for site location.
 - 3. Materials of construction shall be new, unused, and fabricated in a workmanlike manner in a factory environment. Hot rolled steel to meet as a minimum standard ASTM -A36, and all galvanized steel to meet as a minimum standard ASTM A - 653.

4. Building base shall have a hot rolled steel angle framework, welded, primed and painted, with minimum deflection of L1240. Base shall be pre-drilled for anchoring to a concrete foundation. Weld standards shall, as a minimum, meet AWS recommended practices. Manufacturer shall be responsible for design of the anchoring system including number, spacing, size, and material of anchor bolts..
5. The building shall have a complete, internal, self-supporting, structural steel frame which does not rely on the exterior panels or roof cover panels for its structural strength or framing. The building framework shall include 8 to 16 gauge, cold-formed, galvanized steel structural members or building framework to have a flush wall, post and beam format with girts and purlins, and full trusses on both end. Wall and ceiling structural support system are to be designed to provide load carrying capability for anticipated equipment loads using 16 gauge galvanized steel hat channels behind liner panel for reinforcement as needed, with locations shown on approval drawings. Roof trusses to consist of 8 to 14 gauge solid web cold-formed, galvanized steel members.
6. Exterior walls shall have a minimum thickness of 3.5-in, fiberglass batt insulation and a vapor barrier or equivalent. The ceiling shall have a minimum of 6-in insulation and a vapor barrier. In addition to the insulation in the walls and ceiling, an additional 1-in fiberglass insulation blanket shall be installed over the entire building framework and under the exterior wall and roof panels, as a thermal break. The insulation system shall provide a minimum of R-19 in the walls, R-38 above the ceiling.
7. Provide a gabled roof pitched 2-inch in 12-inches or greater shall have a covering of overlapping, 26 gauge, "Multi-Rib" ribbed steel panels with a baked-on Kynar 500, PVDP resin-based finish over a galvalume substrate, and shall carry a 30-year warrant against fading or chalking and a 40-year warranty against peeling or chipping. Overlapping roof panels shall be installed with appropriate self-tapping fasteners with integral gaskets. Standing seam roof panels shall be of Galvalume steel, with a baked-on Kynar 500, PVDF resin-based coating and shall have no visible fasteners on main run. Roof to include a matching, die-formed ridge cap, and a fully supported 3-in overhang. Heavy duty steel lift eyes to be supplied and mounted to the roof trusses as needed for lifting the building.
8. The exterior trim package shall include stepped or boxed eave, rake, fascia, base, corner, jamb, and header trim in, 26-gauge Galvalume material with owner's choice of standard colors and shall carry the same warranty against fading, chalking, peeling and chipping as the exterior panels.
9. The building's interior walls and ceiling shall be lined with flushfit 22-gauge, roll-formed liner panels, with concealed fasteners and a baked-on White polyester finish over G-90 galvalume substrate and shall carry a 30-year warranty against fading or chalking and a 40-year warranty against chipping or peeling. The building interior shall feature a complete matching trim system including base, jamb, header, and ceiling trim. Liner to be reinforced with 14 gauge hat channels mounted vertically as needed for heavy wall mounted items.
10. The fasteners, adhesives, and sealants utilized shall be of types approved for use on this type of structure as required by the appropriate agency or governing body.
11. Matching, pre-molded, closed cell elastomer closures provided by the siding and roof panel manufacturer shall be installed according to the manufacturer's recommendations at the eave line, beneath the roof panels, and where the trim meets the wall panels.
12. Gutters shall be provided of 26ga galvanized steel. They shall be mounted over eave trim on each side of the building. Both eave walls shall be provided with 1 down spout with necessary elbows.
13. Exterior wall, roof, doors, and fascia color shall be White epoxy. Submit color samples of exterior walls and doors for Owner selection.

D. Doors and Hardware

1. Doors shall at a minimum comply with Steel Door Institute directive SDI-100.
2. Doors to be constructed of no less than 18-gauge steel faced leafs with stiffeners and 16 gauge door frames. Doors and frames to be hot-dipped galvanized to ASTM designations A924 and A653, then factory primed and painted with epoxy enamel to match the building or the trim. Door to have insulated core.
3. Provide a 72-in x 84-in double door primary entry.
4. Provide a 36-in x 84-in single door secondary egress.
5. Door hinges shall be NRP stainless steel ball bearing hinges, minimum of three (3) per door.
6. Provide a low profile rim device type panic interior openers, with cylinder lock entry and thumb latch exterior trim, by Von Duprin or equal for each door. Each door shall be fitted with a switch to indicate "door open" position alarm to the PLC.
7. Provide door closers with hold open arms.
8. Provide threshold, weather-stripping and sweeps shall be provided for each door.
9. Provide drip cap shall be provided for each door, extending 3-in past door edge.
10. A rain canopy shall be supplied and mounted above the primary entrance door. The canopy shall be made from 14ga Galvanneal metal.
11. The OWNER shall retain a locksmith to key all doors. CONTRACTOR shall coordinate the manufacturer's design with the OWNER'S locksmith.

2.05 CORROSION PROTECTION

- A. All surfaces of the exposed steel structure, interior and exterior, shall be grit blasted equal to commercial blast cleaning (SSPC-SP6).
- B. Metal exterior walls and roof shall receive a Kynar 500 or Hylar 50000 Fluoropon coating system applied over a galvalume or galvanized substrate. Coating system shall be warranted for forty years against cracking, checking or peeling and thirty years against fading and chalking.
- C. Base frame shall receive a Sherwin Williams Industrial Macropoxy 646 Epoxy coating system. The paint system shall have a dry film thickness per coat of 5 – 7 mils.
- D. The floor area of the completed superstructure shall receive a paint system a non-slip texture added to finished painting. Approved coating is Sherwin Williams Macropoxy 646 Fast Cure Epoxy with a minimum dry film thickness of 5 – 7 mils.
- E. Building exterior walls and finishes to be rated provided with corrosion protection/protective coatings.

2.06 ELECTRICAL

- A. Electrical distribution equipment shall be mounted in the superstructure as shown on the Drawings. The CONTRACTOR/SWITCHGEAR MANUFACTURER shall coordinate and provide any electrical connections from equipment supplied by the superstructure manufacturer and the electrical distribution and control equipment.

- B. All wiring within the equipment enclosure shall be run in conduit. Electrical installation shall be in accordance with Division 16. Exposed conduit shall not be run on the exterior of the building.
- C. The building shall be electrically bonded to the exterior ground grid. Provide welded studs and lug connections for ground cables. Ground connections shall be made to interior structural members.
- D. Provide convenience receptacles as shown on the drawings in accordance with Division 16.
- E. Refer to contract drawings for additional requirements to be provided.

2.07 LIGHTING

- A. Refer to the Lighting Fixture Schedule on the Drawings for fixture types. Provide LED style lights as shown on drawings prewired to panelboard.
- B. Drawings indicate the layout and minimum required number of fixtures. The superstructure interior shall be illuminated by LED type fixtures with emergency ballasts. Each fixture shall be a 48-in ceiling mounted lamps. Provide as shown on the Drawings.
- C. Exterior building mounted lighting shall be provided as shown on the Drawings. Conduit for exterior lighting shall be run inside the building; no exposed conduit is allowed on the outside.
- E. Exterior lighting at entrance doors shall be photocell controlled. All other exterior lighting shall be manually switched from the interior of the building.
- G. Provide emergency and exit signs above each door.
- H. Refer to contract drawings for additional requirements.

2.08 HVAC

- A. Design and provide an engineered HVAC system for the superstructure. The system shall be designed to meet requirements of the Michigan Mechanical Code and be able to maintain a temperature in the superstructure between 50 degrees F and 85 degrees F. Ventilation / exhaust design shall include consideration for the ambient site condition, the dimensions of the building, the building envelope heat gains and the heat generated by equipment within the building.
 - 1. Building envelope heat gains and heat generated by equipment in the building shall be obtained from the supplied equipment vendors and shall be used as the basis for heating and cooling calculations. Assume worst case four pumps running.
 - 2. Assume the outdoor ambient temperature ranges from -40° F to 100° F.
 - 3. Motors shall be NEMA Premium efficiency. Cooling systems shall meet or exceed Michigan State Energy Code efficiency requirements.
 - 4. System design shall limit transmission of electrical equipment noise. Noise shall not exceed a sound level of 55 dBa at the property line.
- B. Provide and install all hangers, supports and anchors as required to support the HVAC equipment and accessories. Any equipment or accessories located outside or on the exterior of

- the building shall be designed and installed to meet the minimum wind loading requirements of the Michigan State Mechanical Code.
- C. Wall-mounted, centrifugal exhaust fan(s) shall be provided to supplement/backup mechanical heating and cooling units.
 - 1. Fans shall be provided with a factory installed local disconnect switch and a NEMA 12 painted steel control enclosure with motor starter, a hand-off-auto switch, run light and controls, motor operated damper, hi-pro polyester (or equal) coating, stainless steel fasteners, aluminum bird screen and rain hood, factory wall grille and factory tie down points.
 - 2. Fan noise shall not exceed 70 dBa.
 - 3. Exhaust locations shall be in accordance with the requirements of the Michigan State Minimum Mechanical Code.
 - 4. Exhaust fans shall be provided with a heavy duty temperature sensing and control device and any miscellaneous controls needed to interface with the mechanical heating and cooling units and intake louvers.
 - D. The building shall be provided with adequate intake louvers as required to maintain an intake velocity of no more than 500 feet per minute based on the FREE AREA of the louver. Provide louver sizing calculations based on the HVAC airflow requirements.
 - 1. The louvers, materials and assemblies, including anchorage, proposed for the work of this Section shall comply with project specific calculated design pressures and the latest edition of the Michigan State Minimum Building Code, including wind-borne debris region requirements, and shall be designed by the Manufacturer to meet these requirements.
 - 2. Louvers shall bear AMCA Certified Rating Seals for air performance, noise and water penetration ratings.
 - 3. Louvers shall be extruded aluminum fixed drainable blade type louvers provided with integral sills, heads, and jambs.
 - 4. Each louver shall be provided with 1/2-in mesh, 0.063-in aluminum wire bird screen secured within rewireable extruded aluminum frame.
 - 5. Louvers shall be provided with a 1.0 mil thick, epoxy prime and PVF2 Kynar 500 finish system.
 - 6. Fixed louver shall be provided with a separate low leakage aluminum motor operated damper, Ruskin model CD40 or equal. Actuators shall be Belimo model AF24-S (24 volt) or AF120-S (120 volt) or equal.
 - E. Provide auxiliary electric space heating as needed with integral thermostat control and disconnect switch. Heating shall be based on HVAC calculations prepared by a professional engineer licensed and registered in the State of Michigan.
 - F. Provide mechanical heating and air conditioning unit with a temperature control system based on HVAC calculations prepared by a professional engineer licensed and registered in the State of Michigan. HVAC units shall be provided with a factory installed disconnect switch and a NEMA 12 painted steel control enclosure.
 - G. A witness test shall be performed for S1 North and S1 South Line-ups completely installed in the prefabricated buildings.

PART 3 - EXECUTION

3.01 FIELD STARTUP SERVICE

- A. Provide startup services for all equipment, mechanical systems and safety equipment in the superstructure. Startup service technicians shall be regular employees the associated equipment manufacturer.
- D. Assume 2 full days at job site for startup and training. Additional time required to troubleshoot manufacturer provided equipment shall be included at no additional cost to the Owner.
- E. Startup service to include two bound operations and maintenance (O&M) manuals.
- F. Startup service report attested to by startup technician and representative of Owner or Engineer.
- G. Service report distributed to the manufacturer's file, Engineer's file and Owner's file.

H. HVAC AND PLUMBING TESTING

- 1. Install all HVAC equipment in accordance with the manufacturer's recommendations and in accordance with the requirements of the Michigan State Minimum Mechanical Code.
- 2. Install all plumbing equipment in accordance with the manufacturer's recommendations.
- 3. Install all hangers, supports, and anchors per the requirements of the SMACNA standards and in accordance with the requirements of the Michigan State Minimum Mechanical Code.
- 4. The manufacturer shall furnish the services of an AABC or NEBB certified agency for the testing, adjusting and balancing of all HVAC systems installed under this Section. Balance the exhaust air systems in accordance with AABC or NEBB Standards by the use of properly calibrated equipment. Reporting forms for testing and balancing shall be as recommended by the AABC or NEBB.
- 5. The manufacturer's startup technician shall test the operation of the ventilation system and demonstrate its successful performance to the Owner during startup.
- 6. Leave all equipment in a thoroughly cleaned condition. Cover all fan openings during transport and construction.

3.02 ELECTRICAL TESTING

- A. Factory test systems and equipment furnished herein and repair or replace all defective work and equipment.
- B. The manufacturer's startup technician shall make adjustments in the field to the systems and instruct the Owner's personnel in the proper operation of the systems. Submit test reports upon completion of testing.
- C. The CONTRACTOR shall provide field acceptance "Witness" testing. The manufacturer's startup technician shall assist the CONTRACTOR as necessary to satisfactorily complete the testing.
- D. Testing shall be scheduled and coordinated in writing with the Engineer at least 2 weeks in advance. Provide qualified test personnel, instruments and test equipment. Provide certified calibration sheets including dates for all equipment to be used for testing with notice of

scheduled testing. Calibration sheets shall also indicate that the units have been calibrated within six months of the testing date. The Owner shall have qualified personnel present during the testing.

END OF SECTION

DIVISION 11

(NOT USED)

DIVISION 12

(NOT USED)

DIVISION 13

SPECIAL CONSTRUCTION

SECTION 13413 - OPTICAL FIBER CABLING SYSTEMS

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes: Product and installation requirements for the following:
 - 1. Fiber-optic (E-FO) Cables.
 - 2. Fiber-optic Connectors, Couplers, and Patch Panels.

1.02 SUBMITTALS

- A. Shop Drawings: Submit in accordance with Section 01330, Shop Drawings covering the items included under this Section. Shop Drawing submittals shall include:
 - 1. Product data for each type of product specified.
 - 2. Product certificates, signed by the communication system manufacturers, certifying that the cables are suitable for the connected equipment as described in "Quality Assurance" Article below.

1.03 QUALITY ASSURANCE

- A. Manufacturers Qualifications: Firms regularly engaged in manufacture of equipment, of types and sizes required, and whose products have been in satisfactory use in similar service for not less than 5 years.
- B. Connected Equipment Manufacturer Certifications: Where cables specified in this Section are used to provide signal paths for systems specified in other sections of these Specifications, or for systems furnished under other contracts, obtain review of the cable characteristics and certification for use with the connected system equipment by the connected equipment manufacturers.
- C. UL Compliance: For cables that may be run in plenum ceilings or other air-handling spaces, provide cables tested for compliance with applicable requirements of UL Standard 910, "Test Method for Fire and Smoke Characteristics of Electrical and Optical Fiber Cables Used in Air-Handling Spaces." In addition, provide FO cables that have passed the UL VW-1 flame test.
- D. EIA/TIA Compliance: Comply with applicable requirements of EIA Standards, EIA-440, -455, -458, -475, -509, -568-b.3, and 598-a pertaining to optical fiber cable and system component construction and installation. EIA/TIA-455-61, FOTP-61, Measurement of Fiber or Cable Attenuation Using an OTDR.
- E. Fiber Optics Experience: CONTRACTOR must be able to prove to the satisfaction of OWNER that it has significant experience in the installation of fiber-optics cable systems. Installation must include installation of fiber-optics cable, fiber termination, knowledge of interconnect equipment, and a thorough knowledge of testing procedures.
- F. Labeling: Handwritten labels are not acceptable. All labels shall be machine printed on clear or opaque tape, stenciled onto adhesive labels, or type written onto adhesive labels. The font shall be at least 1/8 inch in height, block characters, and legible. The text shall be of a color contrasting with the label such that it may be easily read. If labeling tape is utilized, the font color shall contrast with the

background. Patch panels shall exhibit workstation numbers or some type of location identifier, in sequential order, for all workstations or devices attached. Each fiber-optics cable segment shall be labeled at each end with its respective identifier.

- G. Fiber-Optics Interconnect Equipment (Patch Panels): Interconnect equipment shall be used in all fiber cable installations. Patch panels shall be mounted in the equipment racks or panel mounted. Interconnect equipment mounted in racks shall be affixed to the rack by at least 4 screws. All fiber-optics interconnect devices shall be assembled and installed in accordance with the manufacturer's instructions and recommendations.
- H. Patch Cords: Patch cords shall be provided for each fiber-optic port on the patch panel. Patch cords shall meet or exceed technical specifications of all installed fiber-optic cable. Patch cord connectors shall be matched with patch panel connector type and network fiber module connector type as required.

1.04 COMMISSIONING

- A. Subsequent to hook-ups of FO system to signal sources and destination equipment, operate systems to demonstrate proper functioning. Replace malfunctioning FO cabling system items with new materials, and then retest until satisfactory performance is achieved.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Subject to compliance with specified requirements, manufacturers offering products which shall be incorporated in Work include:
 - 1. FO Cables:
 - a. Corning Cable Systems for multimode fiber optic cabling.
 - 2. FO Connectors and Couplers:
 - a. AMP Netcon.
 - b. AT&T Network Systems.
 - c. Corning.
 - d. Thomas and Betts Corp.
 - 3. FO Patch Panels:
 - a. Panduit.
 - b. Corning Cable Systems

2.02 OPTICAL FIBER CABLING SYSTEMS

- A. Fabricate system using manufacturer's standard materials as indicated by published product information and in sizes, types, and performance characteristics as indicated.
- B. FO Cables: Factory fabricated, single channel, all di-electric low loss glass type, fiber-optic single mode (G.652-D) graded-index cables with the following operational and construction features:
 - 1. Single-mode Fibers:
 - a. Cable Type shall be as specified on drawings, all di-electric Cable.
 - b. Number of Fibers: 6 minimum or as listed on Drawings
 - c. Core-Cladding Diameter: 62.5/125 microns or as listed on Drawings.

- d. Subunit Size: 2.0 mm or as listed on Drawings.
 - e. Maximum Attenuation: Less than 0.5 dB/1,350 nm.
 - f. Minimum Bandwidth: Greater than 500 MHz-km.
 - g. Minimum Bend Radius (Unloaded): 10 cm (3.1 in).
 - h. Operating Temperature range: -20 to +70 degrees C.
- C. FO Connectors: Stainless steel, fiber-optic cable connectors, capable of terminating FO glass cables with diameters from 8 through 1,000 microns. Fabricate connectors with optical fiber, self-centering, axial alignment mechanisms. Select ST style connectors as required or shown on Drawings.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine areas and conditions with the Installer present for compliance with requirements, and other conditions affecting the performance of optical fiber cabling system. Do not proceed with Work until unsatisfactory conditions have been corrected in a manner acceptable to Installer.

3.02 INSTALLATION

- A. Install fiber-optic cables and associated equipment and devices in accordance with industry standards and manufacturer's written instructions.
- B. Install fiber-optic cable without damage to fibers, cladding, or jacket. Ensure that media manufacturer's recommended pulling tensions are not exceeded. Do not, at any time, bend cables to smaller radii than minimums recommended by manufacturer.
- C. Install FO cables simultaneously where more than one cable is being installed in same raceway. Use pulling lubricant where necessary; compound used must not deteriorate cable materials. Do not use soap. Use a pulling means, including fish tape, rope, and basket-weave grips, that will not damage media or raceway.
- D. No splices are allowed, except at indicated splice points.

3.03 GROUNDING

- A. Provide grounding connections for FO cable and other system components as required by manufacturer's written instructions.

3.04 APPLICATIONS

- A. Install optical fiber cabling for project applications as detailed on drawings.

3.05 FIELD QUALITY CONTROL

- A. Testing: Testing shall be done by CONTRACTOR with at least 5 years of experience in testing fiber-optic cabling systems. CONTRACTOR shall test each fiber strand. **OWNER reserves the right to have representation present during all or a portion of the testing process. CONTRACTOR must notify OWNER 5 days prior to commencement of testing.** If OWNER

elects to be present during testing, test results will only be acceptable when conducted in the presence of OWNER. Any fiber-optic cable left non-terminated at the discretion of OWNER, shall be tested using an adequate light source to determine that all installed strands are not damaged.

- B. Fiber-Optics Cable: Each fiber strand shall undergo bi-directional testing for signal attenuation losses using power meter and light source. Testing shall also include Optical Time Domain Reflectometer (OTDR) at both 850 and 1,300 nanometers for all installed fiber strands
 - 1. Tests:
 - a. Single-mode: Bi-directional signal attenuation at 850 and 1,300 nm.
 - 2. Test Criteria: Signal loss of less than 10 dB through entire fiber path, including cable, couplers and jumpers.
- C. Documentation (Fiber Optic): CONTRACTOR shall provide documentation to include test results and as-built Drawings. Fiber Test Results: The results of the fiber testing shall be entered into the form "Fiber Attenuation Tests Results." Handwritten results are acceptable provided the test is neat and legible. Copies of test results are not acceptable. Only original signed copies will be acceptable.
 - 1. Each cable installed shall undergo complete testing in accordance with TIA/EIA TSB-67 to guarantee performance to this standard.
 - 2. All required documentation shall be submitted within 30 days at conclusion of the project to OWNER.
 - 3. Test Criteria: Pass rate to conform to latest TIA/EIA Standards that incorporate link performance testing through entire path, including cable, couplers, and jumpers.
- D. Acceptance: Acceptance of the Data Communications System, by OWNER, shall be based on the results of testing, functionality, and the receipt of documentation.

3.06 CLEANING

- A. Clean optical fiber cabling and components of dirt and construction debris upon completion of installation.

END OF SECTION

DIVISION 14

(NOT USED)

DIVISION 15

(NOT USED)

DIVISION 16
ELECTRICAL

SECTION 16050 - BASIC ELECTRICAL REQUIREMENTS

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes: General administrative, procedural requirements, and installation methods for electrical installations specified in Division 16.
- B. The Drawings are schematic and are not intended to show every detail of construction.
 - 1. In general, conduits/raceways, transitions and offsets shown on Drawings indicate approximate locations in plan and elevation where the systems are intended to be run.
 - 2. CONTRACTOR shall fully coordinate electrical Work with other trades to avoid interferences.
 - 3. In the event of interferences, CONTRACTOR shall request clarification from ENGINEER in writing.
- B. Related Documents: Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Sections, apply to Work of this Section.

