

Contract Documents and Technical Specifications

Water Supply Well No. 3 Site Improvements

Haring Charter Township MI

Owner:

Haring Charter Township

515 Bell Ave, Cadillac, MI 49601

Engineer:

Gosling Czubak Engineering Sciences, Inc.

1280 Business Park Drive

Traverse City, Michigan

(231) 946-9191

www.goslingczubak.com

September 2, 2025

Grant No. 24*4066

GCES Project # 240359

CIVIL ENGINEERING

SURVEYING

ENVIRONMENTAL SERVICES

CONSTRUCTION SERVICES

GEOTECHNICAL

DRILLING

LANDSCAPE ARCHITECTURE

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*Must be submitted with BID

ADVERTISEMENT FOR BIDS
HARING CHARTER TOWNSHIP
CADILLAC, MICHIGAN
WATER SUPPLY WELL NO. 3 SITE IMPROVEMENTS

General Notice

Haring Charter Township (Owner) is requesting Bids for the construction of the following Project:

Water Supply Well No. 3 Site Improvements

Bids for the construction of the Project will be received at the Haring Charter Township located at 515 Bell Ave, Cadillac, MI, 49601, until Tuesday, September 30, 2025 at 11 AM local time. At that time the Bids received will be "publicly" opened and read.

The Project includes the following Work:

- A. Yard piping: 175 LF ~ 8-inch watermain, 218 LF ~ 12-inch watermain, associated valves and fittings, connection to existing water system, one 1-inch water service to well house.
- B. Well house: CMU block structure w/ metal crimp seem roof, concrete floor, concrete apron, and metal security doors, lighting, HVAC, process piping, VFD, flow meter, pressure gauges, pressure switches, basic I&C, liquid chlorine treatment and storage, water sampling and testing, security, furnishings, paint and coatings, eye wash and shower station, signage, and personal protective equipment.
- C. Backup Power – Natural Gas Generator and Automatic Transfer Switch.
- D. Site Improvements: Site Clearing, access drive, 6-foot tall chain-link fence, 6-foot tall sliding chain link gate, blow-off pond, and restoration.

Bids are requested for the following Contract: Water Supply Well No. 3 Site Improvements

Obtaining the Bidding Documents

Information and Bidding Documents for the Project can be found at the following designated website:

<https://www.goslingczubak.com>

Bidding Documents may be downloaded from the designated website. Prospective Bidders are required to register with Tim Korson tnkorson@goslingczubak.com as a plan holder. The designated website will be updated periodically with addenda, lists of registered plan holders, reports, and other information relevant to submitting a Bid for the Project. All official notifications, addenda, and other Bidding Documents will be offered only through the designated website. Neither Owner nor Engineer will be responsible for Bidding Documents, including addenda, if any, obtained from sources other than the designated website.

Disadvantaged Business Enterprise (DBE)

Prime Contractors bidding on this project must follow, document, and maintain documentation of their Good Faith Efforts to ensure that DBEs have the opportunity to participate in the project by increasing DBE awareness of procurement efforts and outreach. See Appendix A for additional requirements.

Funding

Compliance with the Davis Bacon Act and adherence to the current U.S. Department of Labor Wage Decision requires that not less than the minimum salaries and wages as set forth in the Contract Documents must be paid on this project.

This agreement is for services related to a project that is subject to the Build America, Buy America Act (BABAA) requirements under Title IX of the Infrastructure Investment and Jobs Act ("IIJA"), Pub. L. 117-

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58. Absent an approved waiver, all iron, steel, manufactured products, and construction materials used in this project must be produced in the United States, as further outlined by the Office of Management and Budget's Memorandum M-22-11, Initial Implementation Guidance on Application of Buy America Preference in Federal Financial Assistance Programs for Infrastructure, April 18, 2022.

See Appendix A for additional requirements.