1.02 SUBMITTALS

- A. Shop Drawings: Submit in accordance with requirements of Section 01330, Shop Drawings covering the items included under this Section of Work. Shop Drawing submittals shall include:
 - 1. Submit product data covering the items included under this Section of Work.
- B. Conforming to Construction Drawings: Submit a complete set of Drawings showing the locations of the piping, ductwork, etc., as actually installed. Such Drawings shall be submitted to ENGINEER on tracing cloth, Mylar, or sepia paper from which blueprints can be obtained.
- C. Operation and Maintenance Manuals: Submit in accordance with requirements of Section 01600, operation and maintenance manuals for items included under this Section. Include following information for equipment items:
 - 1. Description of function, normal operating characteristics and limitations, performance curves, engineering data and tests, and complete nomenclature and commercial numbers of replacement parts.
 - 2. Manufacturer's printed operating procedures to include start-up, break-in, and routine and normal operating instructions; regulation, control, stopping, shutdown, and emergency instructions; and summer and winter operating instructions.
 - 3. Maintenance procedures for routine preventative maintenance and troubleshooting; disassembly, repair, and reassembly; aligning and adjusting instructions.
 - 4. Servicing instructions and lubrication charts and schedules.

1.03 RECORD DOCUMENTS

- A. Prepare Record Documents in accordance with requirements in Section 01770. In addition, CONTRACTOR shall submit, prior to final payment, Drawings conforming to construction records of systems it has installed. Vendor drawings shall be sized as manufacturers' standard.

- B. Provide typewritten data sheets on motor control circuits with following information on each branch feeder: Load name, horsepower or KVA (transformer), fuse size, starter size, service factor of motor, motor nameplate currents, power factor correction capacitor size (if used), and thermal overload part number.

1.04 QUALITY ASSURANCE

- A. National Electrical Code: Comply with NFPA 70, National Electrical Code.
- B. UL Compliance and Labeling: Use products and components labeled by UL.

1.05 PERMITS, INSPECTIONS, AND LICENSES

- A. CONTRACTOR shall procure all necessary permits and licenses, observe and abide by all applicable laws, codes, regulations, ordinances, and rules of the State, territory, or political subdivision thereof, wherein Work is done, or any other duly constituted public authority, and further agrees to hold OWNER harmless from liability or penalty which might be imposed by reason of an asserted violation of such laws, codes, regulations, ordinances, or other rules.
 - 1. Upon completion of Work, CONTRACTOR shall secure certificates of inspection from the inspector having jurisdiction and shall submit 3 copies of the certificates to OWNER. CONTRACTOR shall pay the fees for the permits, inspections, licenses, and certifications when such fees are required.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products to Project properly identified with names, model numbers, types, grades, compliance labels, and other information needed for identification. Equipment shall be packaged to prevent damage during shipment, storage, and handling. Do not install damaged units; replace, and remove damaged units from Site.

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

3.01 GENERAL ELECTRICAL INSTALLATION

- A. Provide electrical materials and equipment enclosures appropriate for areas in which they are installed. Each area will be designated on Drawings with a type of construction such as NEMA 4, 4X, 7 or 9 if it is other than NEMA 12. An area designated by a name and elevation includes space bounded by floor, ceiling, and enclosing walls.
 - 1. Exception: Provide manufacturer's standard construction for indoor or outdoor application where equipment is not manufactured to NEMA specifications (e.g., switchgear, transformers, high voltage capacitors, bus duct, and light fixtures; materials and equipment used in finished areas such as offices, laboratories, etc.).

- B. Provide nonmetallic electrical materials and equipment enclosures in NEMA 4X areas; watertight NEMA 4 and equipment enclosures for outdoor applications and indoor applications below grade; explosion-proof NEC Class I, Division 1, Group D equipment for NEMA 7 areas; explosion-proof NEC Class II, Division 2, Group F equipment for NEMA 9 areas.
- C. Coordinate with power company high voltage and/or low voltage metering requirements. Furnish, install, and connect metering equipment not furnished, installed or connected by power company.
- D. Coordinate with telephone company the communication service requirements. Furnish, install, and connect cable and terminal equipment not furnished, installed, or connected by telephone company. Furnish and install a 4-foot by 8-foot by 3/4-inch plywood backboard painted white, raceway from backboard to property line, and cross-connect base and blocks which utilize punchdown wiring methodology.
- E. Provide chases, slots, and openings in other building components during progress of construction, to allow for electrical installations.
- F. Supporting devices and sleeves shall be set in poured-in-place concrete and other structural components as they are constructed.
- G. Where mounting heights are not detailed or dimensioned, install systems, materials, and equipment to provide maximum headroom possible. Locate light fixtures at approximately 8 feet above floor and where fixtures may be readily serviced.
- H. Coordinate connection of electrical systems with exterior underground and overhead utilities and services. Comply with requirements of governing regulations, franchised service companies, and controlling agencies. Provide required connection for each service.
- I. Install systems, materials, and equipment to conform with approved submittal data, including coordination Drawings, to greatest extent possible. Conform to arrangements indicated by Drawings recognizing that portions of Work are shown only in diagrammatic form. Where coordination requirements conflict with individual system requirements, refer conflict to ENGINEER.
- J. Install systems, materials, and equipment level and plumb, parallel and perpendicular to other building systems and components where installed exposed in finished spaces.
- K. As much as practical, connect equipment for ease of disconnecting with minimum of interference with other installations.
- L. Install access panel or doors where units are concealed behind finished surfaces.
- M. Install systems, materials, and equipment giving right-of-way priority to systems required to be installed at a specified slope.

3.02 RACEWAY INSTALLATION

- A. Outdoors, use the following materials:
 - 1. Exposed Conduit: PVC externally coated rigid metal conduit and fittings.
 - 2. Underground Direct Buried Conduit: PVC externally coated rigid metal conduit.

3. Underground Concrete Encased Conduit: Fiberglass-reinforced conduit or rigid nonmetallic conduit if the conductors are used for power or 120 VAC; otherwise, use rigid metal conduit.
 4. Conduit Used to Connect to Vibrating Equipment including transformers and hydraulic, pneumatic or electric solenoid or motor-driven equipment: Liquidtight flexible metal conduit.
- B. Indoors, use the following wiring materials:
1. Connection to Vibrating Equipment, including transformers and hydraulic, pneumatic or electric solenoid or motor-operated equipment: Liquidtight flexible metal conduit.
 - a. Exception: NEMA 7 or 9 areas require explosion-proof flexible conduit.
 2. Exposed Conduit: Rigid metal conduit or intermediate metal conduit.
 - a. Exceptions:
 - 1) Areas indicated as NEMA 4X, use rigid Schedule 40 PVC conduit.
 - 2) Areas indicated as NEMA 7 or NEMA 9 (such as grit and raw sewage rooms), use PVC externally coated rigid steel conduit.
 3. Concealed Conduit: Rigid metal conduit or intermediate metal conduit unless indicated otherwise.
- C. Minimum size conduit shall be 3/4 inch unless shown otherwise.
- D. Instrument Signal Conduit Requirements: Shielded signal wires for 4-20 mA type instruments or thermocouple wires assigned to the same control panel may be run in the same conduit. Shielded instrument signal wires, thermocouple wires, and shielded 2-wire intercom wires may be run in the same conduit. No other wires will be permitted in an instrument signal/2-wire intercom conduit. Conduit shall be RMC or PVC-coated RMC.
- E. Conduit Thread Paint: Make threaded conduit joints watertight by coating threaded portions with a spray-on or brush-on zinc-bearing paint. Provide paint containing 90 percent minimum by weight of metallic zinc powder in the dried film. Clean field-cut threads of oil using the recommended solvent prior to coating threads.
- F. Install expansion fittings in all exposed rigid nonmetallic conduit runs of 20 feet or more.
- G. Install expansion/deflection fittings where conduit passes a building expansion joint or where conduits are attached to two structures joined by a concrete expansion joint.
- H. Exposed or Concealed Construction: Install conduit exposed inside buildings except for areas with finished walls (e.g., offices, laboratories, lavatories, locker rooms, etc.) unless otherwise indicated.
- I. Concealed Raceways: Raceways embedded in slabs shall be installed in the middle third of the slab thickness where practical and leave at least 1-inch concrete cover. Tie raceways to reinforcing rods or otherwise secure them to prevent sagging or shifting during concrete placement. Space raceways laterally to prevent voids in the concrete. Run 1-inch and smaller raceways with a minimum of bends in the shortest practical distance. Run larger conduit parallel with or at right angles to the main reinforcement; where at right angles to the reinforcement, the conduit shall be close to one of the supports of the slab. Where nonmetallic conduit or fiberglass-reinforced conduit is used, raceways must be converted to PVC externally coated rigid metal conduit before rising above floor.
- J. Exposed Raceways: Install parallel and perpendicular to nearby surfaces or structural members and follow the surface contours as much as practical. Make bends and offsets so the inside diameter is not effectively reduced. Keep the legs of a bend in the same plane and the straight legs of offsets

parallel. Conduits shall slope away from loads to keep moisture from entering the load. Run parallel or banked raceways together. Make bends in parallel or banked runs from the same centerline so that the bends are parallel. Factory elbows may be used in banked runs only where they can be installed parallel. This requires that there be a change in the plane of the run, such as from wall to ceiling and that the raceways be of the same size. In other cases, provide field bends for parallel raceways. Keep raceways at least 6 inches away from parallel runs of flues and steam or hot water pipes. Install horizontal raceway runs above water and steam piping.

- K. Space raceways, fittings, and boxes 0.25 inch from mounting surface in NEMA 4 and NEMA 7 areas. Spacers shall be one-piece construction of stainless steel, galvanized steel, PVC, ABS, or other noncorrosive material.
- L. Sleeves: Install in concrete floor slabs except where conduit passes through a housekeeping pad. Install in exterior walls below grade.
- M. Stub-up Connections: Extend conduits through concrete floor for connection to freestanding equipment with an adjustable top or coupling threaded inside for plugs and set flush with the finished floor. Extend conductors to equipment with rigid metal conduit; flexible metal conduit may be used 6 inches above the floor. Where equipment connections are not made under this Contract, install screwdriver-operated threaded flush plugs with floor.
- N. Flexible Connections: Use short length (maximum 6 feet for lighting fixtures; maximum 3 feet for all other equipment) of flexible conduit for recessed and semi-recessed lighting fixtures, equipment subject to vibration, noise transmission, or movement, and all motors. Use liquidtight flexible conduit in wet locations and rated flexible connections for hazardous locations. Install separate ground conductor across flexible connections.
- O. Join raceways with fittings designed and approved for the purpose and make joints tight. Where joints cannot be made tight, use bonding jumpers to provide electrical continuity of the raceway system. Where terminations are subject to vibration, use bonding bushings or wedges to assure electrical continuity. Where subject to vibration or dampness, use insulating bushings to protect conductors.
- P. Use raceway fittings that are of types compatible with the associated raceway and suitable for the use and location. For intermediate metal conduit, use threaded rigid metal conduit fittings. For PVC externally coated rigid metal conduit, use only factory-coated fittings approved for use with that material. Patch all nicks and scrapes in PVC coating after installing conduit.
- Q. Install raceway sealing fittings in accordance with the manufacturer's written instructions. Locate fittings at suitable, approved, accessible locations and fill them with UL listed sealing compound. For concealed raceways, install each fitting in a flush metal box with a blank cover plate having a finish similar to that of adjacent plates or surfaces. Install raceway sealing fittings at the following points and elsewhere as indicated:
 - 1. Where conduits enter or leave hazardous locations.
 - 2. Where conduits enter or leave NEMA 4X areas.
 - 3. Where conduits pass from warm locations to cold locations, such as the boundaries of refrigerated spaces and air-conditioned spaces.
 - 4. Where required by the NEC.

- R. Install electrical boxes in those locations which ensure ready accessibility to enclosed electrical wiring. Provide knockout closures to cap unused knockout holes where blanks have been removed.
- S. Install device boxes at the height above the floor as follows for:
 - 1. Light switches, 4 feet.
 - 2. Receptacles and telephone jacks, 18 inches except in NEMA 4 and 4X areas, 4 feet.
 - 3. Thermostats, 4'-0".
 - 4. Clock receptacles, 7'-0".
- T. Avoid installing boxes back-to-back in walls. Provide not less than 6-inch (150 mm) separation.
- U. Position recessed outlet boxes accurately to allow for surface finish thickness.
- V. Fasten electrical boxes firmly and rigidly to substrates or structural surfaces to which attached, or solidly embed electrical boxes in concrete masonry.
- W. Provide fire-retardant barriers in all pull and junction boxes containing circuits that are otherwise continuously separated in conduit. Securely fasten these barriers within box. Size barriers so that space between barrier and box wall does not exceed 0.125 inch anywhere around the perimeter of barrier.
- X. Support exposed raceway within 1 foot of an unsupported box and access fittings. In horizontal runs, support at box and access fittings may be omitted where box or access fittings are independently supported and raceway terminals are not made with chase nipples or threadless box connectors.
- Y. In open overhead spaces, cast boxes threaded to raceways need not be supported separately except where used for fixture support; support sheet metal boxes directly from building structure.
- Z. Terminations: Where raceways are terminated with locknuts and bushings, align the raceway to enter squarely and install the locknuts with dished part against the box. Where terminating in threaded hubs, screw the raceway or fitting tight into the hub so the end bears against the wire protection shoulder. Where chase nipples are used, align the raceway so the coupling is square to the box and tighten the chase nipples so no threads are exposed.
- AA. Complete installation of electrical raceways before starting installation of conductors within raceways and prevent foreign matter from entering raceways by using temporary closure protection. Cap spare conduit. Protect stub-ups from damage where conduits rise from floor slabs. Arrange so curved portion of bends is not visible above the finished slab.
- BB. Install pull wires in empty raceways: Use No. 14 AWG zinc-coated steel or monofilament plastic line having not less than 200-pound tensile strength. Leave not less than 12 inches of slack at each end of the pull wire.

3.03 WIRE AND CABLE INSTALLATION

- A. Use pulling means including fish tape, cable, rope, and basket weave wire/cable grips which will not damage cables or raceways. Pull conductors simultaneously where more than one is being installed in same raceway. Use UL listed pulling compound or lubricant where necessary.

- B. Keep branch circuit conductor splices to minimum. Splice feeders only where indicated. Use a standard kit. No splices are allowed for instrument and telephone cables except at indicated splice points.
- C. Install splice and tap connectors which possess equivalent or better mechanical strength and insulation rating than conductors being spliced. Use splice and tap connectors which are compatible with conductor material and are UL listed as pressure type connectors.
- D. Provide adequate length of conductors within electrical enclosures and train conductors to terminal points with no excess. Bundle multiple conductors, with conductors larger than No. 10 AWG cabled in individual circuits. Make terminations so there is no bare conductor at terminal.
- E. Terminate power conductors at equipment using pressure-type terminals specifically designed for type of terminations to be made. Terminate no more than 2 conductors No. 8 AWG and smaller within the same pressure-type terminal. These 2 conductors shall be no more than 4 wire gauge sizes apart. Terminate no more than 1 conductor larger than No. 8 AWG within any pressure-type terminal.
 - 1. Exception: Power factor correction capacitor conductors may be terminated at the motor disconnect switch load terminals.
- F. Seal wire and cable ends until ready to splice or terminate.

3.04 CUTTING AND PATCHING

- A. Perform cutting and patching in accordance with requirements in Section 01730. In addition, the following requirements apply.
 - 1. Perform cutting, fitting, and patching of electrical equipment and materials required to uncover Work to provide for installation of ill-timed Work, remove and replace Work that is either defective or does not conform to requirements of Drawings.
 - 2. Cut, remove, and legally dispose of selected electrical equipment, components, and materials as indicated including, but not limited to, removal of electrical items indicated to be removed and items made obsolete by new Work. Protect structure, furnishings, finishes, and adjacent materials not indicated or scheduled to be removed. Provide and maintain temporary partitions or dust barriers adequate to prevent spread of dust and dirt to adjacent areas.
 - 3. Patch existing finished surfaces and building components using new materials matching existing materials.

3.05 EQUIPMENT CHECKOUT AND TESTING

- A. In addition to testing recommended by equipment or material supplier and called for in equipment or material specification, perform the following.
- B. Motor Testing: Motor insulation shall be tested by using a 500 VDC (minimum) megger and applying test until a constant megohm reading of the following magnitude is obtained:

$$R_{\min.} = 4 (KV + 1) \text{ at } 25 \text{ degrees C winding temp.}$$

$$R_{\min.} = IV + 1 \text{ at } 40 \text{ degrees C winding temp.}$$

 - 1. If motors do not meet requirements of megger test, blow hot air through motors to dry out and repeat until test is passed. If desirable, drying can be done by applying an electrical potential to

- equipment. However, in no case, induced or direct, shall voltage or current exceed continuous rating of equipment being dried.
2. After passing megger test, motors shall be hi-pot tested at 200 percent rated voltage for a minimum of 1 minute.
- C. Equipment Testing: The following tests which are applicable for a particular item of equipment shall be performed:
1. Megger bus work phase-to-phase and phase-to-ground. Minimum acceptable steady-state value is 100 megohms.
 2. Megger power circuit breakers and circuits supplied phase-to-phase and phase-to-ground (100 megohms minimum).
 3. Test current transformer circuits by applying current to secondary wiring at current transformer terminals until contactor trips.
 4. Test, time, and set protective relays. Relays shall be timed at various multiples (minimum of 3 points) of the pick-up value to determine agreement with published curves and adjust as necessary to agree with coordination study required settings. Exact tests to be performed vary with type of relay. Manufacturer's instructions for relay shall be complied with.
 5. After Work has been completed, demonstrate to OWNER's Representative that entire electrical installation is in proper working order and will perform functions for which it was designed by functional testing.
 6. Make any specific tests required by the manufacturer's installation instructions.
- D. Check-out Procedures. In general, check-out procedures (as listed below) which are applicable for a particular item of equipment shall be performed:
1. Vacuum interior of cubicles and remove foreign material.
 2. Wipe clean with a lint-free cloth insulators, bushings, bus supports, etc.
 3. Check and adjust time delay, under-voltage devices, phase relay, over-current relays, etc., as required by coordination study or ENGINEER.
 4. Fill motor bearings requiring oil.
 5. Check and change, as required, thermal overload heater elements to correspond with motor full-load current and service factors of installed motor.
 6. Check direction of rotation of motors and reverse connections if necessary. Check rotation with motor mechanically uncoupled where reverse rotation could damage equipment.
 7. Equipment with two or more sources of power connected by tie breakers, transfer switches, or generator receptacles shall be checked for rotation from each possible combination of power sources. Power sources must have the same phase sequence for each source throughout entire facility.
 8. Check exposed bolted power connections for tightness.
 9. Check operation of breakers, contactors, etc., and control and safety interlocks.
 10. Check tightness of bolted structural connections.
 11. Check leveling and alignment of enclosures.
 12. Check operating parts and linkages for lubrication, freedom from binding, vibration, etc.
 13. Check tightness and correctness of control connections at terminal blocks, relays, meters, switches, etc.
 14. Clean auxiliary contacts and exposed relay contacts after vacuuming.

END OF SECTION

SECTION 16052 - COORDINATION STUDY, SHORT CIRCUIT ANALYSIS, AND ARC FLASH ANALYSIS

PART 1 - GENERAL

1.01 SUBMITTALS

- A. Coordination Study detailing electrical system protection, protective equipment selectivity and arc flash hazard analysis studies.

The report shall include the following sections:

1. One-line diagram showing protective device ampere ratings and associated designations, cable size & lengths, transformer kVA & voltage ratings, motor & generator kVA ratings, and switchgear/switchboard/panelboard designations
2. Descriptions, purpose, basis and scope of the study
3. Tabulations of the worst-case calculated short circuit duties as a percentage of the applied device rating (automatic transfer switches, circuit breakers, fuses, etc.); the short circuit duties shall be upward-adjusted for X/R ratios that are above the device design ratings
4. Protective device time versus current coordination curves with associated one line diagram identifying the plotted devices, tabulations of ANSI protective relay functions and adjustable circuit breaker trip unit settings
5. Fault study input data, case descriptions, and current calculations including a definition of terms and guide for interpretation of the computer printout
6. Incident energy and flash protection boundary calculations
7. Comments and recommendations for system improvements, where needed
8. Executive Summary including source of information and assumptions made

1.02 COORDINATION STUDY

- A. Include as part of Contract for the WWTP and for the Flint 3rd Avenue Pumping Station a complete Coordination and Short Circuit Study from incoming power lines primary switches and transformers through the new medium voltage switchgear, existing generators, existing unit substations, motor control centers branch circuits, existing low voltage power panelboards and lighting panelboards. Obtain available short circuit current, inrush current, and upstream protective device time current curves from the power company. Include power company current data and protective device curve as part of study. Study shall include all coordinating curves with each fuse size, trip settings, and thermal overloads given for connected loads. Curves shall include feeder wire melting curves and transformer ANSI rating points. The study shall also include variable frequency drives harmonic filters, power factor correction equipment, transformers and protective devices associated with variable frequency drives, emergency and standby generators associated paralleling equipment and distribution switchgear. Fuse sizes on motor control centers shall be those shown in Drawings throughout the short circuit and coordination study. Changes in loads from those shown on Drawings shall be incorporated in Study. Report submitted shall be stamped by a licensed professional engineer in the state of Michigan.

- B. Electronic copies of the study for both the WWTP and for the Flint 3rd Avenue Pumping Station shall be turned over in the SKM software. The Owner is to be provided the data files for future updates electronically thru the SKM software (electronic copies of the SKM raw data files created by the SKM software are to be turned over to the Owner). Contractor to obtain from Owner the SKM files for the WWTP and update to include the work shown this contract. The Owner files are only for the WWTP. Update the files for the proposed work shown and collect the data and produce the analysis/report for the Flint 3rd Avenue Pumping Station and deliver those SKM files to Owner along with the updated WWTP SKM files to Owner at project completion.
- C. Analysis and labeling shall include the existing paneboards, distribution centers, disconnect switches, control centers, control panels, etc., as well as the new equipment shown on the contract drawings.
- D. Contractor shall furnish all field data as required for the power system studies and arc flash hazard analysis studies. Include fault contribution of existing motors in the study. . The Contractor shall obtain required existing equipment data, to satisfy the study requirements. This includes walking the site and collecting the data to perform the analysis's specified herein.
- E. Study shall be performed by Eaton. Study results shall be submitted to ENGINEER for approval. These companies are referred to as Contractor in this specification.
- F. After approval all electrical equipment settings, thermal overloads, and fuses shall be made to conform to approved results. CONTRACTOR shall test all trip settings, time delays, and indicating devices on all switchgear, unit substations, and motor control centers. Tests shall be witnessed by ENGINEER.
- G. Data sheets for test are to be furnished by CONTRACTOR and shall be filled out showing the desired settings from Coordination Study and results obtained from witnessed test. Data sheets shall be signed by those performing test and witness. Test data sheets and motor list showing fuses, thermal overload sizes, etc. shall be submitted to ENGINEER as part of Contract.