Pre-bid Conference

A mandatory pre-bid conference for the Project will be held on **Wednesday, September 17, 2025 at 1 PM at 515 Bell Ave, Cadillac, MI, 49601**. Prospective bidders are encouraged to visit the site.

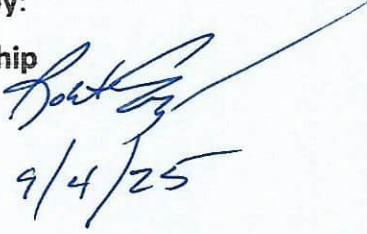
This Advertisement is issued by:

Owner: **Haring Charter Township**

By: **Robert Scarbrough**

Title: **Township Supervisor**

Date: **September 3, 2025**

Handwritten signature of Robert Scarbrough and the date 9/4/25.

INSTRUCTIONS TO BIDDERS FOR CONSTRUCTION CONTRACT

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ARTICLE 1—DEFINED TERMS

- 1.01 Terms used in these Instructions to Bidders have the meanings indicated in the General Conditions and Supplementary Conditions. Additional terms used in these Instructions to Bidders have the meanings indicated below:
- A. *Issuing Office*—The office from which the Bidding Documents are to be issued, and which registers plan holders.

ARTICLE 2—BIDDING DOCUMENTS

- 2.01 Bidder shall obtain a complete set of Bidding Requirements and proposed Contract Documents (together, the Bidding Documents). See the Agreement for a list of the Contract Documents. It is Bidder's responsibility to determine that it is using a complete set of documents in the preparation of a Bid. Bidder assumes sole responsibility for errors or misinterpretations resulting from the use of incomplete documents, by Bidder itself or by its prospective Subcontractors and Suppliers.
- 2.02 Bidding Documents are made available for the sole purpose of obtaining Bids for completion of the Project and permission to download or distribution of the Bidding Documents does not confer a license or grant permission or authorization for any other use. Authorization to download documents, or other distribution, includes the right for plan holders to print documents solely for their use, and the use of their prospective Subcontractors and Suppliers, provided the plan holder pays all costs associated with printing or reproduction. Printed documents may not be re-sold under any circumstances.
- 2.03 Owner has established a Bidding Documents Website as indicated in the Advertisement or invitation to bid. Owner recommends that Bidder register as a plan holder with the Issuing Office at such website, and obtain a complete set of the Bidding Documents from such website. Bidders may rely that sets of Bidding Documents obtained from the Bidding Documents Website are complete, unless an omission is blatant. Registered plan holders will receive Addenda issued by Owner.
- 2.04 Bidder may register as a plan holder and obtain complete sets of Bidding Documents, in the number and format stated in the Advertisement or invitation to bid, from the Issuing Office. Bidders may rely that sets of Bidding Documents obtained from the Issuing Office are complete, unless an omission is blatant. Registered plan holders will receive Addenda issued by Owner.
- 2.05 Plan rooms (including construction information subscription services, and electronic and virtual plan rooms) may distribute the Bidding Documents, or make them available for examination. Those prospective bidders that obtain an electronic (digital) copy of the Bidding Documents from a plan room are encouraged to register as plan holders from the Bidding Documents Website or Issuing Office. Owner is not responsible for omissions in Bidding Documents or other documents obtained from plan rooms, or for a Bidder's failure to obtain Addenda from a plan room.
- 2.06 *Electronic Documents*
- A. When the Bidding Requirements indicate that electronic (digital) copies of the Bidding Documents are available, such documents will be made available to the Bidders as Electronic Documents in the manner specified.
1. Bidding Documents will be provided in Adobe PDF (Portable Document Format) (.pdf) that is readable by Adobe Acrobat Reader Version. It is the intent of the Engineer and

Owner that such Electronic Documents are to be exactly representative of the paper copies of the documents. However, because the Owner and Engineer cannot totally control the transmission and receipt of Electronic Documents nor the Contractor's means of reproduction of such documents, the Owner and Engineer cannot and do not guarantee that Electronic Documents and reproductions prepared from those versions are identical in every manner to the paper copies.