PART 2 - PRODUCTS

2.01 SHORT-CIRCUIT AND PROTECTIVE DEVICE EVALUATION STUDY

- A. Use actual conductor impedances if known. If unknown, use typical conductor impedances based on IEEE Standards 141, latest edition. Transformer design impedances and standard X/R ratios shall be used when test values are not available.
- B. Provide the following information in the study report:
 - 1. Calculation methods and assumptions.
 - 2. Base per unit quantities.
 - 3. One-line diagram of the system being evaluated with available fault at each bus, and interrupting rating of devices noted.
 - 4. Source impedance data, including electric utility system and motor fault contribution characteristics.
 - 5. Typical calculations and tabulations of calculated quantities.

6. Results, conclusions, and recommendations.
- C. Calculate short-circuit momentary and interrupting duties for a three-phase bolted fault at each:
 1. Electric utility's supply termination point.
 2. Incoming switchgear.
 3. Unit substation primary and secondary terminals.
 4. Low voltage switchgear.
 5. Motor control centers.
 6. Standby generators and automatic transfer switches.
 7. Branch circuit panelboards.
 8. Other significant locations throughout the system.
- D. On grounded systems, provide a bolted line-to-ground fault current study for areas as defined for the three-phase bolted fault short-circuit study.
- E. Protective Device Evaluation:
 1. Evaluate equipment and protective devices and compare to short circuit ratings.
 2. Adequacy of switchgear, motor control centers, and panelboard bus bracing to withstand short-circuit stresses.
 3. Adequacy of transformer windings to withstand short-circuit stresses.
 4. Cable and busway sizes for ability to withstand short-circuit heating.
 5. Notify Owner in writing, of existing circuit protective devices improperly rated for the calculated available fault current.

2.02 PROTECTIVE DEVICE COORDINATION STUDY

- A. Proposed protective device coordination time-current curves shall be graphically displayed on log-log scale paper.
- B. Include on each curve sheet a complete title and one-line diagram with legend identifying the specific portion of the system covered.
- C. Terminate device characteristic curves at a point reflecting maximum symmetrical or asymmetrical fault current to which device is exposed.
- D. Identify device associated with each curve by manufacturer type, function, and, if applicable, tap, time delay, and instantaneous settings recommended.
- E. Plot the following characteristics on the curve sheets, where applicable:
 1. Electric utility's protective device
 2. Medium voltage equipment relays
 3. Medium and low voltage fuses including manufacturer's minimum melt, total clearing, tolerance, and damage bands
 4. Low voltage equipment circuit breaker trip devices, including manufacturer's tolerance bands
 5. Transformer full-load current, magnetizing inrush current, and ANSI transformer withstand parameters
 6. Conductor damage curves

7. Ground fault protective devices, as applicable
 8. Pertinent motor starting characteristics and motor damage points
 9. Pertinent generator short-circuit decrement curve and generator damage point
 10. Other system load protective devices for the largest branch circuit and the largest feeder circuit breaker in each motor control center
- F. Provide adequate time margins between device characteristics such that selective operation is provided, while providing proper protection.

2.03 ARC FLASH HAZARD ANALYSIS

- A. The arc flash hazard analysis shall be performed according to the IEEE 1584 equations that are presented in NFPA70E-2004, Annex D.
- B. When appropriate, the short circuit calculations and the clearing times of the phase overcurrent devices will be retrieved from the short-circuit and coordination study model.
- C. The flash protection boundary and the incident energy shall be calculated at all significant locations in the electrical distribution system (switchboards, switchgear, motor-control centers, panelboards, busway and splitters) where work could be performed on energized parts.
- D. The Arc-Flash Hazard Analysis shall include all medium voltage and 480v locations and significant locations in 240 volt , 208 volt and 120V systems fed from stepdown transformers.
- E. Safe working distances shall be specified for calculated fault locations based upon the calculated arc flash boundary considering an incident energy of 1.2 cal/cm².
- F. The Arc Flash Hazard analysis shall include calculations for maximum and minimum contributions of fault current magnitude. The minimum calculation shall assume that the utility contribution is at a minimum and shall assume a minimum motor load. Conversely, the maximum calculation shall assume a maximum contribution from the utility and shall assume motors to be operating under full-load conditions.
- G. Arc flash computation shall include both line and load side of main breaker calculations, where necessary.
- H. Arc Flash calculations shall be based on actual overcurrent protective device clearing time. Maximum clearing time will be capped at 2 seconds based on IEEE 1584-2002 section B.1.2.

2.04 REPORT SECTIONS

- A. Input Data:
 1. Utility three-phase and line-to-ground available contribution with associated X/R ratios
 2. Short-circuit reactance of rotating machines with associated X/R ratios
 3. Cable type, construction, size, # per phase, length, impedance and conduit type
 4. Bus duct type, size, length, and impedance
 5. Transformer primary & secondary voltages, winding configurations, kVA rating, impedance, and X/R ratio
 6. Reactor inductance and continuous ampere rating
 7. Aerial line type, construction, conductor spacing, size, # per phase, and length

- B. Short-Circuit Data:
 - 1. Source fault impedance and generator contributions
 - 2. X to R ratios
 - 3. Asymmetry factors
 - 4. Motor contributions
 - 5. Short circuit kVA
 - 6. Symmetrical and asymmetrical fault currents
- C. Recommended Protective Device Settings:
 - 1. Phase and Ground Relays:
 - a. Current transformer ratio.
 - b. Current setting.
 - c. Time setting.
 - d. Instantaneous setting.
 - e. Specialty non-overcurrent device settings.
 - f. Recommendations on improved relaying systems, if applicable.
 - 2. Circuit Breakers:
 - a. Adjustable pickups and time delays (long time, short time, ground).
 - b. Adjustable time-current characteristic.
 - c. Adjustable instantaneous pickup.
 - d. Recommendations on improved trip systems, if applicable.
- D. Incident energy and flash protection boundary calculations.
 - 1. Arcing fault magnitude
 - 2. Device clearing time
 - 3. Duration of arc
 - 4. Arc flash boundary
 - 5. Working distance
 - 6. Incident energy
 - 7. Hazard Risk Category
 - 8. Recommendations for arc flash energy reduction

PART 3 - EXECUTION

3.01 ARC FLASH WARNING LABELS

- A. The CONTRACTOR shall provide a 3.5 in. x 5 in. thermal transfer type label of high adhesion polyester for each work location analyzed.
- B. The label shall have an orange header with the wording, "WARNING, ARC FLASH HAZARD", and shall include the following information:
 - 1. Location designation

2. Nominal voltage
 3. Flash protection boundary
 4. Hazard risk category
 5. Incident energy
 6. Working distance
 7. Engineering report number, revision number and issue date
- C. Arc flash labels shall be provided in the following manner and all labels shall be based on recommended overcurrent device settings.
1. For each 480V and applicable 240V/208V/120V volt panelboards and disconnects, two arc flash labels shall be provided.
 2. For each motor control center, two arc flash labels shall be provided, one at each end of the motor control center.
 3. For each low voltage switchboard and panelboard, two arc flash labels shall be provided
 4. For each switchgear or unit substations, two arc flash labels shall be provided, one at each end of the equipment or near each main breaker.
 5. For each medium voltage switch, three arc flash labels shall be provided.
- D. Labels shall be field installed by the electrical supplier performing the studies, local power company, or engineering service division of the equipment manufacturer during the Startup and Acceptance Testing.

3.02 ARC FLASH TRAINING

- A. The equipment vendor shall train personnel of the potential arc flash hazards associated with working on energized equipment (minimum of 16 hours, two trips to the Owners facility). Maintenance procedures in accordance with the requirements of NFPA 70E, Standard for Electrical Safety Requirements for Employee Workplaces, shall be provided in the equipment manuals. The training shall be certified for continuing education units (CEUs) by the International Association for Continuing Education Training (IACET). Assume for Twenty-Five (25) individuals of the Ownersstaff to be trained over two 8 hours days at the Flint WPC facility.

END OF SECTION

SECTION 16060 - GROUNDING

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes: Electrical grounding and bonding Work as follows:
 - 1. Solidly grounded.
- B. Applications of electrical grounding and bonding Work in this Section:
 - 1. Underground metal piping.
 - 2. Underground metal water piping.
 - 3. Underground metal structures.
 - 4. Metal building frames.
 - 5. Electrical power systems.
 - 6. Grounding electrodes.
 - 7. Separately derived systems.
 - 8. Raceways.
 - 9. Service equipment.
 - 10. Enclosures.
 - 11. Equipment.
 - 12. Lighting standards.
 - 13. Landscape lighting.
 - 14. Signs.

1.02 SUBMITTALS

- A. Shop Drawings: Submit in accordance with Section 01330, Shop Drawings covering the items included under this Section. Shop Drawing submittals shall include:
 - 1. Product Data: Submit manufacturer's data on grounding and bonding products and associated accessories.

1.03 QUALITY ASSURANCE

- A. Codes and Standards:
 - 1. UL Compliance: Comply with applicable requirements of UL Standards No. 467, "Electrical Grounding and Bonding Equipment," and No. 869, "Electrical Service Equipment," pertaining to grounding and bonding of systems, circuits, and equipment. In addition, comply with UL Standard 486A, "Wire Connectors and Soldering Lugs for Use with Copper Conductors." Provide grounding and bonding products which are UL listed and labeled for their intended usage.
 - 2. IEEE Compliance: Comply with applicable requirements and recommended installation practices of IEEE Standards 80, 81, 141, and 142 pertaining to grounding and bonding of systems, circuits, and equipment.

PART 2 - PRODUCTS

2.01 GROUNDING AND BONDING

A. Materials and Components:

1. Except as otherwise indicated, provide electrical grounding and bonding systems indicated; with assembly of materials including, but not limited to, cables/wires, connectors, solderless lug terminals, grounding electrodes and plate electrodes, bonding jumper braid, surge arresters, and additional accessories needed for complete installation. Where more than one type component product meets indicated requirements, selection is Installer's option. Where materials or components are not indicated, provide products which comply with NEC, UL, and IEEE requirements and with established industry standards for those applications indicated.
2. Conductors: Electrical copper grounding conductors for grounding system connections that match power supply wiring materials and are sized according to NEC.
3. Ground Bus: 0.25 inch by 1 inch minimum copper ground bus where indicated.
4. Service Arrester: Electrical service arrester, 480 volts, 3-phase, 4-wire, for exterior mounting.
5. Grounding Electrodes: Steel with copper welded exterior, 3/4-inch diameter by 20 feet.
6. Electrical Grounding Connection Accessories: Provide electrical insulating tape, heat-shrinkable insulating tubing, welding materials, bonding straps, as recommended by accessories manufacturers for type services indicated.

PART 3 - EXECUTION

3.01 INSTALLATION OF ELECTRICAL GROUNDING AND BONDING SYSTEMS

- A. Connect grounding conductors to underground grounding electrodes using exothermic weld process or mechanical compression type connectors.
- B. Ground electrical service system neutral at service entrance equipment to grounding electrodes.
- C. Ground each separately derived system neutral to effectively grounded metallic water pipe, effectively grounded structural steel member, and separate grounding electrode.
- D. Connect together system neutral, service equipment enclosures, exposed noncurrent carrying metal parts of electrical equipment, metal raceway systems, grounding conductor in raceways and cables, receptacle ground connectors, and plumbing systems.
- E. Terminate feeder and branch circuit insulated equipment grounding conductors with grounding lug, bus, or bushing.
- F. Connect grounding electrode conductors to 1-inch diameter or greater, metallic cold water pipe using a suitably sized ground clamp. Provide connections to flanged piping at street side of flange.
- G. Connect building reinforcing steel, building steel beam, building steel roof and walls and duct bank and vault reinforcing steel to ground mat using No. 4/0 AWG bare copper grounding cable.
- H. Bond bare No. 4/0 AWG grounding cable in duct banks to grounding cable in vaults and to power equipment ground bus at ends of each duct bank.

- I. Bond strut and other metal inside of electrical manholes and vaults to bare No. 4/0 AWG grounding cable carried in duct bank.
- J. Bond grounding cables to both ends of metal conduit or sleeves through which such cables pass.
- K. Tighten grounding and bonding connectors and terminals, including screws and bolts, in accordance with manufacturer's published torque-tightening values for connectors and bolts. Where manufacturer's torquing requirements are not indicated, tighten connections to comply with tightening torque values specified in UL 486A to assure permanent and effective grounding.
- L. Install braided type bonding jumpers with code-sized ground clamps on water meter piping to electrically bypass water meters.
- M. Route grounding connections and conductors to ground and protective devices in shortest and straightest paths as possible while following building lines to minimize transient voltage rises. Protect exposed cables and straps where subject to mechanical damage.
- N. Apply corrosion-resistant finish to field connections, buried metallic grounding and bonding products, and places where factory applied protective coatings have been destroyed and are subjected to corrosive action.

3.02 FIELD QUALITY CONTROL

- A. Upon completion of installation of electrical grounding and bonding systems, test ground resistance with ground resistance tester using the 3-point fall of potential method. Testing shall be performed during normal dry weather conditions with at least 5 non-rain days elapsing prior to test. Where tests show resistance-to-ground is over 5 ohms, take appropriate action to reduce resistance to 5 ohms or less by driving additional ground rods; then retest to demonstrate compliance.
- B. Test ground paths for continuity by applying a low DC voltage source of current, capable of furnishing up to 100 amps, between electrical equipment grounds and ground grid. Grounding path must conduct a 100-amp current at a resistance of 0.010 ohms or less as calculated from circuit voltage.

END OF SECTION

SECTION 16070 - SUPPORTING DEVICES

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes: Secure support from the building structure for electrical items by means of hangers, supports, anchors, sleeves, inserts, seals, and associated fastenings.

1.02 SUBMITTALS

- A. Shop Drawings: Submit in accordance with Section 01330, Shop Drawings covering the items included under this Section. Shop Drawing submittals shall include:
 - 1. Product data for each type of product specified.

1.03 QUALITY ASSURANCE

- A. Electrical components shall be listed and labeled by UL, ETL, CSA, or other approved, nationally recognized testing and listing agency that provides third-party certification follow-up services.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Subject to compliance with specified requirements, manufacturers offering products which may be incorporated in Work include:
 - 1. Slotted Metal Angle and U-Channel Systems:
 - a. Allied Tube & Conduit.
 - b. American Electric.
 - c. B-Line Systems, Inc.
 - d. Cinch Clamp Co., Inc.
 - e. GS Metals Corp.
 - f. Haydon Corp.
 - g. Kin-Line, Inc.
 - h. Unistrut Diversified Products.
 - 2. Conduit Sealing Bushings:
 - a. Bridgeport Fittings, Inc.
 - b. Cooper Industries, Inc.
 - c. Elliott Electric Mfg. Corp.
 - d. GS Metals Corp.
 - e. Killark Electric Mfg. Co.
 - f. Madison Equipment Co.
 - g. L.E. Mason Co.
 - h. O-Z/Gedney.
 - i. Producto Electric Corp.
 - j. Racco, Inc.
 - k. Red Seal Electric Corp.
 - l. Spring City Electrical Mfg. Co.
 - m. Thomas & Betts Corp.

2.02 COATINGS

- A. Coating: Supports, support hardware, and fasteners shall be stainless steel. Products for use outdoors, in NEMA 4 areas, or embedded in concrete or in Nema 12 areas indoors shall be stainless steel.

2.03 MANUFACTURED SUPPORTING DEVICES

- A. Raceway Supports: Clevis hangers, riser clamps, conduit straps, threaded C-clamps with retainers, ceiling trapeze hangers, wall brackets, and stainless steel spring clamps.
- B. Fasteners. Types, materials, and construction features as follows:
 - 1. Expansion Anchors: 304 stainless steel wedge or sleeve type.
 - 2. Toggle Bolts: 304 stainless steel springhead type.
 - 3. Hanger Rods: 0.375-inch diameter minimum, 304 stainless steel.
- C. Conduit Sealing Bushings: Factory fabricated, watertight conduit sealing bushing assemblies suitable for sealing around conduit or tubing passing through concrete floors and walls. Construct seals with steel sleeve, malleable iron body, neoprene sealing grommets or rings, metal pressure rings, pressure clamps, and cap screws.
- D. Cable Supports for Vertical Conduit: Factory fabricated assembly consisting of threaded body and insulating wedging plug for nonarmored electrical cables in riser conduits. Provide plugs with number and size of conductor gripping holes as required to suit individual risers. Construct body of 304 stainless steel.
- E. U-Channel Systems: 12 gauge or 0.105-inch-thick 304 stainless steel channels, with 9/16-inch-diameter holes, at a minimum of 8 inches on center in top surface. Provide fittings and accessories that mate and match with U-channel and are of same manufacturer.

2.04 FABRICATED SUPPORTING DEVICES

- A. Shop- or field-fabricated supports or manufactured supports assembled from U-channel components.
- B. 304 stainless steel Brackets: Fabricated of angles, channels, and other standard structural shapes. Connect with welds and machine bolts to form rigid supports.
- C. Pipe Sleeves: Provide a waterstop on pipe sleeves. Provide pipe sleeves of 2 standard sizes larger than conduit/pipe passing through it and of one of the following:
 - 1. Steel Pipe: Fabricate from Schedule 40 stainless steel pipe.
 - 2. Plastic Pipe: Fabricate from Schedule 80 PVC plastic pipe

PART 3 - EXECUTION

NOT USED

END OF SECTION

SECTION 16075 - ELECTRICAL IDENTIFICATION

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes: Identification of electrical materials, equipment, and installations. It includes requirements for electrical identification components including, but not limited to, the following:
 - 1. Buried electrical line warnings.
 - 2. Identification labeling for cables and conductors.
 - 3. Operational instruction signs.
 - 4. Warning and caution signs.
 - 5. Equipment labels and signs.

1.02 SUBMITTALS

- A. Shop Drawings: Submit in accordance with Section 01330, Shop Drawings covering the items included under this Section. Shop Drawing submittals shall include:
 - 1. Product Data for each type of product specified.

PART 2 - PRODUCTS

2.01 ELECTRICAL IDENTIFICATION PRODUCTS

- A. Colored Adhesive Marking Tape for Wires and Cables: Self-adhesive, vinyl tape not less than 3 mils thick by 1 inch to 2 inches in width.
- B. Pre-tensioned Flexible Wraparound Colored Plastic Sleeves for Cable Identification: Flexible acrylic bands sized to suit raceway diameter and arranged to stay in place by pre-tensioned gripping action when coiled around the cable.
- C. Underground Line Marking Tape: Permanent, bright colored, continuous printed, plastic tape compounded for direct-burial service not less than 6 inches wide by 4 mils thick. Printed legend indicative of general type of underground line below.
- D. Wire/Cable Designation Tape Markers: Vinyl self-laminating thermal transfer type.
- E. Aluminum, Wraparound Cable Marker Bands: Bands cut from 0.014-inch-thick aluminum sheet, fitted with slots or ears for securing permanently around wire or cable jacket or around groups of conductors. Provide for legend application with stamped letters or numbers.
- F. Engraved, Plastic Laminated Labels, Signs, and Instruction Plates: Engraving stock melamine plastic laminate, 1/16 inch minimum thick for signs up to 20 square inches or 8 inches in length; 1/8-inch thick for larger sizes. Engraved legend in white letters on black face and punched for mechanical fasteners.
- G. Baked Enamel Warning and Caution Signs for Interior Use: Pre-printed aluminum signs, punched for fasteners, with colors, legend, and size appropriate to the location.

- H. Exterior Metal-Backed Butyrate Warning and Caution Signs: Weather-resistant, nonfading, pre-printed cellulose acetate butyrate signs with 20-gauge galvanized steel backing, with colors, legend, and size appropriate to location. Provide 1/4-inch grommets in corners for mounting.
- I. Fasteners for Plastic Laminated and Metal Signs: Self-tapping stainless steel screws or Number 10/32 stainless steel machine screws with nuts and flat and lock washers.
- J. Cable Ties: Fungus-inert, self-extinguishing, one-piece, self-locking nylon cable ties, 0.18 inch minimum width, 50-pound minimum tensile strength, and suitable for a temperature range from minus 50 to 350 degrees F. Provide ties in specified colors when used for color coding.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Lettering and Graphics: Coordinate names, abbreviations, colors, and other designations used in electrical identification Work with corresponding designations specified or indicated. Install numbers, lettering, and colors as approved in submittals and as required by Code.
- B. Underground Electrical Line Identification: During trench backfilling for exterior nonconcrete encased underground power, signal, and communications lines, install continuous underground plastic line marker located directly above line at 6 to 8 inches below finished grade. Where multiple lines installed in a common trench, do not exceed an overall width of 16 inches; install a single line marker.
- C. Install line marker for underground wiring, both direct buried and in raceway.
- D. Conductor Color Coding: Provide color coding for secondary service, feeder, and branch circuit conductors throughout the Project secondary electrical system following OWNER's method of phase identification or as follows:

<u>Phase</u>	<u>480/277 Volts</u>
A	BROWN
B	ORANGE
C	YELLOW
Neutral	WHITE
Ground	GREEN

- E. Wiring Standards:
 - 1. 480/277 Volt, 3-Phase Power:
 - a. Brown.
 - b. Orange.
 - c. Yellow.
 - d. Grey Neutral.
 - 2. 208 Volt, 3-Phase Power:
 - a. Black.
 - b. Red.

- c. Blue.
- 3. 240/120 Volt, 1-Phase Power:
 - a. Black.
 - b. Red.
 - c. White Neutral.
- 4. Motor Leads, Control Cabinet/MCC:
 - a. Black, numbered L1-T1, etc.
- 5. Control Wiring:
 - a. Red Control circuit wiring that is de-energized when the main disconnect is opened (powered from within panel).
 - b. Yellow PLC Discrete input and discrete output wiring.
 - c. Blue DC positive
 - d. Gray DC Negative
 - e. Green Equipment grounding
 - f. White- Grounded control circuit wiring from within panel.
 - g. Orange- with white tracer- control circuit wiring from outside panel.
- F. Use conductors with color factory applied entire length of conductors except as follows:
 - 1. The following field applied color coding methods may be used in lieu of factory-coded wire for sizes larger than No. 10 AWG.
 - a. Apply colored, pressure-sensitive plastic tape in half-lapped turns for a distance of 6 inches from terminal points and in boxes where splices or taps are made. Apply last 2 laps of tape with no tension to prevent possible unwinding. Use 1-inch-wide tape in colors as specified. Do not obliterate cable identification markings by taping. Tape locations may be adjusted slightly to prevent such obliteration.
 - b. In lieu of pressure-sensitive tape, colored cable ties may be used for color identification. Apply 3 ties of specified color to each wire at each terminal or splice point starting 3 inches from the terminal spaced 3 inches apart. Apply with a special tool or pliers, tighten for snug fit, and cut off excess length.
- G. Power Circuit Identification: Securely fasten identifying metal tags of aluminum wraparound marker bands to cables, feeders, and power circuits in vaults, pull boxes, junction boxes, manholes, and switchboard rooms with 1/4-inch steel letter and number stamps with legend to correspond with designations on Drawings. If metal tags are provided, attach them with approximately 55-pound test monofilament line or one-piece self-locking nylon cable ties.
- H. Install wire/cable designation tape markers at termination points, splices, or junctions in each circuit. Circuit designations shall be as indicated on Drawings.

END OF SECTION

SECTION 16085 - ELECTRICAL EQUIPMENT MAINTENANCE CONTRACT (36-MONTHS)

PART 1 - GENERAL

1.01 SUMMARY

- A. Section includes the following:
 - 1. Electrical Equipment Maintenance Contract (medium voltage switchgear).

1.02 SUBMITTALS

- A. Service Contract Draft containing all of information specified.

PART 2 - PRODUCTS

2.01 ELECTRICAL EQUIPMENT MAINTENANCE CONTRACT

- A. Maintenance Contract is to be performed quarterly (4-times/year) for 3-years from date of acceptance of last item of switchgear, unit substation, high voltage starters, or motor control centers. This maintenance shall be considered part of this Contract and shall be performed by qualified personnel who have been trained and are familiar in the operation of equipment involved.
- B. Scope of Work: Maintenance shall include, but not be limited to, the following Work and shall be coordinated with OWNER so that plant operation is not disrupted. Extreme care shall be taken to prevent accidents.
 - 1. This Specification is general in nature and is not designed to cover any particular manufacture of equipment. It is intended as a guide to procedures for a successful testing and maintenance program for electrical equipment. This section covers the medium voltage switchgear at the Flint WPC and at the Flint 3RD Avenue Pump Station.
 - 2. Scope of Work includes all equipment from, and including:
 - a. Primary feeder disconnect switches.
 - b. 5KV rated switchgear.
 - c. Liquid-filled substation style and padmount style transformers and associated switches and secondary breakers.
 - d. Feeders between above equipment.
 - e. 5KV metal clad switchgear
 - f. 5KV metal enclosed switchgear
 - 3. CONTRACTOR shall return to OWNER's premises to install any replacement items not immediately available which are covered by this Contract.
 - 4. CONTRACTOR shall arrange with OWNER for CONTRACTOR to enter all pertinent maintenance schedules and notifications (monthly, 6-month, yearly and 3-year procedures including IR observations and testing) for each piece of new equipment included and installed by CONTRACTOR under this contract to be entered by CONTRACTOR into the OWNERS existing Antero Maintenance system following the OWNERS existing format. This work shall be coordinated with OWNER.
- C. Safety: Maintenance and testing shall be done on apparatus de-energized from the commercial AC service. Where temporary feed for power is required to keep vital circuits in continuous operation,

provision shall be made to isolate these circuits from equipment being serviced. Isolation of these circuits shall be done only with prior approval of OWNER's Representative familiar with system. Prior to any testing, all incoming power cables shall be checked to determine that all electrical power has been removed, and also determine that temporary leads are not backfeeding equipment being serviced.

1. A designated representative of OWNER will point out any known safety hazards. Contracting company shall provide all safety equipment deemed necessary by its safety practices to adequately protect its personnel. A ground lead of proper size shall be connected to all test apparatus prior to its use. There shall be sufficient fire extinguishers available.
- D. Inspection, Test, and Maintenance: The following equipment shall be inspected, adjusted, and maintained as if it were being performed on a schedule of once every 3 years.
1. Transformers: Bushings shall be visually inspected for chipped petticoats, fractured porcelain, etc. Any damaged parts should be replaced. All bushings shall be cleaned, and gaskets checked for positioning, resilience, and leaks.
 - a. In general, insulators shall be cleaned by polishing with a soft cloth dipped in solvent or bushing cleaner. When clean, polish with a soft, dry cloth. The use of water or caustic solutions to remove oxide or dirt deposits on porcelain glaze or abrasives, steel wool, or wire brushing is prohibited.
 - b. Rust on bushing caps and flanges shall be removed by sanding, then the surface primed and repainted with a rust inhibitor type primer and paint for application to metal surfaces.
 - c. The transformer shall be "ratio" tested using a Biddle "TTR" turn tester to assure proper output voltage. Samples of the insulating liquid shall be removed and analyzed to establish the dielectric value, acidity content, color, and specific gravity.
 - d. Pressure relief diaphragms shall be inspected to assure they are free of leaks.
 - e. Tap changer mechanisms shall be checked for proper operation.
 - f. In addition, dry-type transformers 10 kVA and larger shall be inspected, bushings cleaned, connections checked and tightened as required, and the winding cleaned by vacuum or compressed air.
 2. Disconnects: Disconnects shall be checked for freedom of movement, galling, or friction in moving parts; check for signs of heating on current-carrying parts, loose or missing hardware, and broken or missing cotter keys or retainer rings. Missing or broken parts shall be replaced. Lubrication shall be per manufacturer's specification.
 - a. Contacts shall be clean and free of oxide or corrosion. Contact mating shall be maintained at 80 percent or more on knife or butt type contact surfaces.
 - b. The contact overtravel and positive stops shall be checked. Overtravel shall be 0.0625 to 0.03125 inch to permit wiping action when contacts close. Stops are to be set to limit overtravel to a safe amount, usually 0.0625 to 0.125 inch. High current disconnects and gang type disconnects usually have main arcing contacts which shall be checked for proper operation.
 - c. Fuses shall be checked for proper size and connections for tightness in ferrules.
 3. Lightning Arrestors: Lightning arrestors are generally sealed components, free of maintenance, except for an occasional cleaning and mechanical inspection. Arresters shall be cleaned thoroughly when inspecting the transformer. Tightness of all bolted connections to ground shall be checked and retightened as necessary. Megger (1,000 volt) test value should read infinity unless internal resistors are used in the manufacture of the lightning arrestor. Low reading or grounded arrestors shall be replaced.
 4. Medium Voltage Air Circuit Breakers (2.4 to 13.8 KV Class): Primary feeder circuit breakers are generally relay-operated units and, depending on the number of recorded tripping

operations, shall be checked at these frequencies. Inspect every 100 operations or every 3 years, whichever comes first.

- a. With control circuit energized, the breaker shall be tripped and closed several times electrically.
- b. The control circuit shall be de-energized and the control relays, control and auxiliary switches and related wiring visually inspected. All connections shall be checked and tightened as necessary; burned contacts shall be replaced.
- c. Breakers shall be checked for broken or missing lock washers, cotter pins, springs, all hardware for tightness, and control connections for loose or broken connections and damaged insulation. Only manufacturer's specified lubricant or equivalent shall be used.
- d. Arc chutes shall be removed and inspected for broken or missing parts; if conditions warrant, these shall be replaced.
- e. Contacts shall be inspected for burning, pitting, alignment, pressure, and contact sequence. (If contacts need replacing, replace only in pairs. Do not change contact shape by filing.) The tank or tanks on oil-filled breakers shall be lowered and all moving parts inspected. Oil shall be tested and tank gaskets or seals are to be inspected. Defective oil or parts shall be replaced.
- f. After completion of mechanical checks and inspection, the breaker shall be hi-potted using ASA Standard C-37-20. Hi-Pot Test must be performed if high voltage bushings or insulated components have been replaced. In all cases, the breaker shall be meggered using a 2,500 volt megger. AIEE Standard No. 27 Insulation Resistance should not be less than 200 megohms. Isolate low voltage control relays and megger separately using a lower output voltage megger to avoid damage to these items. Precautions shall be observed when hi-potting in cold weather.
- g. No hi-potential test will be applied below 40 degrees F due to the possibility of flashover due to condensate occurring at these lower temperatures.

- E. Routine Maintenance and Cleaning: This Work shall be done on de-energized equipment only. The inside of the switchboards and other enclosures housing electrical switchgear shall be cleaned with a vacuum cleaner with insulated attachments and then hand cleaned. Keep generally free from dust, lint, dirt, and abrasive material. Wipe clean all buses, supports, etc. Buses and connections shall be inspected for signs of overheating and weakening of insulation. Buses shall be inspected for adequate support spacing and bracing in accordance with the NEMA Standards for bus bar bracing. All structure supports shall be checked for "Tracking" and anchor bolts shall be checked for tightness. All control connections, screws, lugs, bolts, solderless connectors, etc., shall be checked for tightness to ensure good electrical continuity and mechanical condition. CONTRACTOR shall inspect the ground for a solid, continuous, and adequate ground. The connections shall be cleaned and tightened. All raceway systems entering the equipment shall be inspected to determine that they are properly bonded with lock nuts, etc. Service entrance equipment shall be checked to see that it is grounded in accordance with current NEC requirements. All switchgear compartments shall have the backs removed to allow complete cleaning. All front switch compartments shall be cleaned and lubricated as necessary. The primary circuit shall then be meggered using a 2,500 volt megger or equivalent.
- F. Lubrication: The finest grease and oils tend to oxidize with time. Evidence of oxidation is hardening and darkening. Hence, lubricants shall be renewed to prevent sluggishness and allow smooth operation of equipment.
- G. Cleaning Agents: CONTRACTOR shall use approved cleaning fluids for removal of old oxidized grease. When using solvents in any quantity, the work areas shall be well ventilated. Only lint-free cloths shall be used.

1. Typical Visual Inspection Procedure: When working on "bolted-in" type, low voltage power circuit breakers, the power circuit must be de-energized. This is not required with draw-out type breakers. The following steps shall be taken in servicing and testing these breakers:
 - a. Open Breaker: If draw-out type breaker, rack out breaker and remove from cubicle. Note that these breakers are heavy and should be handled with some type of lifting device. If no lifting device is available, at least 2 men will be needed to lower breaker to the floor. If "bolted in" breaker, open front panel to gain access, then bus connections can be unbolted, secondary control wires disconnected and the breaker mounting bolts can be loosened (very carefully) and, utilizing a specifically designed "lift," the breaker shall be removed for servicing.
 - b. Inspect primary fingers in back of breaker. Check to see that no springs are missing or broken or the fingers excessively worn. Clean out dust or dirt.
 - c. Remove arc chutes; inspect for cracked, broken, or burned parts. Clean and replace. Defective parts shall be replaced.
 - d. Inspect, clean, and dress main and arcing contacts in accordance with manufacturer's instructions.
 - e. With the arc chutes removed, mechanically close breaker, utilizing the maintenance closing device, to inspect contact action and alignment. When the arc chutes are moved, moving parts of the breaker are exposed.
 - f. Open and close breaker several times to determine that the operation is smooth and there is no binding.
 - g. Lubricate the racking mechanism and inspect. Make sure there is no evidence of binding.
 - h. Lubricate mechanical joints and mechanism used to close and open.
 - i. Tighten all screwed and bolted connections.
 - j. Blow dust and dirt from breaker and arc chutes. Use low pressure dry air.
 - k. Inspect to determine the movement of the common trip bar will unlatch the mechanism and trip the breaker.
 - l. Determine that the trip arms on the trip devices properly engage the trip bar and have the proper amount of "overtravel."
 - m. Determine that the breaker position indicator is showing actual position of breaker.
 - n. If any adjustments are necessary, consult the manufacturer's instruction bulletin for proper adjustments.
2. Electrical Test, High Current: Most of these breakers are equipped with one series overcurrent trip device per phase. The operation of any one of these devices will trip the breaker.
 - a. Method:
 - 1) The breaker shall be tested one phase at a time.
 - 2) Trip devices shall be allowed to fully reset between tests.
 - b. The low voltage power circuit breaker trip device test shall be:
 - 1) Timing (long and short-time delay elements).
 - 2) Instantaneous.
 - c. All circuit breakers, high voltage and low voltage, shall be removed from service and inspected for loose, broken, or defective parts. All current contacts shall be inspected, cleaned, and polished as required. All bolts, cotter pins, rollers, and bearings shall be examined to determine if any defect, looseness, or unusual condition exists. All linkages shall be examined and lubricated as required. All arc chutes, barriers, and insulation shall be examined for broken or burned areas. All parts shall be cleaned as required.
 - d. The circuit breaker shall be reassembled, tested with hand-operated 1,000 volt megger and doctor, and operated by hand to assure proper, non-binding closing and tripping. The circuit breaker shall then be tested for electrical tripping using low voltage, high current

- test equipment or trip tested by using simulated CT current through the time-overcurrent relay devices in accordance with the manufacturer's specifications and published standards.
- e. No change in trip device settings from "as found" shall be made without express approval of the designated representative of OWNER.
- H. Switches (Safety, Disconnect, Transfer, Pressure Control): Switches of the above types have a tendency to build up high resistance across the contacts if it is not operated frequently. Several manufacturers of this equipment have designed this apparatus in such a manner as to make it difficult to actually see the contacts and moving parts.
- 1. Where possible, the main contacts of the switch shall be cleaned, adjusted and a thin film of lubricant placed on them. The fuse clips, connections to the bus or cable, mountings in switchboard and handles shall be checked for tightness and proper alignment. When applicable, the tension on the contacts shall be checked when signs of discoloration caused by heating are noted.
 - 2. Due to the design of this type equipment, it is not necessary to perform electrical tests as in the case of a circuit breaker. However, there is one test that will indicate if the operating mechanism of the switch has deteriorated to the extent that the probability of failure in the near future is great. This test is called the ductor test and measures in millivolts the contact resistance drop. After exercising the switch several times, cleaning and making any adjustments necessary, with a ductor test set, the resistance drop across each phase shall be measured. If the drop exceeds 50 millivolts or has greater than plus or minus 20 percent variation between phases, parts are to be replaced.
- I. Relays: Relays shall be checked with current and an accurate timing device when they are placed in service. This will help to assure that the relay was not damaged during shipping or installation and will operate properly. If a relay does not give the desired operating time for a given current, the desired time can usually be obtained by cleaning and adjustment. Only qualified personnel, properly trained and properly equipped with test equipment, manufacturer's data, and necessary special tools, shall work on this equipment.
- 1. The relay shall be inspected for loose terminals, lock screws, and other parts for filings or other foreign material in magnet gaps, for burned or dirty contacts, sticky contact back-stops, dirty, worn, or broken bearings or other cause for sluggish operation, damaged coils, resistors, or wiring, and damaged or maladjusted indicator targets or holding devices. Performance tests of the relays will vary somewhat with the type of relay. The following is a typical visual and electrical test procedure to be followed.
 - 2. Visual Inspection:
 - a. Remove cover:
 - 1) Inspect the cover gasket.
 - 2) Check glass for tightness in the frame, cracks, etc.
 - 3) Clean glass inside and out.
 - b. Open trip circuit.
 - 1) This is done by opening the red-handled switch in the Westinghouse type "CO" relay or removal of the connection block in the General Electric Type "IAC" relay. Open the rest of the black-handled switches on the Westinghouse relay. Open the latches that hold the relay in the case and carefully remove relay from case. Remember, the switchblades attached to the case in the Westinghouse relay, as well as the bars in the bottom of the General Electric case, are still "hot."
 - c. Foreign material in the relay such as dust, filings, etc., shall be removed using dry compressed air 25 psi or lower.

- d. Any rust or filings from disc or magnet poles shall be removed with a magnet cleaner or brush.
 - e. Clearance between magnet poles shall be checked to assure they do not rub.
 - f. Relay shall be inspected for the presence of moisture.
 - g. Pitted or burned contacts shall be cleaned or replaced as necessary.
 - h. Overcurrent Relay Testing. Type of tests:
 - 1) Zero set.
 - 2) Pick-up.
 - 3) Time Current Characteristics.
 - 4) Target and Seal-In Operation.
 - i. Overcurrent Instantaneous Relays: Consult manufacturer's instruction leaflet to identify current terminals and contact terminals.
 - j. Over/Under Voltage Relays: Consult manufacturer's instruction leaflet to identify potential terminals and contact terminals. Types of tests:
 - 1) Zero Set test.
 - 2) Pick-Up test.
 - 3) Timing test.
 - k. Directional Overcurrent Relays: Test overcurrent unit for pickup and timing the same as for an overcurrent relay, except that for directional controlled relays, the directional unit contacts must be blocked closed for this test or the overcurrent units will not operate.
 - l. Percentage Differential Relays: Consult manufacturer's instruction book for proper connections and information on characteristics.
 - m. Voltage Balance-Phase Sequence Relay. Type of tests:
 - 1) Check Phase Sequence Trip.
 - 2) Set Voltage Balance Trip at 18-20 volts (negative sequence of 10.4 -11.6 volts).
3. After completion of the electrical tests of relays removed from the switchgear, the relays shall be replaced in their drawout compartments and a check of wiring continuity made by mechanically operating the relay to assure it will trip the protective device ahead.
- J. Indicating Meters and Meter Switches: Check switches for continuity in each position. Check the wiring connections at the switch and meter, making corrections for discontinuities or intermittent connections. Clean switch contacts. Apply a signal to each meter to check for proper operation within the specifications of the meter. Repair any sticking or malfunctioning meters.
- K. Parts and Supplies: Furnish new indicating lights where needed, lubricants, fasteners, cleaning supplies, report forms, and other expendable items including nuts and bolts. Any item priced at \$10 or less shall be considered expendable. CONTRACTOR shall include a lump sum amount of dollars in its Bid to cover unknown replacement items for the equipment involved. The lump sum shall be a minimum of \$1,000 and separately shown in the Bid. OWNER's Representative shall have final authority to authorize all expenditures out of the lump sum dollars for replacement items. This authorization will be available on a day-to-day basis to allow immediate restoration of items during the maintenance.
- L. Reports: Record data on measurements and draw graphs on measurements where multiple readings are taken over a time period. The data sheets shall identify the test, item, date, CONTRACTOR, and any other pertinent parameters.
- 1. Complete reports on applicable forms. One copy shall be retained by CONTRACTOR. In addition to the "forms," CONTRACTOR shall make written recommendations indicating any major defects or deviations in the electrical system detected during the test and inspection and any violations of national or local code that may affect the safety of personnel and/or continuity

of service. The report shall be forwarded in pamphlet form. Extra copies shall be available upon request.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Obtain OWNER's signature on Service Contact following final system acceptance. Effective date of service Contact shall be date system is accepted by ENGINEER.

END OF SECTION

SECTION 16090 - DEMOLITION AND EARTHWORK

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes: Limited scope general construction materials and methods for application with electrical installations as follows:
 - 1. Selective Demolition including:
 - a. Nondestructive removal of materials and equipment for reuse or salvage as indicated.
 - b. Dismantling electrical materials and equipment made obsolete by these installations.
 - 2. Excavation for underground utilities and services, including underground raceways, vaults, and equipment.

1.02 PROJECT CONDITIONS

- A. Conditions Affecting Selective Demolition: The following Project conditions apply:
 - 1. Protect adjacent materials indicated to remain. Install and maintain dust and noise barriers to keep dirt, dust, and noise from being transmitted to adjacent areas. Remove protection and barriers after demolition operations are complete.
 - 2. Locate, identify, and protect electrical services passing through demolition area and serving other areas outside the demolition limits. Maintain services to areas outside demolition limits. When services must be interrupted, install temporary services for affected areas.
- B. Conditions Affecting Excavations: The following Project conditions apply:
 - 1. Maintain and protect existing building services which transit the area affected by selective demolition.
 - 2. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by excavation operations.
 - 3. Site Information: Subsurface conditions were investigated during the design of the Project. Reports of these investigations are available for information only; data in the reports are not intended as representations or warranties of accuracy or continuity of conditions. OWNER will not be responsible for interpretations or conclusions drawn from this information.
 - 4. Existing Utilities: Locate existing underground utilities in excavation areas. If utilities are indicated to remain, support and protect services during excavation operations.
 - 5. Remove existing underground utilities indicated to be removed.
 - a. Uncharted or Incorrectly Charted Utilities: Contact utility owner immediately for instructions.
 - b. Provide temporary utility services to affected areas. Provide minimum of 48-hour notice to ENGINEER prior to utility interruption.
 - 6. Use of explosives is not permitted.

1.03 SEQUENCING AND SCHEDULING

- A. Coordinate the shutoff and disconnection of electrical service with OWNER and utility company.
- B. Notify ENGINEER at least 5 days prior to commencing demolition operations.

- C. Perform demolition in phases as indicated.

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

3.01 SELECTIVE DEMOLITION

- A. Demolish, remove, demount, and disconnect abandoned electrical materials and equipment indicated to be removed and not indicated to be salvaged or saved.
- B. Materials and Equipment to be Salvaged: Remove, demount, and disconnect existing electrical materials and equipment indicated to be removed and salvaged, and deliver materials and equipment to location designated for storage.
- C. Disposal and Clean Up: Remove from Site and legally dispose of demolished materials and equipment not indicated to be salvaged.
- D. Electrical Materials and Equipment: Demolish, remove, demount, and disconnect the following items:
 - 1. Inactive and obsolete raceway systems, controls, and fixtures.
 - 2. Raceways embedded in floors, walls, and ceilings may remain if such materials do not interfere with new installations. Remove materials above accessible ceilings.
- E. Perform cutting and patching required for demolition in accordance with Section 01730.

3.02 EXCAVATION

- A. Slope sides of excavations to comply with local codes and ordinances. Shore and brace as required for stability of excavation.
- B. Shoring and Bracing: Establish requirements for trench shoring and bracing to comply with local codes and authorities. Maintain shoring and bracing in excavations regardless of time period excavations will be open.
- C. Remove and Bracing: Establish requirements for trench shoring and bracing to comply with local codes and authorities. Maintain shoring and bracing in excavations regardless of time period excavations will be open.
- D. Install sediment and erosion control measures in accordance with local codes and ordinances.
- E. Dewatering: Prevent surface water and subsurface or groundwater from flowing into excavations and from flooding Project Site and surrounding area.
 - 1. Do not allow water to accumulate in excavations. Remove to prevent softening of bearing materials. Provide and maintain dewatering system components necessary to convey water away from excavations.