- B. Unless otherwise stated in the Bidding Documents, the Bidder may use and rely upon complete sets of Electronic Documents of the Bidding Documents, described in Paragraph 2.06.A above. However, Bidder assumes all risks associated with differences arising from transmission/receipt of Electronic Documents versions of Bidding Documents and reproductions prepared from those versions and, further, assumes all risks, costs, and responsibility associated with use of the Electronic Documents versions to derive information that is not explicitly contained in printed paper versions of the documents, and for Bidder's reliance upon such derived information.

ARTICLE 3—QUALIFICATIONS OF BIDDERS

- 3.01 To demonstrate Bidder's qualifications to perform the Work, after submitting its Bid and within 7 days of Owner's request, Bidder must submit the following information:
 - A. Written evidence establishing its qualifications such as financial data, previous experience, and present commitments.
 - B. A written statement that Bidder is authorized to do business in the state where the Project is located, or a written certification that Bidder will obtain such authority prior to the Effective Date of the Contract.
 - C. Bidder's state or other contractor license number, if applicable.
 - D. Subcontractor and Supplier qualification information.
 - E. Other required information regarding qualifications.
- 3.02 A Bidder's failure to submit required qualification information within the times indicated may disqualify Bidder from receiving an award of the Contract.
- 3.03 No requirement in this Article 3 to submit information will prejudice the right of Owner to seek additional pertinent information regarding Bidder's qualifications.

ARTICLE 4—PRE-BID CONFERENCE

- 4.01 A mandatory pre-bid conference for the Project will be held on Wednesday, September 17, 2025 at 1 PM at 515 Bell Ave, Cadillac, MI, 49601. Prospective bidders are encouraged to visit the sites.

ARTICLE 5—SITE AND OTHER AREAS; EXISTING SITE CONDITIONS; EXAMINATION OF SITE; OWNER'S SAFETY PROGRAM; OTHER WORK AT THE SITE

- 5.01 *Site and Other Areas*
 - A. The Site is identified in the Bidding Documents. By definition, the Site includes rights-of-way, easements, and other lands furnished by Owner for the use of the Contractor. Any additional lands required for temporary construction facilities, construction equipment, or storage of

materials and equipment, and any access needed for such additional lands, are to be obtained and paid for by Contractor.

5.02 *Existing Site Conditions*

A. *Subsurface and Physical Conditions; Hazardous Environmental Conditions*

1. The Supplementary Conditions identify the following regarding existing conditions at or adjacent to the Site:
 - a. Those reports of explorations and tests of subsurface conditions at or adjacent to the Site that contain Technical Data.
 - b. Those drawings known to Owner of existing physical conditions at or adjacent to the Site, including those drawings depicting existing surface or subsurface structures at or adjacent to the Site (except Underground Facilities), that contain Technical Data.
 - c. Reports and drawings known to Owner relating to Hazardous Environmental Conditions that have been identified at or adjacent to the Site.
 - d. Technical Data contained in such reports and drawings.
2. Owner will make copies of reports and drawings referenced above available to any Bidder on request. These reports and drawings are not part of the Contract Documents, but the Technical Data contained therein upon whose accuracy Bidder is entitled to rely, as provided in the General Conditions, has been identified and established in the Supplementary Conditions. Bidder is responsible for any interpretation or conclusion Bidder draws from any Technical Data or any other data, interpretations, opinions, or information contained in such reports or shown or indicated in such drawings.
3. If the Supplementary Conditions do not identify Technical Data, the default definition of Technical Data set forth in Article 1 of the General Conditions will apply.

- B. *Underground Facilities:* Underground Facilities are shown or indicated on the Drawings, pursuant to Paragraph 5.05 of the General Conditions, and not in the drawings referred to in Paragraph 5.02.A of these Instructions to Bidders. Information and data regarding the presence or location of Underground Facilities are not intended to be categorized, identified, or defined as Technical Data.

5.03 *Other Site-related Documents*

- A. In addition to the documents regarding existing Site conditions referred to in Paragraph 5.02.A, the following other documents relating to conditions at or adjacent to the Site are known to Owner and made available to Bidders for reference:

Owner will make copies of these other Site-related documents available to any Bidder on request.

- B. Owner has not verified the contents of these other Site-related documents, and Bidder may not rely on the accuracy of any data or information in such documents. Bidder is responsible for any interpretation or conclusion Bidder draws from the other Site-related documents.
- C. The other Site-related documents are not part of the Contract Documents.

- D. Bidders are encouraged to review the other Site-related documents, but Bidders will not be held accountable for any data or information in such documents. The requirement to review and take responsibility for documentary Site information is limited to information in (1) the Contract Documents and (2) the Technical Data.
- E. No other Site-related documents are available.

5.04 *Site Visit and Testing by Bidders*

- A. Bidders visiting the Site are required to arrange their own transportation to the Site.
- B. All access to the Site other than during a regularly scheduled Site visit must be coordinated through the Owner's Operator for visiting the Site: Thomas Lutke tlutke@iaiwater.com. Bidder must conduct the Site visit during normal working hours.
- C. Bidder is not required to conduct any subsurface testing, or exhaustive investigations of Site conditions.
- D. On request, and to the extent Owner has control over the Site, and schedule permitting, the Owner will provide Bidder general access to the Site to conduct such additional examinations, investigations, explorations, tests, and studies as Bidder deems necessary for preparing and submitting a successful Bid. Owner will not have any obligation to grant such access if doing so is not practical because of existing operations, security or safety concerns, or restraints on Owner's authority regarding the Site. Bidder is responsible for establishing access needed to reach specific selected test sites.
- E. Bidder must comply with all applicable Laws and Regulations regarding excavation and location of utilities, obtain all permits, and comply with all terms and conditions established by Owner or by property owners or other entities controlling the Site with respect to schedule, access, existing operations, security, liability insurance, and applicable safety programs.
- F. Bidder must fill all holes and clean up and restore the Site to its former condition upon completion of such explorations, investigations, tests, and studies.

5.05 *Owner's Safety Program*

- A. Site visits and work at the Site may be governed by an Owner safety program. If an Owner safety program exists, it will be noted in the Supplementary Conditions.

5.06 *Other Work at the Site*

- A. Reference is made to Article 8 of the Supplementary Conditions for the identification of the general nature of other work of which Owner is aware (if any) that is to be performed at the Site by Owner or others (such as utilities and other prime contractors) and relates to the Work contemplated by these Bidding Documents. If Owner is party to a written contract for such other work, then on request, Owner will provide to each Bidder access to examine such contracts (other than portions thereof related to price and other confidential matters), if any.

ARTICLE 6—BIDDER'S REPRESENTATIONS AND CERTIFICATIONS

6.01 *Express Representations and Certifications in Bid Form, Agreement*

- A. The Bid Form that each Bidder will submit contains express representations regarding the Bidder's examination of Project documentation, Site visit, and preparation of the Bid, and

certifications regarding lack of collusion or fraud in connection with the Bid. Bidder should review these representations and certifications, and assure that Bidder can make the representations and certifications in good faith, before executing and submitting its Bid.

- B. If Bidder is awarded the Contract, Bidder (as Contractor) will make similar express representations and certifications when it executes the Agreement.