2. Establish and maintain temporary drainage ditches and other diversions outside excavation limits to convey surface water to collecting or run-off areas. Do not use trench excavations as temporary drainage ditches.
- F. Material Storage: Stockpile satisfactory excavated materials where directed, until required for backfill or fill. Place, grade, and shape stockpiles for proper drainage.
1. Locate and retail soil materials away from edge of excavations. Do not store within drip-line of trees indicated to remain.
 2. Remove and legally dispose of excess excavated materials and materials not acceptable for use as backfill or fill.
- G. Excavation for Underground Vaults and Electrical Structures: Conform to elevations and dimensions shown within a tolerance of plus or minus 0.10 foot; plus a sufficient distance to permit placing and removal of concrete formwork, installation of services, other construction, and for inspection.
1. Excavate, by hand, areas within drip line of large trees. Protect the root system from damage and dry-out. Maintain moist conditions for root system and cover exposed roots with burlap. Paint root cuts of 1 inch in diameter and larger with emulsified asphalt tree paint.
 2. Take care not to disturb bottom of excavation. Excavate by hand to final grade just before concrete reinforcement is placed.
- H. Trenching: Excavate trenches for electrical installations as follows:
1. Excavate trenches to uniform width, sufficiently wide to provide ample working room and minimum of 6 to 9 inches clearance on both sides of raceways and equipment.
 2. Excavate trenches to depth indicated or required.
 3. Limit length of open trench to that in which installations can be made and trench backfilled within same day.
 4. Where rock is encountered, carry excavation below required elevation and backfill with a layer of crushed stone or gravel prior to installation of raceways and equipment. Provide minimum of 6 inches of stone or gravel cushion between rock bearing surface and electrical installations.
- I. Cold Weather Protection: Protect excavation bottoms against freezing when atmospheric temperature is less than 35 degrees F (1 degree C).
- J. Backfilling and Filling. Place soil materials in layers to required subgrade elevations for each area classification listed below:
1. Under walks and pavements, use a combination of subbase materials and excavated or borrowed materials.
 2. Under building slabs, use drainage fill materials.
 3. Under piping and equipment, use subbase materials where required over rock bearing surface and for correction of unauthorized excavation.
 4. For raceway less than 30 inches below surface of roadways, provide 4-inch-thick concrete base slab support. After installation of raceways, provide a 4-inch-thick concrete encasement (sides and top) prior to backfilling and placement of roadway subbase.
 5. Other areas, use excavated or borrowed materials.
- K. Backfill excavations as promptly as work permits, but not until completion of following:
1. Inspection, testing, approval, and locations of underground utilities have been recorded.
 2. Removal of concrete formwork.
 3. Removal of shoring and bracing, and backfilling of voids.
 4. Removal of trash and debris.

- L. Placement and Compaction: Place backfill and fill materials in layers of not more than 8 inches in loose depth for material compacted by heavy equipment, and not more than 4 inches in loose depth for material compacted by hand-operated tampers.
- M. Before compaction, moisten or aerate each layer as necessary to provide optimum moisture content. Compact each layer to required percentage of maximum dry density or relative dry density for each area classification specified below. Do not place backfill or fill material on surfaces that are muddy, frozen, or contain frost or ice.
- N. Place backfill and fill materials evenly adjacent to structures, piping, and equipment to required elevations. Prevent displacement of raceways and equipment by carrying material uniformly around them to approximately same elevation in each lift.
- O. Compaction: Control soil compaction during construction, providing minimum percentage of density specified for each area classification indicated below.
 - 1. Percentage of Maximum Density Requirements: Compact soil to not less than the following percentages of maximum density for soils which exhibit a well-defined moisture-density relationship (cohesive soils), determined in accordance with ASTM D 1557 and not less than the following percentages of relative density, determined in accordance with ASTM D 2049, for soils which will not exhibit a well-defined moisture-density relationship (cohesionless soils).
 - a. Areas Under Structures, Building Slabs and Steps, Pavements: Compact to 12 inches of subgrade and each layer of backfill or fill material to 90 percent maximum density for cohesive material, or 95 percent relative density for cohesionless material.
 - b. Areas Under Walkways: Compact top 6 inches of subgrade and each layer of backfill or fill material to 90 percent maximum density for cohesive material, or 95 percent relative density for cohesionless material.
 - c. Other Areas: Compact 6 inches of subgrade and each layer of backfill or fill material to 85 percent maximum density for cohesive soils, and 90 percent relative density for cohesionless soils.
 - 2. Moisture Control: Where subgrade or layer of soil material must be moisture conditioned before compaction, uniformly apply water. Apply water in minimum quantity necessary to achieve required moisture content and to prevent water appearing on surface during or subsequent to compaction operations.
- P. Subsidence. Where subsidence occurs at electrical installation excavations during the period 12 months after Substantial Completion, remove surface treatment (i.e., pavement, lawn, or other finish), add backfill material, compact to specified conditions, and replace surface treatment. Restore appearance, quality, and condition of surface or finish to match adjacent areas.

END OF SECTION

SECTION 16120 - WIRES AND CABLES

PART 1 - GENERAL

1.01 SUMMARY

- A. Section includes the following:
 - 1. Low-Voltage Wire and Cable.
 - 2. Medium-Voltage Cable.
 - 3. Instrument Cable.
 - 4. Local Area Network Wiring (LAN).

1.02 SUBMITTALS

- A. Shop Drawings: Submit in accordance with Section 01330, Shop Drawings covering the items included under this Section. Include Shop Drawings of wires, cables, connectors, splice kits, and termination assemblies.
- B. Reports of field tests prepared as noted in Section 01600.

1.03 QUALITY ASSURANCE

- A. UL Compliance: Provide components which are listed and labeled by UL. For cables intended for use in air handling space comply with applicable requirements of UL Standard 710, "Test Method for Fire and Smoke characteristics of cables used in Air Handling Spaces."
- B. NEMA/ICEA Compliance: Provide components which comply with following standards:
 - 1. NEMA WC 70-1999/ICEA S-95-658-1999, Nonshielded Power Cables Rated 2,000 Volts or Less for the Distribution of Electrical Energy.
 - 2. NEMA WC 71-1999/ICEA S-96-659-1999, Standard for Nonshielded Cables Rated 2,001-5,000 Volts for use in the Distribution of Electrical Energy.
 - 3. NEMA WC 74-2000/ICEA S-93-639, 5-46 kV Shielded Power Cable for use in the Transmission and Distribution of Electrical Energy.
- C. IEEE Compliance: Provide components which comply with the following standard.
 - 1. Standard 82, Test procedures for Impulse Voltage Tests on Insulated Conductors.
- D. Network Wiring Experience: CONTRACTOR must be able to prove to the satisfaction of OWNER that it has significant experience in the installation of Local Area Network cable systems. Installation must include installation of Network cable, cable termination, knowledge of interconnect equipment, and a thorough knowledge of testing procedures.
- E. Labeling: Handwritten labels are not acceptable. All labels shall be machine printed on clear or opaque tape, stenciled onto adhesive labels, or typewritten onto adhesive labels. The font shall be at least 1/8 inch in height, block characters, and legible. The text shall be of a color contrasting with the label such that it may be easily read. If labeling tape is utilized, the font color shall contrast with the background. Patch panels shall exhibit workstation numbers or some type of location identifier, in sequential order, for all workstations or devices attached. Each Network cable segment shall be labeled at each end with its respective identifier.

- F. Network Wiring Interconnect Equipment (Patch Panels): Interconnect equipment shall be used in all Local Area Network cable installations. Patch panels shall be mounted in the equipment racks or panel mounted. Interconnect equipment mounted in racks shall be affixed to the rack by at least 4 screws. All interconnect devices shall be assembled and installed in accordance with the manufacturer's instructions and recommendations.
- G. Patch Cords: Patch cords shall be provided for each Local Area Network port on the patch panel. Patch cords shall meet or exceed technical specifications of all installed Local Area Network cable. Patch cord connectors shall be matched with patch panel connector type and network module connector type as required.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Subject to compliance with specified requirements, manufacturers offering products which may be incorporated in Work include:
 - 1. Low-Voltage Wire and Cable:
 - a. American Insulated Wire Corp.
 - b. General Cable.
 - c. The Okonite Co.
 - d. Southwire Co.
 - 2. Connectors for Low-Voltage Wires and Cable Conductors:
 - a. AMP.
 - b. O-Z/Gedney Co.
 - c. Square D Company.
 - d. 3M Company.
 - 3. Medium-Voltage Cable:
 - a. American Insulated Wire Corp.
 - b. General Cable.
 - c. Kerite Co.
 - d. The Okonite Co.
 - e. Prysmian Cables & Systems.
 - f. Southwire Co.
 - 4. Medium-Voltage Cable Splicing and Terminating Products and Accessories:
 - a. Adelet-PLM.
 - b. Amerace Corp.
 - c. Electrical Products Division 3M.
 - d. G&W Electric Co.
 - e. M.P. Husky Corp.
 - f. Raychem Corp.
 - g. RTE Components.
 - 5. Instrument Cable:
 - a. Belden (Trade Nos. 1120A and 1118A).
 - 6. Local Area Network Cable:
 - a. Belden 7882A/7883A, or equal.

2.02 LOW-VOLTAGE WIRES AND CABLES

- A. Conductors: Provide stranded conductors conforming to ASTM Standards for concentric stranding, Class B. Construction of wire and cable shall be single conductor (1/c) unless multiconductor cable is shown by notation in form (x/c) where x indicates the number of separate insulated conductors per cable.
- B. Conductor Material: Copper. Minimum size power wire shall be No. 12 AWG.
- C. Insulation: Provide RHW/USE insulation for power conductors used in single- and 3-phase circuits with more than 120 volts to ground. Provide RHW/USE, XHHW, or THWN/THHN insulation for power conductors used in single- and 3-phase circuits with 120 volts or less to ground
 1. Provide RHW, THHN/THWN, or XHHW insulation for grounding conductors installed in raceways.
 2. Provide THHN/THWN insulation for control conductors.

2.03 CONNECTORS FOR LOW-VOLTAGE WIRES AND CABLES

- A. Provide UL listed factory fabricated, solderless metal connectors of sizes, ampacity ratings, materials, types, and classes for applications and services indicated. Use connectors with temperature ratings equal to or greater than those of the wires upon which used.

2.04 MEDIUM-VOLTAGE CABLE

- A. Cable shall be single-conductor type, size as indicated, and conforming to UL Standard 1072, "Medium Voltage Power Cables."
- B. Cable shall be ethylene propylene rubber (EPR) insulated and shall conform to NEMA Standard WC 74-2000 (ICEA S-93-639) "5-46 kV Shielded Power Cable for use in the Transmission and Distribution of Electrical Energy."
- C. Conductors: Class B stranded, annealed copper.
- D. Conductor Shield: Extruded, semiconducting.
- E. Insulation Shield: Extruded, semiconducting.
- F. Metallic Shielding: Copper shielding tape, helically applied over semiconducting insulation shield or evenly spaced solid copper wires applied concentrically over semiconducting insulation shield.
- G. Cable Jacket: Sunlight-resistant PVC, cross-linked polyolefin, or chlorosulfonated polyethylene (hypalon).
- H. Cable Voltage Rating: 5 kV phase to phase (or as shown on drawings)

2.05 MEDIUM-VOLTAGE SPLICING AND TERMINATING PRODUCTS

- A. Types: Compatible with cable materials and shall be suitable for indoor or outdoor environments as required.

- B. Connectors: Compression type as recommended by cable or splicing kit manufacturer for application.
- C. Splicing and Terminating Kits: As recommended by manufacturer in writing for specific sizes, ratings, and configurations of cable conductor, splices, and terminations specified. Kits shall contain components required for a complete splice or termination including detailed instructions and shall be the product of a single manufacturer. Completed splices and terminations shall provide insulation equivalent to the insulation class of cable it connects and maintain current carrying capacity and mechanical strength of cable.

2.06 INSTRUMENT CABLE

- A. Instrument Cable: 600 volt minimum insulated shielded cable with two or more twisted No. 16 or No. 18AWG stranded copper conductors; PVC, nylon, or polyethylene outer jacket; and 100 percent foil shielding.

2.07 LOCAL AREA NETWORK CABLE

- A. Category 6 (Ethernet) Data and Patch Cable:
 - 1. Paired, 4-pair, 24 AWG, solid bare copper conductors with polyethylene insulation, overall aluminum foil-polyester tape shield with 24 AWG stranded tinned copper drain wire, 100 percent shield coverage, PVC jacket.
 - 2. UL verified to Category 6.
 - 3. Provide plenum rated cable..

PART 3 - EXECUTION

3.01 FIELD QUALITY CONTROL

- A. Prior to energizing, check installed 480 volt, 3-phase power circuits and higher wires and cables with a 1,000-volt megohm meter to determine insulation resistance levels to assure requirements are fulfilled. Minimum acceptable megohm meter reading is 100 megohms held at a constant value for 15 seconds. A certified copy of megohm meter tests shall be submitted to ENGINEER. Test reports shall include ambient temperature and humidity at time of testing. Notify ENGINEER 48 hours prior to test with schedule.
- B. Medium-Voltage Cable Tests shall include high-potential test of cable and accessories and such tests and examinations required to achieve specified objectives. Where new cables are spliced to existing cables, high-potential test shall be performed on the new cable prior to splicing. After test results for new cables are approved and splice is made, an insulation resistance test and continuity test on the length of cable including the splice with existing cables being tested to the nearest disconnect point.
- C. Local Area Network (LAN) Cable Tests: Testing of all cable segments shall be completed in compliance with EIA/TIA-568-B.1 Standards. Testing shall be done by CONTRACTOR with at least 5 years of experience in testing Network cabling systems.
 - 1. TESTING: CONTRACTOR shall test each network cable segment. **OWNER reserves the right to have representation present during all or a portion of the testing process. CONTRACTOR must notify OWNER 5 days prior to commencement of testing.** If OWNER elects to be present during testing, test results will only be acceptable when conducted in the presence of OWNER.

2. DOCUMENTATION (Network Cable): CONTRACTOR shall provide documentation to include test results and as-built Drawings. Network Cable Results: Handwritten results are acceptable provided the test is neat and legible. Copies of test results are not acceptable. Only original signed copies will be acceptable.
 - a. Each cable installed shall undergo complete testing in accordance with TIA/EIA-568-B.1 to guarantee performance to this Standard.
 - b. All required documentation shall be submitted within 30 days at conclusion of the project to OWNER.
 - c. Test Criteria: Pass rate to conform to latest TIA/EIA-568-B.1 Standards that incorporate link performance testing through entire path, including cable, couplers, and jumpers.
 3. ACCEPTANCE: Acceptance of the Data Communications System, by OWNER, shall be based on the results of testing, functionality, and receipt of documentation.
- D. Reports (non-LAN cable): Testing organization shall maintain a written record of observations and tests, report defective materials and workmanship, and retest corrected defective items. Testing organization shall submit written reports to ENGINEER.

END OF SECTION

SECTION 16130 - RACEWAYS

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes: Raceways for electrical wiring. Types of raceways in this Section include the following:
1. Flexible metal conduit.
 2. Intermediate metal conduit.
 3. Liquidtight flexible conduit.
 4. Underground plastic utilities duct.
 5. Rigid metal conduit.
 6. Rigid nonmetallic conduit.
 7. Surface raceways.
 8. PVC externally coated rigid metal conduit.
 9. Fiberglass reinforced conduit.
 10. Electrical nonmetallic tubing.
 11. Wireway.
 12. Conduit bodies.
 13. Aluminum RMC

1.02 SUBMITTALS

- A. Shop Drawings: Submit in accordance with Section 01330, Shop Drawings covering the items included under this Section. Shop Drawing submittals shall include:
1. Product data for the following products:
 - a. Surface raceway and fittings.
 - b. Wireway and fittings.
 - c. Conduit.
 - d. Conduit bodies.

1.03 QUALITY ASSURANCE

- A. Codes and Standards:
1. NEMA Compliance: Comply with applicable requirements of NEMA standards pertaining to raceways.
 2. UL Compliance and Labeling: Comply with applicable requirements of UL standards pertaining to electrical raceway systems. Provide raceway products and components listed and labeled by UL, ETL, or CSA.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Subject to compliance with requirements, manufacturers offering products which may be incorporated in Work include:

1. Conduit:
 - a. Allied Tube.
 - b. Carlon.
 - c. Johns Manville.
 - d. Occidental Coatings.
 - e. Orangeburg.
 - f. Perma-Cote Industries.
 - g. Republic Steel.
 - h. Steelduct Co.
 - i. Triangle Conduit.
 - j. Wheatland Tube.
 - k. Youngstown Sheet and Tube.
2. Liquidtight Conduit:
 - a. Anamet, Inc.
 - b. Carlon.
 - c. Electric-Flex.
 - d. Thomas and Betts.
3. Conduit Bodies:
 - a. Adalet-PLM.
 - b. American Electric.
 - c. Appleton Electric Co.
 - d. Carlon.
 - e. Crouse-Hinds Division, Cooper Industries, Inc.
 - f. Delta Industrial Products.
 - g. Killark Electric Mfg. Co.
 - h. Kraloy Products Co.
 - i. O-Z/Gedney Co.
 - j. Perma-Cote Industries.
 - k. Spring City Electrical Mfg. Co.
4. Conduit Thread Paint:
 - a. CRC Chemicals, USA.
 - b. Sherwin Williams.
 - c. ZRC Chemical Products Co.
5. Wireway:
 - a. Alrey-Thompson Co.
 - b. Anchor Electric Co.
 - c. Hoffman Engineering Co.
 - d. Keystone/Rees, Inc.
 - e. Robroy Industries, Inc.
 - f. Square D Company.
6. Surface Metal Raceway:
 - a. Allied Tube & Conduit.
 - b. B-Line Systems, Inc.
 - c. Butler Mfg. Co.
 - d. Hoffman Engineering Co.
 - e. Isoduct Energy Systems.
 - f. Isotrol Systems.
 - g. Keystone/Rees, Inc.
 - h. Square D Company.

- i. The Wiremold Co.
- 7. Surface Nonmetallic Raceway:
 - a. Anixter Brothers, Inc.
 - b. Hoffman Engineering Co.
 - c. Hubbell, Inc.
 - d. Panduit Corp.
 - e. Premier Telecom Products, Inc.
 - f. Thermotools Co.
 - g. The Wiremold Co.

2.02 METAL CONDUIT AND TUBING

- A. Rigid Metal Conduit: ANSI C 80.1, hot-dip galvanized.
- B. PVC Externally Coated Rigid Metal Conduit and Fittings: ANSI C 80.1 and NEMA RN 1., Type 40, 40 mil nominal coating and thickness. The bond of the PVC to the substrate shall be stronger than the tensile strength of the PVC.
- C. Flexible Metal Conduit: UL 1, zinc-coated metal.
- D. Liquidtight Flexible Metal Conduit and Fittings: UL 360. Fittings shall be specifically approved for use with this raceway.
- E. Aluminum RMC.

2.03 NONMETALLIC CONDUIT AND DUCTS

- A. Rigid Nonmetallic Conduit (RNC): NEMA TC 2 and UL 651, Schedule 40 or 80 PVC.
- B. PVC Conduit and Tubing Fittings: NEMA TC 3; match to conduit or conduit/tubing type and material.
- C. Underground PVC and ABS Plastic Utilities Duct: NEMA TC 6, Type I for encased burial in concrete, Type II for direct burial.
- D. PVC and ABS Plastic Utilities Duct Fittings: NEMA TC 9; match to duct type and material.
- E. Liquidtight Flexible Nonmetallic Conduit and Fittings: UL 1660. Fittings shall be specifically approved for use with this raceway.
- F. Fiberglass-Reinforced Conduit and Fittings: CSA B196.1 and B1089 A.

2.04 CONDUIT BODIES

- A. Provide matching gasketed covers secured with corrosion-resistant screws. Use cast covers in NEMA 4 areas and stamped steel covers in NEMA 1 and 12 areas. Use nonmetallic covers in NEMA 4X areas and threaded, ground joint covers in NEMA 7 and NEMA 9 areas.

- B. Metallic Conduit and Tubing: Use metallic conduit bodies as follows:
1. Rigid Metal Conduit: Use cast or malleable iron conduit bodies with zinc electroplating, aluminum enamel or lacquer finish, and threaded hubs.
 2. Intermediate Metal Conduit: Use cast or malleable iron conduit bodies with zinc electroplating, aluminum enamel or lacquer finish, and threaded hubs.
 3. Electrical Metallic Tubing: Use cast or malleable iron conduit bodies with zinc electroplating, aluminum enamel or lacquer finish, and compression type or setscrew connectors.
 4. PVC Externally Coated Rigid Metal Conduit: Use hot-dipped galvanized or cadmium-plated cast or malleable iron conduit bodies with threaded hubs factory PVC-coated. Field application of PVC coating to conduit bodies is not acceptable. Secure covers using PVC encapsulated or stainless steel screws.
 5. Nonmetallic Conduit and Tubing: Use nonmetallic conduit bodies conforming to UL 514 B.
 6. NEMA 7 and NEMA 9 Areas: Use materials conforming to UL standards for the area.

2.05 WIREWAYS

- A. Fittings and accessories including but not limited to couplings, offsets, elbows, expansion joints, adapters, hold-down straps, and end caps shall match and mate with wireway as required for complete system. Where features are not indicated, select to fulfill wiring requirements and comply with applicable provisions of NEC.
- B. Wireway covers shall be hinged type.

2.06 SURFACE RACEWAYS

- A. Sizes and channels as indicated. Provide fittings that match and mate with raceway.
- B. Surface Metal Raceway: Construct of galvanized steel with snap-on covers, with 1/8-inch mounting screw knockouts in base approximately 8 inches o.c. Finish with manufacturer's standard prime coating suitable for painting. Provide raceways of types suitable for each application required.
- C. Surface Nonmetallic Raceway: Two-piece construction, manufactured of rigid PVC compound with matte texture and manufacturer's standard color. Raceway and system components shall meet UL 94 requirements for nonflammable, self-extinguishing characteristics.

PART 3 - EXECUTION

NOT USED

END OF SECTION

SECTION 16135 - CABINETS, BOXES, AND FITTINGS

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes: Cabinets, boxes, and fittings for electrical installations and certain types of electrical fittings not covered in other Sections. Types of products specified in this Section include:
 - 1. Outlet and device boxes.
 - 2. Pull and junction boxes.
 - 3. Terminal boxes.
 - 4. Bushings.
 - 5. Locknuts.
 - 6. Conduit hubs.

1.02 SUBMITTALS

- A. Shop Drawings: Submit in accordance with Section 01330, Shop Drawings covering the items included under this Section. Shop Drawing submittals shall include:
 - 1. Shop Drawings for floor boxes and boxes, enclosures, and cabinets that are to be shop-fabricated, (nonstock items). For shop-fabricated junction and pull boxes, show accurately scaled views and spatial relationships to adjacent equipment. Show box types, dimensions, and finishes.
 - 2. Product data for boxes, fittings, cabinets, and enclosures.

1.03 QUALITY ASSURANCE

- A. Codes and Standards:
 - 1. UL Listing and Labeling: Items provided under this section shall be listed and labeled by UL.
 - 2. NEMA Compliance: Comply with NEMA Standard 250, "Enclosures for Electrical Equipment (1,000 Volts Maximum)."

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Subject to compliance with specified requirements, manufacturers offering products which may be incorporated in Work include:
 - 1. Outlet Boxes, Concealed Conduit System:
 - a. Adalet-PLM Div., Scott Fetzer Co.
 - b. Appleton Electric, Emerson Electric Co.
 - c. Bell Electric, Square D Company
 - d. Eagle Electric Mfg. Co., Inc.
 - e. Midland-Ross Corp.
 - f. OZ/Gedney, General Signal Co.
 - g. Pass and Seymour, Inc.
 - h. RACO Div., Harvey Hubbell, Inc.

- i. Thomas & Betts Co.
- 2. Outlet Boxes, Exposed Conduit System:
 - a. Appleton Electric, Type JB, GS, or SHE.
 - b. Crouse-Hinds, Type GS or GRF.
- 3. Device Boxes, Concealed Conduit Systems:
 - a. Adalet-PLM Div., Scott Fetzer Co.
 - b. Appleton Electric; Emerson Electric Co.
 - c. Bell Electric, Square D Company.
 - d. Eagle Electric Mfg. Co., Inc.
 - e. Midland-Ross Corp.
 - f. OZ/Gedney, General Signal Co.
 - g. Pass and Seymour, Inc.
 - h. RACO Div., Harvey Hubbell, Inc.
 - i. Thomas & Betts Co
- 4. Device Boxes, Exposed Conduit System:
 - a. Appleton Electric, Type FS/FD.
 - b. Crouse-Hinds, Type FS/FD.
- 5. Junction and Pull Boxes, Concealed System:
 - a. Adalet-PLM Div., Scott Fetzer Co.
 - b. Appleton Electric, Emerson Electric Co.
 - c. Arrow-Hart Div., Crouse-Hinds Co.
 - d. Bell Electric, Square D Company.
 - e. GTE Corporation.
 - f. Keystone Columbia, Inc.
 - g. OZ/Gedney Co.; General Signal Co.
 - h. Spring City Electrical Mfg. Co.
- 6. Junction and Pull Boxes, Exposed Conduit System:
 - a. Appleton Electric, Type FS/FD.
 - b. Crouse-Hinds, Type FS/FD.
- 7. Terminal Boxes:
 - a. AMFCO.
 - b. Boss.
 - c. Hoffman.
 - d. Keystone.
 - e. Hope.
- 8. Bushings, Knockout Closures, Locknuts, and Connectors:
 - a. Adalet-PLM Div., Scott Fetzer Co.
 - b. AMP, Inc.
 - c. Arrow-Hart Div., Crouse-Hinds Co.
 - d. Appleton Electric Co., Emerson Electric Co.
 - e. Bell Electric; Square D Co.
 - f. Midland-Ross Corp.
 - g. Midwest Electric, Cooper Industries, Inc.
 - h. OZ/Gedney Co., General Signal Co.
 - i. RACO Div., Harvey Hubbell, Inc.
 - j. Thomas & Betts Co., Inc.

2.02 CABINETS, BOXES, AND FITTINGS - GENERAL

- A. Outlet Boxes: Suitable for the conduit system installation as follows:
 - 1. Exposed Conduit: Provide cast outlet boxes finished with aluminum lacquer or enamel. Provide cast metal covers with neoprene gaskets for NEMA 12 and 4 areas and undesignated areas.
 - a. Exception: Provide non-metallic outlet boxes for NEMA 4X areas. Provide the appropriate explosion-proof rating for outlet boxes installed in NEMA 7 and NEMA 9 areas. Provide factory PVC-coated boxes where PVC-coated conduit is specified.
 - 2. Concealed Conduit: Provide galvanized coated flat-rolled sheet-steel outlet wiring boxes, of shapes, cubic inch capacities, and sizes, including box depths as indicated, suitable for installation at respective locations. 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 cast metal outlet boxes for exterior outlets.
- B. Device Boxes: Suitable for the conduit system as follows:
 - 1. Exposed Conduit: Provide cast or malleable iron, zinc electroplated device boxes finished with aluminum lacquer or enamel. Provide exterior mounting lugs on device boxes.
 - a. Exception: Provide non-metallic outlet boxes for NEMA 4X areas. Provide appropriate explosion-proof rating for device boxes installed in NEMA 7 and NEMA 9 areas. Provide factory PVC-coated device boxes where PVC-coated conduit is specified.
 - 2. Concealed Conduit: Provide galvanized coated flat-rolled sheet-steel non-gangable device boxes, of shapes, cubic inch capacities, and sizes, including box depths as indicated, suitable for installation at respective locations. Construct device boxes for flush mounting with mounting holes, and with cable-size knockout openings in bottom and ends, and with threaded screw holes in end plates for fastening devices. Provide cable clamps and corrosion-resistant screws for fastening cable clamps, and for equipment type grounding. Provide cast metal device boxes for exterior devices.
- C. Junction and Pull Boxes: Suitable for the conduit system installation as follows:
 - 1. Exposed Conduit: For pull and junction boxes provide 316 stainless steel hinged boxes. Provide exterior mounting lugs. Grind exposed edges smooth or roll edges to prevent scuffing of wire during installation. Provide a continuous neoprene or rubber gasket cemented to the box cover where it contacts the box body.
 - a. Exceptions: Provide nonmetallic pull and junction boxes in NEMA 4X areas. Provide appropriate explosion-proof construction for boxes located in NEMA 7 and NEMA 9 areas. Provide factory PVC-coated boxes for areas where PVC conduit is used.
 - 2. Concealed Conduit: Provide 316 stainless steel junction and pull boxes, with screw-on covers; of types, shapes and sizes, to suit each respective location and installation; with welded seams and equipped with stainless steel nuts, bolts, screws, and washers.
- D. Terminal Boxes: Provide compression lug type terminal strips in each terminal box with a minimum of 20 percent spare terminals. Provide appropriate NEMA enclosure rating for area in which terminal box is installed.
- E. Bushings, Knockout Closures, and Locknuts: Provide corrosion-resistant box knockout closures, conduit locknuts and malleable iron conduit bushings, offset connectors, of types and sizes, to suit

respective installation requirements and applications. Provide watertight hubs on conduits terminated at sheet steel enclosures in NEMA 4 areas.

PART 3 - EXECUTION

NOT USED

END OF SECTION

SECTION 16139 - VAULTS

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes: Extent of underground concrete encased conduit (ductbank) vault, manhole, and handhole work as indicated by Drawings, and is hereby defined to include those units which are utilized exclusively for installation of instrumentation, communication, and control media and equipment; and electrical power cables, wires, and equipment.
- B. Types of vaults, manholes, and handholes in this Section include, but are not limited to:
 - 1. Utility vaults.
 - 2. Electrical manholes.
 - 3. Electrical handholes.
 - 4. Concrete encased conduit (ductbank).
- C. Related Work in Other Sections:
 - 1. Excavation and backfill required in connection with vaults, manholes, and handholes.
 - 2. Concrete Work required in connection with vaults, manholes, and handholes.
 - 3. Waterproofing and dampproofing of vaults, manholes, and handholes.

1.02 SUBMITTALS

- A. Shop Drawings: Submit in accordance with Section 01330, Shop Drawings covering the items included under this Section. Shop Drawing submittals shall include:
 - 1. Manufacturer's Data: Submit manufacturer's data on concrete encased conduit vault, manhole, and handhole components and associated specialty products.
 - 2. Submit Shop Drawings for vault system, showing raceway types and sizes, locations, and elevations for horizontal runs. Include details of underground structures, accessories, fittings, and connections.

1.03 QUALITY ASSURANCE

- A. Prefabricators: Firms regularly engaged in manufacture of factory fabricated vaults, manholes, and handholes, of types and sizes required, whose products have been in satisfactory use in similar service for not less than 3 years.
- B. Codes and Standards:
 - 1. ANSI Compliance: Comply with requirements of ANSI C2, "National Electrical Safety Code," pertaining to construction and installation of concrete encased conduit vaults, manholes, and handholes.
 - 2. ASTM Compliance: Comply with applicable requirements of American Society for Testing and Materials (ASTM) standards pertaining to construction and materials for vaults, manholes, and handholes.
 - 3. UL Compliance: Comply with applicable requirements of Standard 486A, "Wire Connectors and Soldering Lugs for Use With Copper Conductors." Provide vault, manhole, and handhole accessories which are UL listed and labeled.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Subject to compliance with specified requirements, manufacturers offering products which may be incorporated in Work include:
- B. Prefabricated Units:
 - 1. Advance Concrete.
- C. Manhole Frames and Covers:
 - 1. James B. Clow & Sons.
 - 2. Neenah Foundry Co.

2.02 MATERIALS FOR FIELD FABRICATED UNITS

- A. Concrete Materials: Comply with Division 3 requirements for applicable product requirements of concrete materials, except as otherwise indicated.
- B. Concrete Masonry Units: ASTM C 139.
- C. Masonry Mortar: ASTM C 270, Type M:
 - 1. For minor amounts of mortar comprising less than 2.0-cubic-foot packaged mortar materials complying with ASTM C 387, Type M, may be substituted at CONTRACTOR's option.
- D. Manhole Frames and Covers: Grey cast iron, ASTM A 48, Class 30B:
 - 1. Dip coat frames and covers in black asphalt paint. Provide 30-inch-diameter openings for vaults and manholes carrying low-voltage circuits. Provide 36-inch-diameter openings for vaults and manholes carrying medium-voltage circuits.
 - 2. Furnish covers with cast-in legend "ELECTRIC" on roadway face.
 - 3. Designed for easy removal.
- E. Vault and Manhole Steps: Grey cast iron, ASTM A 48, Class 30B, integrally cast into vault and manhole sidewalls, unless otherwise indicated.

2.03 FACTORY FABRICATED VAULTS, MANHOLES, AND HANDHOLES

- A. Concrete Vaults and Manholes: Provide watertight, precast concrete vaults and manholes in types and sizes indicated, with access knockout entrance holes for raceways and cable, cast-iron manhole access cover and frame with machined bearing surfaces, with pulling/lift irons, sump/drainage box and vertical embedded continuous slot inserts.
- B. Manhole Frames and Covers: Grey cast iron, ASTM A 48, Class 30B:
 - 1. Dip coat frames and covers in black asphalt paint. Provide 30-inch-diameter openings for vaults and manholes carrying low-voltage circuits. Provide 36-inch diameter openings for vaults and manholes carrying medium-voltage circuits.
 - 2. Furnish covers with cast-in legend "ELECTRIC" on roadway face.
 - 3. Provide reinforced concrete for vaults and manholes with slabs designed for H-20 highway loading and walls designed for a lateral earth pressure of 80 pounds per square foot per foot of depth.
 - 4. Designed for easy removal.

- C. Handholes and Boxes: Provide handholes and boxes for pulling, splicing, and terminating conductors, in types and sizes indicated, with watertight cover and penta-head bolts and knockout access holes; equip base with sump/drainage box.
 - 1. Provide concrete body with cast iron cover and ring.
- D. Accessories: Provide vault, manhole, and handhole accessories, including pulling-in irons, embedded cable support accessories, cable rack arms, porcelain saddles, sump pump pits, ladders, mastics, and sealants as indicated or required.

PART 3 - EXECUTION

3.01 INSPECTION

- A. Installer must examine areas and conditions under which concrete encased conduit vaults, manholes, and handholes are to be installed, and notify CONTRACTOR in writing of those conditions detrimental to proper completion of Work. Do not proceed with Work until unsatisfactory conditions have been corrected in manner acceptable to Installer.

3.02 UNDERGROUND CONCRETE ENCASED CONDUIT

- A. Support conduit to be encased on approved spacers at the dimensions shown on Drawings.
- B. Reinforce concrete encasement as indicated.
- C. Slope duct runs a minimum of 0.5 percent in the direction indicated.
- D. Maintain a 12-inch minimum clearance between concrete encasement and yard piping.
- E. Provide 24-inch minimum clearance from top of concrete encasement to finished grade unless otherwise noted.
- F. Mandrel and clean all underground conduits prior to cable installation.

3.03 INSTALLATION OF VAULTS, MANHOLES, AND HANDHOLES

- A. Install vaults, manholes, and handholes as indicated, in accordance with manufacturer's written instructions and with recognized industry practices to ensure that vaults, manholes, and handholes comply with requirements.
- B. Set manhole frames and covers flush with sidewalk, pavement, or ground surface. In gravel driveways set covers 4 inches below surface.
- C. Coordinate with other Work, including electrical raceway and wiring Work, as necessary to interface installation of vaults, manholes, and handholes with other Work.

3.04 INSTALLATION OF FIELD FABRICATED UNITS

- A. Fabricate vaults, manholes, and handholes, of types and sizes indicated, watertight, and equip with manhole metal access cover, steps, access holes for raceways and cables, sump/drainage box, and bolting inserts.
- B. Masonry Construction Manholes:
 - 1. Use concrete masonry units to construct masonry manholes and vaults.
 - 2. Construct manholes and vaults in sizes and shapes indicated.
 - 3. Mix mortar with only enough water for workability. Retempering of mortar is not permitted. Keep mortar mixing and conveying equipment clean. Do not deposit mortar upon, or permit contact with, the ground.
 - 4. Lay masonry in mortar to form full-bed joints, with end and side joints formed in one operation, and with bed and vertical joints not more than 5/8-inch wide. Protect fresh masonry from freezing and also from too rapidly freezing and from too rapidly drying.
 - 5. Apply a 1/2-inch-thick mortar coating on both interior and exterior wall surfaces.
 - 6. Where manholes are installed in pavements, set tops of frames and covers flush with finish surface. Elsewhere, set tops 3 inches above finish surface unless otherwise indicated.
 - 7. Use an epoxy bonding compound where manhole steps are mortared into masonry walls.
- C. Cast-In-Place Concrete Manholes:
 - 1. Use cast-in-place concrete to construct manholes and vaults.
 - 2. Construct manholes and vaults of sizes and shapes indicated.
 - 3. Dampproofing and Waterproofing:
 - a. Coordinate dampproofing and waterproofing Work with installation of field fabricated units as necessary for proper interface.
 - b. Install dampproofing and waterproofing materials as indicated.

3.05 INSTALLATION OF FACTORY FABRICATED UNITS

- A. Install vaults, manholes, and handholes as indicated, in accordance with manufacturer's written instructions and recognized industry practices to ensure that vaults, manholes, and handholes comply with requirements and serve intended purposes.
- B. Precast Concrete Units: Place precast concrete sections as indicated. Where units occur in pavements, set tops of frames and covers flush with finish surface, unless otherwise indicated. Use epoxy bonding compound where steps are mortared into unit walls.
 - 1. Install rubber joint gasket, complying with ASTM C 443, at joints between sections.
 - 2. Apply bituminous mastic coating at joints between sections.
 - 3. Coordinate dampproofing and waterproofing Work with installation of precast concrete units as necessary for proper interface.
 - 4. Install dampproofing and waterproofing materials as indicated.

3.06 BACKFILLING

- A. Delay backfilling of excavations surrounding vaults, manholes, and handholes until after initial inspection has been completed.

3.07 GROUNDING AND BONDING

- A. Provide equipment grounding and bonding connections for exposed metal parts in vaults, manholes, and handholes as indicated. Tighten connections to comply with tightening torques specified in UL Std 486A to assure permanent and effective grounds.

END OF SECTION

SECTION 16140 - WIRING DEVICES

PART 1 - GENERAL

1.01 SUMMARY

- A. Section includes the following:
 - 1. Receptacles.
 - 2. Ground fault circuit interrupter receptacles.
 - 3. Plugs.
 - 4. Plug connectors.
 - 5. Telephone and network outlets.
 - 6. Wall plates.

1.02 SUBMITTALS

- A. Shop Drawings: Submit in accordance with Section 01330, Shop Drawings covering the items included under this Section. Shop Drawing submittals shall include:
 - 1. Product data for each type of product specified.

1.03 QUALITY ASSURANCE

- A. Codes and Standards:
 - 1. UL and NEMA Compliance: Provide wiring devices which are listed and labeled by UL and comply with applicable UL and NEMA standards.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Subject to compliance with specified requirements, manufacturers offering products which may be incorporated in Work include:
 - 1. Bryant Electric Co., Division of Hubbell Corporation.
 - 2. Cooper Wiring Devices.
 - 3. Hubbell, Inc.
 - 4. Leviton Manufacturing Co., Inc.
 - 5. Pass and Seymour, Inc.

2.02 WIRING DEVICES

- A. Provide devices which are UL listed and which comply with NEMA WD 1 and other applicable UL and NEMA standards. Provide ivory color devices and wall plates except as otherwise indicated.
- B. Receptacles: Provide specification grade or heavy-duty grounding receptacles with the NEMA rating shown on Wiring Device Schedule on Drawings. Comply with UL 498 and NEMA WD1.
- C. Receptacles, Industrial Heavy-Duty: Provide pin and sleeve design receptacles conforming to UL 498. Comply with UL 1010 where installed in hazardous locations. Provide features indicated.

- D. Ground Fault Interrupter (GFI) Receptacles: Provide specification grade or heavy-duty "feed-through" type ground fault circuit interrupter, with integral grounding type NEMA 5-20R duplex receptacles arranged to protect connected downstream receptacles on same circuit. Provide units rated Class A, Group 1, per UL Standard 94.3.
- E. Plugs: 15 amperes, 125 volts, 3-wire, grounding, armored cap plugs, parallel blades with cord clamp, and 0.4-inch cord hole; match NEMA configuration with power source's.
- F. Plug Connectors: 15 amperes, 125 volts, bakelite-body armored connectors, 3-wire, grounding, parallel blades, double wipe contact, with cord clamp, and 0.4-inch cord hole, match NEMA configuration to mating plug's. Arrange as indicated.
- G. Telephone and Network Outlets: Telephone outlets shall consist of box, wall plate, and RJ-12 jack. Network outlets shall consist of box, wall plate, and RJ-45 jack. Network outlet shall comply with requirements of CAT-5E cabling systems. Wall plates shall match color and style of receptacle and switch wall plates used throughout the Project.

2.03 WIRING DEVICE ACCESSORIES

- A. Wall plates: Single and combination, of types, sizes, and with ganging and cutouts as indicated. Provide plates which mate and match with wiring devices to which attached. Provide metal screws for securing plates to devices with screw heads colored to match finish of plates. Provide wall plates with engraved legend where indicated. Exterior receptacle covers shall provide rainproof protection while in use. Conform to requirements of Section 16075. Provide plates possessing the following additional construction features:
 - 1. NEMA 12 and Unclassified Areas. Material and Finish: 0.04-inch-thick stainless steel, or 0.04-inch-thick brass, chrome plated.
 - 2. NEMA 4 Area Material and Finish: Cast screw cap and cover plate for receptacles. Cast cover plate with lever or plunger operator for switches.
 - 3. NEMA 4X Material and Finish: Non-metallic, watertight wall plates 0.05-inch-thick aluminum, anodized.
 - 4. NEMA 7 and NEMA 9 Material and Finish: cast metal cover plates meeting NEC requirements for area.

PART 3 - EXECUTION

NOT USED

END OF SECTION

SECTION 16330 - MEDIUM-VOLTAGE TRANSFORMERS

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes: Distribution and power transformers with medium-voltage primaries. Types of transformers specified in this Section include:
 - 1. Pad-mounted type and substation type as shown on contract drawings.

1.02 SUBMITTALS

- A. Shop Drawings: Submit Shop Drawings covering the items included under this Section. Shop Drawing submittals shall include:
 - 1. Shop Drawings for each transformer, including dimensional plans, sections, and elevations showing minimum clearances, installed devices, and materials lists.
 - 2. Product data for each product specified.
 - 3. Wiring diagrams from manufacturer differentiating between manufacturer-installed and field-installed wiring.
- B. Product Test Reports: Certified copies of manufacturer's design and factory tests as follows.
 - 1. Turns ratio.
 - 2. Polarity.
 - 3. Resistance.
 - 4. Impedance.
 - 5. Load losses.
 - 6. No load losses.
 - 7. Exciting current.
 - 8. Regulation at 80percent power factor.
 - 9. Impulse test (transformers larger than 750 kVA only).
 - 10. Corona test (transformers larger than 1500 kVA only).
- C. Power company approval for all transformers interfacing with power company connections. Submit one copy of product data signed by power company if required by contract drawings.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Subject to compliance with specified requirements, manufacturers offering products which may be incorporated in Work include(no or equal):
 - 1. Eaton Corporation

2.02 TRANSFORMERS, GENERAL

- A. Medium-Voltage Transformers: Factory assembled and tested, general-purpose, air-cooled, dry type or liquid filled as indicated, and having characteristics and capacities as indicated.

- B. Windings: 2-winding type, designed for operation with high-voltage windings connected to the system, indicated on Drawings. Provide 4- or 5-legged cores for all wye-wye connected transformers.
- C. Finishes: Thoroughly clean interior and exterior prior to coating enclosure and equipment, including bolted joints, with rust inhibiting primer coat. Provide 2 finish coats of manufacturer's standard color finish.
 - 1. Top-Liquid Temperature Sensing on Liquid-Filled Transformers: Thermally operated control device with thermal element mounted in a well, and provisions for mounting control cabinet, conduit, and fans.
- D. Windings: Copper or aluminum.
- E. Provide fully insulated neutral terminal for wye-connected windings.
- F. Equip each transformer with a permanent stainless-steel nameplate which includes serial number, shop order number, transformer class, number of phases, frequency, kVA rating, primary and secondary voltage, tap voltages, connection and vector diagrams, manufacturer's name, percent impedance, temperature rise, weight of core, coils and fittings, weight and volume of fill liquid (if applicable), and BIL of high and low voltage windings.

2.03 PAD MOUNTED TRANSFORMERS

- A. Comply with ANSI/IEEE C57.12.22 and with the following features and ratings:
- B. Comply with ANSI/IEEE C57.12.26 and with the following features and ratings:
 - 1. Insulating Liquid: Mineral oil, conforming to ASTM D 3487, "Specifications for Mineral Insulating Oil Used in Electrical Apparatus," Type II, tested in accordance with ASTM D 117, "Guide to Test Methods and Specifications for Electrical Insulating Oils of Petroleum Origin." Provide with environmental friendly fill fluid where shown on contract drawings.
 - a. Insulation Temperature Rise: 65 degrees C.
 - b. Basic Impulse Insulation Level: 60 kV for 5.0 kV class.
 - c. Basic Impulse Insulation Level: 75 kV for 8.7 kV class.
 - d. Basic Impulse Insulation Level: 95 kV for 15.0 kV class.
 - 2. Full-Capacity Voltage Taps: Four nominal 2.5 percent taps, 2 above and 2 below rated high voltage, with externally operable tap changer for de-energized use, with position indicator.
 - 3. Surge Arresters: Comply with NEMA Standard LA 1, Distribution Class, supported from tank wall within high-voltage compartment, one for each primary phase.
 - a. Provide Ohio Brass Co. metal-oxide type surge-arresters with ethylene propylene housing. Provide a barrier around the arresters which complies with Power Company's requirements.
 - 4. Impedance: 5.75 percent unless otherwise indicated.
 - 5. Accessories: Provide the following accessories:
 - a. One-inch drain valve with sampling device.
 - b. Dial-type thermometer.
 - c. Liquid level gauge.
 - d. Pressure-vacuum gauge.
 - e. Pressure relief device, self-sealing with indicator.
 - f. Mounting provision for low-voltage current transformers and potential transformers.

- g. Alarm contacts for above gauges.
- h. Key interlock on HV compartment door.
- i. Refer to drawings for additional requirements for the padmount transformers and substation style transformers to be provided this contract.

PART 3 - EXECUTION

3.01 ADJUSTING

- A. Adjust transformer taps to provide optimum voltage conditions at utilization equipment.

END OF SECTION

SECTION 16334 - MEDIUM VOLTAGE SWITCHGEAR

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes: Medium voltage switchgear and associated auxiliary equipment, and includes the following:
 - 1. Metal-clad circuit breaker switchgear.
 - 2. Grounding and test device.
 - 3. Load Interrupter Switches
 - 4. Fuses.

1.02 SUBMITTALS

- A. Shop Drawings: Submit Shop Drawings covering the items included under this Section. Shop Drawing submittals shall include:
 - 1. Product data for each product specified.
 - 2. Shop Drawings for each switchgear lineup and accessory component. Include dimensional plans, sections, connection details, and elevations showing minimum clearances, installed devices, major features, and materials lists.
 - 3. Wiring Diagrams, both elementary and schematic, differentiating between manufacturer installed and field-installed wiring.
 - 4. Time-Current curves for power fuses.
 - 5. Protective relay settings for protective relays.
- B. Operation and Maintenance Manuals: Submit in accordance with requirements of Section 01600, operation and maintenance manuals for items included under this Section.
- C. Power company approval for switchgear interfacing with power company connections: Submit one copy of product data signed by power company.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Subject to compliance with specified requirements, manufacturers offering products which may be incorporated in Work include(no or equal):
 - 1. Metal Clad Switchgear:
 - a. Eaton Corporation

2.02 MEDIUM VOLTAGE SWITCHGEAR, GENERAL REQUIREMENTS

- A. Factory assembled, factory tested, with functions and circuit assignments for each bay, and types, characteristics, and ratings of busses and disconnecting, and protective devices as indicated. Switchgear shall conform to NEMA Standard SG5, "Power Switchgear Assemblies," and entire switchgear lineup shall be engineered, fabricated, and tested by nameplated manufacturer of major electrical components.

1. Circuit breaker type switchgear shall comply with ANSI/IEEE Standard C37.20.2, "Standard for Metal-Clad and Station-Type Cubicle Switchgear."
- B. System Type: Suitable for application on system indicated on Drawings.
- C. Switchgear Ratings: As follows:
1. Nominal System Voltage: 4.16 kV; maximum design voltage: 5.5 kV.
 2. Main Bus Continuous: As indicated on Drawings.
 3. Nominal Interrupting Capacity Class: 350 MVA at 5.5 kV.
 4. BIL Voltage: 60 kV at 5.5 kV class.
 5. 60 Hertz Withstand Voltage: 19 kV (5 kV class switchgear).
 6. Momentary Current Rating: 61,000 amperes, rms asymmetrical.
 7. Short-Time Current Rating: 50,000 amperes, rms symmetrical.
 8. Provide ratings as indicated on drawings.
- D. Basic Structure: As indicated, including the following where shown on contract drawings:
1. Outdoor in a prefabricated building or indoors in a Nema 12 enclosure. See specification section and drawings for additional requirements on prefabricated building. For S1 North and S1 South the Switchgear is to be completely wired, programmed and installed in a prefabricated outdoor building (two buildings total). Building to be complete with HVAC, lighting, controls, etc., as shown on drawings and specified in the contract documents. For S2 South, this is to be installed in a Nema 12 enclosure, completely pre-wired and programmed as shown on contract drawings. S3 Switchgear is to be located in a Nema 12 enclosure. Refer to contract drawings for additional requirements.
- E. Finishes: Thoroughly clean interior and exterior prior to coating the enclosure and equipment, including bolted joints, with rust inhibiting primer coat. Provide 2 finish coats of manufacturer's standard color finish.
- F. Ground Bus: Copper; silver-plated at connection points extending the entire length of the switchgear.
- G. Main Bus: Copper with fluidized bed epoxy flame-retardant and track-resistant insulation. The bus supports between units shall be flame-retardant, track-resistant, glass polyester.
- H. Main Bus Supports: Porcelain or flame-retardant, track-resistant insulation.
- I. Electric space heater in each compartment of outdoor equipment powered from a separate control power transformer supplied with switchgear.
- J. Low Voltage Wiring: No. 14 AWG minimum, Type SIS, 600 volt, 90 degrees C labeled at each terminal point with designations keyed to wiring diagrams.
- K. Utility Metering Unit: Constructed to suit Power Company requirements and to match and line up with basic switchgear assembly.
- L. Bus transition and incoming line units: As indicated or required.
- M. Load-Interrupter Switch Unit: With fuses equipped to house stationary device rated and arranged as indicated.

- N. Load-Interrupter Switch Unit: Without fuses equipped to house stationary device rated and arranged as indicated.
- O. Circuit Breaker Compartment: Equipped to house drawout circuit breaker.
- P. Access to Rear Interior of Switchgear: Through hinged doors secured by captive thumb screws.
- Q. Auxiliary Unit: Arranged to house meters, relays, controls, and auxiliary equipment as indicated.
- R. Mimic Bus: Continuous integrated mimic bus on front of switchgear line up. Arrange in single line diagram format, using symbols consistent with Drawings, to produce a concise visual conception of the principal switchgear components and connections. To represent bus and components, use metallic strips at least 1/8-inch thick fixed to panels with countersunk corrosion resistant screws and painted an approved contrasting color.
- S. Key Interlocks: Where indicated, arranged so interlocking keys are held captive at devices indicated. Where provision for future key interlocking is indicated, provide all necessary mountings and hardware as required for future installation of key interlocking devices.
- T. Instrument Transformers: Conforming to NEMA Standard EI 21.1, "Instrument Transformers for Revenue Metering 110 kV BIL and Less," ANSI Standard C57.13, "Requirements for Instrument Transformers," and the following:
 - 1. Potential Transformer Secondary Voltage Rating: 120 volt with NEMA Accuracy Class of 0.3 with burdens of W, X, and Y. Provide primary and secondary fusing.
 - 2. Current Transformers Ratios: As indicated with accuracy class suitable for connected relays, meters, and instruments. Provide 0.3 accuracy class for B-0.1, B-0.2, and B-0.3 burdens.
- U. Microprocessor Based Bus Power Monitoring Device: Where indicated on Drawings, provide a Eaton Power monitor (to match Flint 3rd Avenue) series power monitor with keypad having the features and functions specified below. The device shall consist of a single microprocessor-based unit capable of monitoring and displaying the functions listed below with the accuracy indicated. The device shall provide the adjustable protection functions indicated, and the capability to communicate data via Ethernet network. The device shall be UL listed and also meet ANSI Standard C37.90.1 for surge withstand.
 - 1. Metered Values (Accuracy Percent Full Scale):
 - a. AC Phase Amperes plus or minus (0.3 percent).
 - b. AC Phase Voltage plus or minus (0.3 percent).
 - c. Watts plus or minus (0.6 percent).
 - d. VA plus or minus (0.6 percent).
 - e. VARS plus or minus (0.6 percent).
 - f. Power Factor (plus or minus 1 digit).
 - g. Frequency plus or minus (0.1 hertz).
 - h. Watt hours plus or minus (0.6 percent).
 - i. VAR hours plus or minus (0.6 percent).
 - j. VA-hours plus or minus (0.6 percent).
 - k. Watt Demand with 10-, 15-, 20-, 25-, 30-, 45-, 60-minute interval).
 - l. Percent THD (through 31st harmonic).
 - m. Voltage -- minimum/maximum.
 - n. Current -- minimum/maximum.
 - o. Power -- minimum/maximum.

- p. Power Factor -- minimum/maximum.
- q. Frequency -- minimum/maximum.
- r. Peak percent THD.
- s. Peak Demand.
- 2. Alarm Functions:
 - a. Voltage Phase Loss.
 - b. Current Phase Loss.
 - c. Phase Voltage Unbalance (5 to 40 percent).
 - d. Phase Voltage Reversal.
 - e. Overvoltage (105 to 140 percent).
 - f. Undervoltage (95 to 60 percent).
 - g. Time Delay for Overvoltage (0 to 20 seconds).
 - h. Time Delay for Undervoltage (0 to 20 seconds).
 - i. Time Delay for Phase Unbalance (0 to 20 seconds).
- 3. Outputs shall have separate Form C (NO/NC) trip and alarm contacts with ratings of 10 amperes at 115/240-volt AC.
- 4. Input ranges of the device shall accommodate external current transformers with ranges from 5/5 through 5,000/5 amperes. Provide external current transformers with rating as indicated on Drawings or sized for incoming service. Above 600 volts, provide fused external potential transformers.
- 5. Control power shall be capable of being supplied from the monitored incoming AC line without the need for a separate AC supply control circuit or separate remote power source (96 to 264 volt AC or 100 to 350 volt DC) where shown on Drawings.
- 6. Refer to contract drawings for additional requirements. The switchgear shall be furnished with Rockwell Control logix processor, network switch, fiber converters, Panelview Plus series 7 Touchscreen with software as shown on drawings, and associated PLC hardware as shown. Processor and IO to be completely programmed to provide for automatic transfer of the main and tie breakers, Refer to contract drawings for additional requirements.
- 7. Provide Eaton protective relays(match multilin model number as shown on contract drawings for functionality- Typical) as shown for main and tie breakers. Integrate those Eaton relays for monitoring to the PLC via Ethernet Modbus. Provide interface card as required. Assume for 35 parameters per relay to be monitored on the panelview plus 1500 touchscreen.
- 8. Provide the operator interface computers, generator IO panel no.1, all preprogrammed to accomplish the sequence shown on the contract drawings.
- 9. Turn over electronic program copies of PLC programs and panelview applications to Owner/Engineer for integration to existing plant scada system by Tetra Tech.
- V. Relays: Comply with ANSI/IEEE Standard C37.90, "Relays and Relay Systems Associated with Electric Power Apparatus." Types and settings with test blocks and plugs, as indicated.
- W. Surge Arresters: Comply with NEMA Standard LA 1, "Surge Arresters." Arresters shall be distribution class with ratings as indicated, metal-oxide type, and ethylene propylene housing. Install in cable termination compartments and connect in each phase of circuit.
- X. Switchgear manufacturer to program the system shown on contract drawings. At a minimum, the programming shall be provided and configured to include the following:
 - 1. PLC logic and interlocking by switchgear manufacturer to accomplish the protection breaker sequencing described in this specification section and on contract drawings.
 - 2. Graphic screens in consisting of:
 - a. Photos of switchgear and three generators with navigation tools for ease of use

- b. Menu system which includes an overview, control and alarm setpoints, trending, alarms, diagnostics, communication status's, and metering
 - c. Each incoming power source including current status, and settings for manual, auto, start/stop, and cooldown
 - d. Metering for all of the power meters and protective relays and power factor correction systems shown.
 - e. Switchgear diagrams with breaker control, status, and interlocking
 - f. Summary screens for each protective relay and power monitor and power factor correction systems (35 parameters per relay and power monitor and power factor correction system are to be programmed).
 - g. Trending screens for each analog and discrete status, configurable by user
 - h. Overview of the electrical distribution system including setpoint screens breaker automatic and semi-automatic transfer scheme.
 - i. Coordinate with Owner/Engineer on programming standards to be complied with.
 - j. Deliver to Owner/Engineer within 12 weeks of start-up the completed PLC software and Panelview application.
 - k. Setpoint/selection screen for selecting which power source will be primary and secondary for each side of the S2 switchgear bus.
- Y. Manual software control of each breaker and generator with hardwired and software interlocks in place to prevent two different sources from being closed onto any of the S2 switchgear buses.
- Z. Switchgear manufacturer to program the protective relays shown on the switchgear drawings once the arc flash/coordination study/short circuit analysis results are complete and approved.
- AA. Program software screens to depict not only the S1, S2 switchgear layouts shown on the the drawings but replicate the hardwired mimic layout in software. Refer to contract drawings of the proposed switchgear for information on software screen development.
- BB. Include in bid to be on site for an additional 5 days(40hours and 5 trips to the site) to work with Owner/Engineer to make revisions to the graphic screens as directed by Owner/Engineer. These five days are separate from the contract work specified herein. These 5 days are for after checkout and start-up is completed and the system is ready for operation.
- CC. Provide manual control thru the panelview for open and close operation of the S1 North and S1 South breakers. Provide manual control for these breakers outside of the PLC control system from switches on the face of each breaker.

2.03 LOAD INTERRUPTER SWITCHES

- A. Stationary mounted in switchgear and including the following features:
1. Arrangement and Rating: Gang operated, rated 600 amperes for continuous duty and for load break. Suitable for operation up to the maximum short circuit rating of integrated switchgear assembly.
 2. Switch Action: No external arc. Interrupting action shall not liberate significant quantities of ionized gas into enclosure.
 3. Switch Construction: Switchblade material shall be copper. Switch and parts including electrical and mechanical connections shall be supported entirely from the interior framework of structure. Switch shall have external manual operating handle with lock-open padlocking provisions for multiple padlocks.

4. Operating Mechanism: Quick-make, quick-break, stored energy type.
5. Barriers: Phase barriers for the full length of the blades and fuses for each pole. If a protective barrier is used, it shall be designed for easy removal. The barrier material shall allow visual inspection of the switch with the barrier in place.
6. Protective shield to cover potentially live parts and terminals.
7. Fuses: De-energized when switch is open.
8. Mechanical interlock shall prevent opening door unless the switchblades are open and closing switch if door is open. Interlocks shall be provided to prevent closing of a breaker between operating and test positions, to trip breakers upon insertion or removal from housing, and to discharge stored energy mechanisms upon insertion or removal from the housing. The breaker shall be secured positively in the housing between and including the operating and test positions.
9. Window: For viewing switchblade positions.
10. Power Fuses: Current ratings as indicated. Each fuse shall have an indicator to show it has blown. Fuses shall meet applicable requirements of NEMA Standard SG 2, "High Voltage Fuses," and the following:
 - a. Fuses shall be positively held in position with provision for easy removal and replacement from the front without the use of special tools.
 - b. Spares: Each fusible bay shall include 3 fuses in use and 3 spare fuses in storage clips.
11. Expulsion Fuses: Furnished in disconnect type mountings and renewable with replacement fuse units. Gases emitted on interruption shall be controlled and silenced by chambers designed for that purpose.
12. Interrupting rating of fuses at rated system voltage shall be compatible with switchgear being used and source short circuit current capability.

2.04 CIRCUIT BREAKERS

- A. Vacuum-type circuit breakers shall be draw-out mounted and shall use 3 individual vacuum sealed contact modules. Circuit breaker design shall provide for operation at rated voltage to interrupt any fault current within its rating within 3 cycles of trip initiation in accordance with applicable ANSI C37 standards. For systems with X/R ratio 17 or less, the transient voltage upon such interruption shall not exceed twice-rated line-to-ground voltage of system. Circuit breaker shall have a contact wear indicator readily accessible to field maintenance personnel.
- B. The switchgear manufacturer shall furnish and install for each circuit breaker, the type and rating of protection relays as indicated on Drawings and described in this Specification.
- C. Microprocessor based solid-state, multi-functional type protective relay shall be used, consisting of current transformers, a solid-state unit to interpret output of current transformers, and a tripping solenoid acting directly to trip breaker. Time delay and pick-up characteristics shall be variable in field. Device shall be designed such that performance at any setting is repeatable. A ground detection device shall be provided when shown on Drawing.
 1. The protective relay shall contain, as a minimum, the functionality for adjustable phase time over-current, instantaneous over-current and ground fault protection, ANSI 50/51, and selectable 50/51G or 50/51N into a single device.
 2. The protective relay shall provide true rms sensing circuit protection by analyzing each phase and ground of the secondary current signals received from the circuit breaker current sensors. The protective relay shall initiate trip signals to the circuit breaker trip actuators when pre-determined trip levels and time delay settings are reached. Ground element shall be capable

- of being utilized in residual, zero sequence, or ground source connection schemes, or deactivated.
3. The protective relay shall provide ANSI 50/51N and other specified protective functions for each of the 3 phases, and ANSI 50/51N or 50/51G ground fault protection functions as shown on Drawings or as determined by Coordination Study.
 4. The primary current transformer rating being used for phase and ground protection feeding the protective relay shall be programmable for current transformers with primary current ratings from 5 through 5,000 amperes.
 5. Both the phase and ground protection curves shall be independently field selectable and programmable with or without load. Curves shall be selectable from the following:
 - a. IEEE: Moderately inverse, very inverse, extremely inverse time.
 - b. Thermal: Flat, I_t , I^2t , I^4t .
 6. Thermal curves shall be similar to those on low voltage trip units for close coordination with downstream devices. Selectable short delay pick-up and short delay time settings shall also be provided. The phase instantaneous over-current trip shall have field programmable pick-up points from 1.0 to 25 times current transformer primary rating.
 7. The protective relay shall have a Type "A" contact assigned to the ANSI 51/50 phase protection function and a second Type "A" contact assigned to the 51/50 ground protection function.
 8. The protective relay shall have a built-in alphanumeric display capable of displaying the following information with metering accuracy of plus or minus 1 percent of full scale:
 - a. Individual phase currents.
 - b. Ground current.
 - c. Cause of trip.
 - d. Magnitude and phase of current causing trip.
 - e. Peak current demand for each phase and ground since last reset.
 - f. Current transformer primary rating.
 - g. Programmed phase and ground setpoints.
 9. The protective relay shall have the following features:
 - a. Integral manual testing capability for both phase and ground.
 - b. Zone selective interlocking capability for short time and ground fault protection. This function shall be provided and factory wired. Where zone selective interlocking is not an integral part of the protective device; a full bus differential scheme shall be required for both phase and ground in addition to specified time over-current and instantaneous over-current phase and ground fault protection. Bus differential scheme shall be provided with separate differential current transformers for all incoming and outgoing loads as well as appropriate differential relays (ANSI 87 and 87G) as approved by ENGINEER.
 - c. Continuous self-testing of internal circuitry.
 - d. Unit failure alarm contact for customer use.
 - e. Programmable lockout/self-reset after trip function.
 - f. Programmable setpoints for device curve selection.
 - g. Programmable inputs, such as current transformer ratios.
 10. Relay shall be suitable for operating temperatures from -30 to 55 degrees C. Relay shall be suitable for operating with humidity from 0 to 95 percent relative humidity (non-condensing).
 11. Relay alarm and/or trip contacts shall not change state if power is lost or an under-voltage occurs. These contacts shall only cause a trip upon detection of an over-current or fault condition based on programmed settings.
 12. The relay shall be suitable for operating on control power with a nominal input voltage of 48 to 125 volt DC, or 120- to 240 volts AC, 60 hertz.

13. When AC control power schemes are shown on Drawings, in addition to control power transformer or remote-control power shown or herein specified, a single phase uninterruptible power supply shall be included to supply control power to protective devices.
- D. Ratings: MVA interrupting rating class and momentary and short-time current ratings same as switchgear. Current rating of breakers shall be as indicated.
- E. Operating Mechanism: Electrically charged, mechanically and electrically trip-free, stored energy-operated mechanism.
 1. Closing speed of moving contacts shall be independent of both control and operator.
 2. Provision included for manual charging of mechanism and for slow closing of contacts for inspection or adjustment.
- F. Control Power: The control voltage shall be derived from a control power transformer in switchgear with 120-volt AC secondary. Breaker closing power shall be 120-volt AC Breaker shall have 120-volt DC capacitor tripping.
- G. Auxiliary Contacts: Provide one 52/a and one 52/b spare contact on each circuit breaker and wire to terminal strips.
- H. Indicating Lights: In each circuit breaker circuit provide a red "closed" indicator, a green "tripped" indicator, and a blue "lockout" indicator.
- I. Engraved nameplates, mounted on the face of the assembly, shall be furnished for all main and feeder circuits. Nameplates shall be laminated plastic, black characters on white background, and secured with screws. Characters shall be 3/16-inch high, minimum. Nameplates shall give item designation and circuit number as well as frame ampere size and appropriate trip rating. Nameplates for feeder breakers shall also indicate which substation is being fed. Furnish master nameplate giving switchgear designation, voltage ampere rating, short circuit rating, manufacturer's name, general order number, and item number.
- J. Control components mounted within the assembly, such as fuse blocks, relays, push-buttons, switches, etc., shall be suitably marked for identification corresponding to appropriate designations on manufacturer's wiring diagrams.

2.05 ACCESSORY COMPONENTS

- A. Accessory set shall include tools and miscellaneous items as required for circuit breaker and switchgear test, inspection maintenance, and operation. Include extension rails, lifting device and transport dolly or dockable dolly or mobile lift, and other items necessary to remove breaker from housing and transport to remote location. Include a racking handle to move breaker manually between connected and disconnected positions and a secondary test coupler to permit testing of breaker without removal from switchgear. Include relay and meter test plugs and spare fuses for potential and control power transformers and control circuits.
- B. Accessory Set: Furnish an accessory set, including tools and miscellaneous items required for interrupter switchgear test, inspection, maintenance, and operation. Include the following items:
 1. Spare fuses for potential and control power transformers.
 2. Fuse handling tool as recommended by manufacturer.

2.06 CIRCUIT BREAKER TEST CABINET

- A. Test Cabinet: Separately mounted, containing push-buttons for breaker closing and tripping, control relay, fuses, and secondary coupler with cable approximately 9 feet long. Provide a set of secondary devices for operating breaker when removed from the switchgear and moved to vicinity of test cabinet. Cabinet shall have provisions for storage of test and maintenance accessories. Locate cabinet as indicated.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Anchoring: Anchor each switchgear assembly to two 4-inch minimum channel iron sills by tack welding or bolting.
- B. Sills shall suit the switchgear and shall be leveled and grouted flush into floor.
- C. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from switchgear units and components.

3.02 FIELD QUALITY CONTROL

- A. Protective Relay Settings: CONTRACTOR shall recommend settings based on data given on Drawings, field investigation, discussions with utility company, or Coordination Study. Settings shall be verified to be appropriate for final system configuration and parameters. Where discrepancies are found, CONTRACTOR shall recommend revised relay settings to ENGINEER, and any revised settings accepted by him shall be used by CONTRACTOR's testing and start-up personnel to make final adjustments.
- B. Manufacturer's Field Services: Arrange and pay for services of a factory-authorized service representative to supervise field assembly and connection of components and testing and adjustment of switchgear components.
- C. Testing: Upon completing installation of system, perform the following tests:
 - 1. Make insulation resistance tests of switchgear buses, components, and connecting supply, feeder, and control circuits.
 - 2. Make continuity test of circuits.
 - 3. Perform test procedures required by the manufacturer's installation and testing instructions.
 - 4. Perform mechanical and electrical operator tests. Check main and auxiliary contact alignment.
 - 5. Check arc interrupter operation on load interrupter switches.
 - 6. Verify key interlock operation.
 - 7. Test insulation resistance on each phase to ground and from each phase to each other phase.
 - 8. Test AC over-potential in accordance with applicable ANSI/IEEE standards.
 - 9. Test contact resistance across each main contact set. Report contact resistance in excess of manufacturer's tolerances.
 - 10. Test protective relays to determine pickup parameters. Verify accuracy of timing setting for 3 points on time dial curve.
 - 11. Trip each circuit breaker by operating each associated protective relay.
 - 12. Measure minimum pickup voltage of each trip and close coil.

13. Test arc chutes for losses in accordance with manufacturer's instructions.
 14. Verify operation of auxiliary and emergency equipment.
- D. Retesting: Correct deficiencies identified by tests and completely retest switchgear. Verify by the system test that the total system meets the specified requirements.
- E. A training session shall be conducted by a manufacturer's qualified representative. Training program shall include instructions on the assembly, circuit breaker, protective devices, and other major components.

END OF SECTION

SECTION 16410 - CIRCUIT AND MOTOR DISCONNECTS

PART 1 - GENERAL

1.01 SUBMITTALS

- A. Shop Drawings: Submit in accordance with Section 01330, Shop Drawings covering the items included under this Section. Shop Drawing submittals shall include:
 - 1. Product data for each type of product specified.
- B. Operation and Maintenance Manuals: Submit in accordance with requirements of Sections 01600 and 13410, operation and maintenance manuals for items included under this Section, including circuits and motor disconnects.

1.02 QUALITY ASSURANCE

- A. Codes and Standards:
 - 1. Electrical Component Standards: Provide components which are listed and labeled by UL. Comply with UL Standard 98 and NEMA Standard KS 1.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Subject to compliance with specified requirements, manufacturers offering products which shall be incorporated are:
 - 1. Eaton Corporation

2.02 CIRCUIT AND MOTOR DISCONNECT SWITCHES

- A. Provide NEMA 4, 4X, 7, 9, or 12 enclosure to match the rating of the area in which switch is installed. Nema 4 and 12 areas require stainless steel enclosures. For motor and motor starter disconnects through 100 horsepower, provide units with horsepower ratings suitable to loads. For motor and motor starter disconnects above 100 horsepower, clearly label switch, "DO NOT OPEN UNDER LOAD."
- B. Fusible Switches: (Heavy-duty) switches, with fuses of classes and current ratings indicated. See Section "Fuses" for specifications. Where current limiting fuses are indicated, provide switches with non-interchangeable feature suitable only for current limiting type fuses.
- C. Circuit Breaker Switches: Where individual circuit breakers are required, provide factory-assembled, molded-case circuit breakers with permanent instantaneous magnetic and thermal trips in each pole, and with fault-current limiting protection, ampere ratings as indicated. Construct with overcenter, trip-free, toggle type operating mechanisms with quick-make, quick-break action and positive handle indication. Provide push-to-trip feature for testing and exercising circuit breaker trip mechanism. Construct breakers for mounting and operating in any physical position and in an ambient temperature of 40 degrees C. Provide with AL/CU-rated mechanical screw type removable connector lugs.

- D. Non-fusible Disconnects: (Heavy-duty) switches of classes and current ratings as indicated.
- E. Double-Throw Switches: (Heavy-duty) switches of classes and current ratings as indicated.
- F. Bolted Pressure Switches: Bolted pressure switches conforming to and listed under UL Standard 977, single- or double-throw arrangement as indicated. For fusible units, provide fuses as indicated.
- G. Service Switches: (Heavy-duty) fusible/circuit breaker switches. UL listed for use as service equipment under UL Standard 98 or 869.
- H. Switches for Classified (Hazardous) Locations: Heavy-duty switches with UL labels and listings for hazardous location classifications in which installed.

2.03 ACCESSORIES

- A. Special Enclosure Material: Provide special enclosure material as follows for switches indicated:
 - 1. Stainless Steel for NEMA 4 switches.
 - 2. Molded fiberglass-reinforced plastic for NEMA 4X switches.

PART 3 - EXECUTION

NOT USED

END OF SECTION

SECTION 16440 - PANELBOARDS

PART 1 - GENERAL

1.01 SUMMARY

- A. Section includes the following:
 - 1. Lighting panelboards.

1.02 SUBMITTALS

- A. Shop Drawings: Submit in accordance with Section 01330, Shop Drawings covering the items included under this Section. Shop Drawing submittals shall include:
 - 1. Manufacturer's product data on panelboards and enclosures.

1.03 QUALITY ASSURANCE

- A. Codes and Standards:
 - 1. UL Compliance: Comply with applicable requirements of UL 67, "Electric Panelboards," and UL's 50, 869, 486A, 486B, and 1053 pertaining to panelboards, accessories, and enclosures. Provide panelboard units which are UL listed and labeled.
 - 2. NEMA Compliance: Comply with NEMA Standards Pub/No. 250, "Enclosures for Electrical Equipment (1,000 Volts Maximum)," Pub/No. PB 1, "Panelboards," and Pub/No. PB 1.1, "Instructions for Safe Installation, Operation and Maintenance of Panelboards Rated 600 Volts or Less."
 - 3. Federal Specification Compliance: Comply with FS W-P-115, "Power Distribution Panel," pertaining to panelboards and accessories.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Subject to compliance with specified requirements, manufacturers offering products which may be incorporated in Work include:
 - 1. Eaton Corporation

2.02 PANELBOARDS

- A. Except as otherwise indicated, provide panelboards, enclosures, and ancillary components, of types, sizes, and ratings indicated, which comply with manufacturer's standard materials; with design and construction in accordance with published product information. Equip with proper number of unit panelboard devices as required for complete installation. Where types, sizes, or ratings are not indicated, comply with NEC, UL, and established industry standards for those applications indicated.
- B. Lighting Panelboards: Provide dead-front safety type lighting and appliance panelboards as indicated, with switching and protective devices in quantities, ratings, and types shown; with anti-turn solderless pressure type lug connectors approved for use with copper conductors. Construct unit

for connecting feeders at top of panel; equip with copper bus bars, full-sized neutral bar with bolt-in type heavy-duty, quick-make quick-break, single pole circuit breakers, and toggle handles that indicate when tripped. Provide suitable lugs on neutral bus for each outgoing feeder required and provide bare uninsulated grounding bars suitable for bolting to enclosures. Select enclosures fabricated by same manufacturer as panelboards, which mate and match properly with panelboards. Panelboards and circuit breakers shall be braced for 10,000 rms symmetrical amperes fault current unless otherwise indicated.

- C. Panelboard Enclosures: Provide galvanized sheet steel cabinet type enclosures, in sizes and NEMA types as indicated, code gauge, minimum 16-gauge thickness. Construct with multiple knockouts and wiring gutters. Provide fronts with adjustable trim clamps and doors with flush locks and keys, all panelboard enclosures keyed alike, with concealed piano door hinges and door swings as indicated. Equip with interior circuit directory frame and card with clear plastic covering. Provide baked gray enamel finish over a rust-inhibitor coating. Design enclosures for recessed or surface mounting as indicated. Provide enclosures which are fabricated by same manufacturer as panelboards, which mate and match properly with panelboards to be enclosed.
- D. Molded-Case Circuit Breakers: Provide factory assembled, molded-case circuit breakers of frame sizes, characteristics, and ratings, including rms symmetrical interrupting ratings indicated. Select breakers with permanent thermal and instantaneous magnetic trip, and with fault-current limiting protection, ampere ratings as indicated. Construct with overcenter, trip-free, toggle type operating mechanisms with quick-make quick-break action and positive handle trip indication. Construct breakers for mounting and operating in any physical position, and operating in an ambient temperature of 40 degrees C. Provide breakers with mechanical screw type removable connector lugs, AL/CU rated.
- E. Ground Fault Protected Breakers: Provide UL Class A protected GFI breakers with 6 mA for personnel protection, and for general-purpose receptacles. For breakers dedicated to equipment (sump pumps, heat trace, etc.), provide breaker with 30 mA equipment protection.
- F. Accessories: Provide panelboard accessories and devices including, but not necessarily limited to, ground-fault protection units or circuit breaker locking hardware as indicated.
- G. Spares: In each panelboard provide 8 installed, single pole, 20A spare circuit breakers unless otherwise indicated.

PART 3 - EXECUTION

3.01 INSTALLATION OF PANELBOARDS

- A. Type out panelboard's circuit directory card upon completion of installation Work.

END OF SECTION

SECTION 16450 - BUSWAYS

PART 1 - GENERAL

1.01 SUMMARY

- A. Busways are defined as electrical distribution systems consisting of bus bars installed within protective enclosures. Busways are comprised of straight lengths, fittings, and devices.
- B. Section includes the following:
 - 1. Branch circuit.
 - 2. Outdoor feeder.
 - 3. Indoor feeder.
 - 4. Indoor plug-in.
 - 5. Service entrance.
 - 6. Plug-in devices.

1.02 SUBMITTALS

- A. Shop Drawings: Submit Shop Drawings covering the items included under this Section. Shop Drawing submittals shall include:
 - 1. Dimensioned layout Drawings of busway systems including, but not limited to, offsets, cable tap boxes, and transformer connections. Show accurately scaled busway with locations of supports and fittings, including firestops and weather seals. Indicate spatial relationship of busways to other associated equipment.
 - 2. Wiring Diagrams: Submit wiring diagrams for busways, including electrical connections to feeders and distribution conductors. Differentiate between portions of wiring which are manufacturer installed and those portions to be field installed.
 - 3. Product Data: Submit manufacturer's data for busways, including sizes and types of enclosures, finishes, bus joints, bar configurations, temperature rise above ambient, and electrical ratings and characteristics. Include short circuit rating.

1.03 QUALITY ASSURANCE

- A. Codes and Standards:
 - 1. NEMA Compliance: Comply with NEMA Standards Pub./No's. BU 1, "Busways," and BU 1.1, "Instructions for Safe Handling, Installation, Operation and Maintenance of Busway and Associated Fittings Rated 600 Volts or Less."
 - 2. UL Compliance: Comply with requirements of UL 857, "Electric Busways and Associated Fittings." Provide busways which are UL listed and labeled.
 - 3. IEEE Compliance: Comply with IEEE Standard 241, "Recommended Practice for Electric Power Systems in Commercial Buildings," pertaining to construction and installation of busways.
 - 4. ANSI Compliance: Comply with applicable requirements of ANSI C2, "National Electrical Safety Code," pertaining to metal enclosed bus.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Subject to compliance with specified requirements, manufacturers offering products which may be incorporated in Work include:
 - 1. Eaton Corporation.

2.02 MATERIALS AND COMPONENTS

- A. Provide busway systems of sizes, types, and ratings indicated, complete with, but not limited to, conductor bus bars, electrical insulators, enclosures, flanges, elbows, offsets, tees, cable tap boxes, weatherheads, transformer connections, power take-off sections, reducers, expansion joints, end enclosures, and other components and accessories needed to form complete systems.
- B. Outdoor Feeder Busway: Provide complete outdoor feeder busway distribution system; low impedance, factory fabricated weathertight galvanized steel housings with sealed seams, drain holes with removable plugs, of types, sizes and ratings indicated. Provide a 50 percent rated internal ground bus. Equip with bolted section joints, gasketed joint covers, and splice plates. Insulate bus bar conductors with Class B (130 degrees C) rated material except at section joints. Silver-plated bus bar conductors at electrical contact surfaces. Temperature rise in busways not to exceed 55 degrees C rise above 40 degrees C ambient temperature when operating at rated load current. Select busway where it is possible to remove a bus length in a run without disturbing the two adjacent lengths to which it connects. Design busways to withstand short-circuit currents in compliance with NEMA short circuit current ratings for feeder busways. Finish busways with 2 coats of manufacturer's standard color.
 - 1. Conductor Material: Copper with not less than 98 percent conductivity, or aluminum with not less than 55 percent conductivity.
- C. Indoor Feeder Busway: Provide complete indoor feeder busway distribution system, low impedance, factory fabricated and assembled. Provide a 50 percent rated internal ground bus. Select busway with ventilated housings constructed of sheet steel with baked-on enamel finish, bottom cover welded to side "C" channels, and top cover bolted to side channels, of types, sizes, and ratings indicated. Equip with bolted section joints and splice plates; with bus bar conductors silver-plated at electrical contact surfaces, and insulated except at section joints. Temperature rise in busway not to exceed 55 degrees C rise above 40 degrees C ambient temperature when operating at rated load current. Select busway so it is possible to remove a bus length in a run without disturbing the two adjacent lengths to which it connects. Design busways to withstand short circuit currents in compliance with NEMA short-circuit current ratings for feeder busways. Finish busways with 2 coats of manufacturer's standard color.
 - 1. Conductor Material: Copper with not less than 98 percent conductivity, or aluminum with not less than 55 percent conductivity.
- D. Busway Components: Provide busway components including crosses, elbows, closures, and reducers, in types, sizes and ratings indicated, which are compatible with busway sections and as recommended by busway manufacturer.
- E. Supports and Accessories: Provide busway supports and accessories, including hangers and anchors as indicated and as recommended by busway manufacturer.

PART 3 - EXECUTION

3.01 INSTALLATION OF BUSWAYS

- A. Install busway expansion fittings at those locations where busway crosses building expansion joint.
- B. Install integral fire stops where busway penetrates fire-rated walls and floors. Seal between busway and opening and around opening with fire-rated sealant not less than wall or floor fire ratings.
- C. Install integral weatherseal where busway penetrates exterior wall or roof. Provide appropriate flange and seal around openings to maintain weathertight installation.

END OF SECTION

SECTION 16497 - FUSES

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes: Types of fuses specified, including:
 - 1. Class L time-delay.
 - 2. Class RK1 time-delay.

1.02 SUBMITTALS

- A. Shop Drawings: Submit in accordance with Section 01330, Shop Drawings covering the items included under this Section. Shop Drawing submittals shall include:
 - 1. Product Data: Submit manufacturer's technical product data on fuses, including specifications, electrical characteristics, installation instructions, furnished specialties, and accessories. In addition, include voltages and current ratings, interrupting ratings, current limitation ratings, time-current trip characteristics curves, and mounting requirements.

1.03 QUALITY ASSURANCE

- A. Manufacturer's Qualifications: Firms regularly engaged in manufacture of equipment, of types and sizes required, and whose products have been in satisfactory use in similar service for not less than 5 years.
- B. Codes and Standards:
 - 1. UL Compliance and Labeling: Comply with applicable provisions of UL 198D, "High-Interrupting Capacity Class K Fuses." Provide overcurrent protective devices which are UL listed and labeled.
 - 2. ANSI Compliance: Comply with applicable requirements of ANSI C97.1, "Low-Voltage Cartridge Fuses 600 Volts or Less."

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Subject to compliance with specified requirements, manufacturers offering fusable devices which may be incorporated in Work include:
 - 1. [Bussmann](#) Division, Cooper Industries.
 - 2. Commercial Enclosed Fuse Co.
 - 3. Littelfuse, Inc.
 - 4. Shawmut Division, Gould, Inc.
 - 5. Reliance Fuse Division, Federal Pacific Electric Co.

2.02 FUSES

- A. Except as otherwise indicated, provide fuses of types, sizes, ratings, and average time-current and peak let-through current characteristics indicated, which comply with manufacturer's standard

design, materials, and constructed in accordance with published product information, and with industry standards and configurations.

- B. Class L Time-Delay Fuses: UL Class L time-delay fuses rated 600 volts, 60 Hertz, 800 amperes, with 200,000 rms symmetrical interrupting current rating for protecting transformers, motors, circuit breakers.
- C. Class RK1 Time-Delay Fuses: UL Class RK1 dual element time-delay fuses rated 600 volts, 60 Hertz, 400 amperes, with 200,000 rms symmetrical interrupting current rating for protecting motors and circuit breakers.

2.03 EXTRA MATERIAL

- A. Spare Fuses: For the types and ratings required, furnish additional fuses, amounting to 1 unit for every 10 installed units, but not less than 1 set of 3 of each kind.

PART 3 - EXECUTION

NOT USED

END OF SECTION

SECTION 16529 - HAZARDOUS MATERIAL DISPOSAL

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes: Labor, materials, equipment, and services necessary to fully complete removal of hazardous materials specified herein including, but not limited to:
 - 1. Removal of scheduled equipment from OWNER's premises.
 - 2. Verified disposal of scheduled hazardous material.
 - 3. Verified disposal of contaminated equipment.
- B. A complete description of hazardous material is given in Hazardous Material Schedule included in this Section.

1.02 HAZARDOUS MATERIAL DISPOSAL CONTRACTOR

- A. Hazardous Material Disposal Contractor performing this Work (hereinafter referred to as CONTRACTOR) shall be experienced in the handling, disposal, clean up, and documentation of PCB capacitors, mercury filled pressure switches, Lead cables and Lead materials, and PCB light fixture ballasts. CONTRACTOR shall provide insurance certificates for performing this Work at levels of coverage as specified in Conditions of the Contract. Insurance policies shall not contain pollution exclusion clauses for performing Work required under this Contract. CONTRACTOR shall provide insurance certificates that cover environmental pollution Work for performance under this Contract and shall hold harmless from and indemnify OWNER and ENGINEER against claims, suits, actions, costs, counsel fees, expenses, damages, judgments, or decrees by reason of any person or persons or property being damaged or injured by performance of CONTRACTOR during the progress of this Work.

1.03 PERMITS, INSPECTIONS, AND LICENSES

- A. Procure permits, licenses, approvals, and other documents which are required for processing removal, transporting, and disposal of hazardous material and equipment specified on Schedules. CONTRACTOR shall observe and abide by requirements of Federal, State, and local laws, rules, regulations, and/or ordinances applicable to the services to be performed. If changes occur with respect to such laws, rules, regulations, or ordinances which interfere with execution of this Contract, CONTRACTOR shall comply with these changes and shall obtain any additional permits, licenses, approvals, or other documents required by such changes to allow timely completion of this Contract. CONTRACTOR shall pay fees for these documents when such fees are required.

1.04 PAYMENT

- A. An invoice shall be prepared by CONTRACTOR once disposal Work has been completed. Payments to CONTRACTOR will not be made until written verifications of disposal are submitted to ENGINEER.

1.05 SCHEDULE

- A. Work shall be done between the hours of 8:00 a.m. and 4:00 p.m. local time, Monday through Friday, except holidays, as agreed upon with OWNER.

PART 2 – PRODUCTS

NOT USED

PART 3 - EXECUTION

3.01 PROCESSING, REMOVAL, AND DISPOSAL OF HAZARDOUS MATERIALS

- A. Removal: CONTRACTOR shall remove and transport from OWNER's premises PCB capacitors, mercury filled pressure switches, Lead cables and lead materials, and PCB light fixture ballasts as described above, equipment described on Schedules, and any contaminated debris generated by execution of this Contract, as soon as liquid, equipment, or debris is taken out of service. It is not acceptable to store any portion of removed Lead material on OWNER's premises while rest of Lead material is being taken out of service. CONTRACTOR shall load materials on a vehicle provided by CONTRACTOR and shall transport this material from OWNER's premises to disposal site(s). CONTRACTOR shall provide waste hauler manifest. It shall be CONTRACTOR's responsibility to thoroughly clean up and decontaminate hazardous material spilled during loading and transporting operations.
- B. Disposal: Hazardous liquid and hazardous solids designated by CONTRACTOR shall be transported by CONTRACTOR to an EPA-approved facility and disposed.
- C. Name of hazardous material facility site to be used shall be submitted to ENGINEER.
- D. After destruction of hazardous liquids and/or solids, CONTRACTOR shall submit to ENGINEER a "disposal certificate" indicating that destruction of hazardous materials has been completed in compliance with Federal, State, and local regulatory requirements.

3.02 Contaminated equipment shall be transported by CONTRACTOR to an EPA-approved facility.

- A. Name of hazardous contaminated equipment incineration site to be used shall be submitted to ENGINEER.
- B. After delivery of contaminated equipment and materials to incinerator site, CONTRACTOR shall receive and submit to ENGINEER a "manifest of acceptance" of contaminated material and "disposal" certificate" indicating that destruction of contaminated equipment has been completed in compliance with Federal, State, and local regulatory requirements.

END OF SECTION