ARTICLE 7—INTERPRETATIONS AND ADDENDA

- 7.01 Owner on its own initiative may issue Addenda to clarify, correct, supplement, or change the Bidding Documents.
- 7.02 Bidder shall submit all questions about the meaning or intent of the Bidding Documents to Engineer in writing. Contact information and submittal procedures for such questions are as follows:
 - A. Tim Korson, email tnkorson@goslingczubak.com phone: 231.933.5113
- 7.03 Interpretations or clarifications considered necessary by Engineer in response to such questions will be issued by Addenda delivered to all registered plan holders. Questions received less than seven days prior to the date for opening of Bids may not be answered.
- 7.04 Only responses set forth in an Addendum will be binding. Oral and other interpretations or clarifications will be without legal effect. Responses to questions are not part of the Contract Documents unless set forth in an Addendum that expressly modifies or supplements the Contract Documents.

ARTICLE 8—BID SECURITY

- 8.01 A Bid must be accompanied by Bid security made payable to Owner in an amount of 5% percent of Bidder's maximum Bid price (determined by adding the base bid and all alternates) and in the form of a Bid bond issued by a surety meeting the requirements of Paragraph 6.01 of the General Conditions. Such Bid bond will be issued in the form included in the Bidding Documents.
- 8.02 The Bid security of the apparent Successful Bidder will be retained until Owner awards the contract to such Bidder, and such Bidder has executed the Contract, furnished the required Contract security, and met the other conditions of the Notice of Award, whereupon the Bid security will be released. If the Successful Bidder fails to execute and deliver the Contract and furnish the required Contract security within 15 days after the Notice of Award, Owner may consider Bidder to be in default, annul the Notice of Award, and the Bid security of that Bidder will be forfeited, in whole in the case of a penal sum bid bond, and to the extent of Owner's damages in the case of a damages-form bond. Such forfeiture will be Owner's exclusive remedy if Bidder defaults.
- 8.03 The Bid security of other Bidders that Owner believes to have a reasonable chance of receiving the award may be retained by Owner until the earlier of 7 days after the Effective Date of the

Contract or 61 days after the Bid opening, whereupon Bid security furnished by such Bidders will be released.

- 8.04 Bid security of other Bidders that Owner believes do not have a reasonable chance of receiving the award will be released within 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 and (b) ready for final payment, and (c) Milestones (if any) are to be achieved, are set forth in the Agreement.
- 9.02 Bidder must set forth in the Bid the time by which Bidder must achieve Substantial Completion, subject to the restrictions established in Paragraph 13.07 of these Instructions. The Owner will take Bidder's time commitment regarding Substantial Completion into consideration during the evaluation of Bids, and it will be necessary for the apparent Successful Bidder to satisfy Owner that it will be able to achieve Substantial Completion within the time such Bidder has designated in the Bid. The Successful Bidder's time commitments will be entered into the Agreement or incorporated in the Agreement by reference to the specific terms of the Bid.
- 9.03 Provisions for liquidated damages, if any, for failure to timely attain a Milestone, Substantial Completion, or completion of the Work in readiness for final payment, are set forth in the Agreement.

ARTICLE 10—SUBSTITUTE AND "OR EQUAL" ITEMS

- 10.01 All prices that Bidder sets forth in its Bid will be based on the presumption that the Contractor will furnish the materials and equipment specified or described in the Bidding Documents, as supplemented by Addenda. Any assumptions regarding the possibility of post-Bid approvals of "or-equal" or substitution requests are made at Bidder's sole risk.

ARTICLE 11—SUBCONTRACTORS, SUPPLIERS, AND OTHERS

- 11.01 A Bidder must be prepared to retain specific Subcontractors and Suppliers for the performance of the Work if required to do so by the Bidding Documents or in the Specifications. If a prospective Bidder objects to retaining any such Subcontractor or Supplier and the concern is not relieved by an Addendum, then the prospective Bidder should refrain from submitting a Bid.
- 11.02 If requested by Owner, such list must be accompanied by an experience statement with pertinent information regarding similar projects and other evidence of qualification for each such Subcontractor or Supplier. If Owner or Engineer, after due investigation, has reasonable objection to any proposed Subcontractor or Supplier, Owner may, before the Notice of Award is given, request apparent Successful Bidder to submit an acceptable substitute, in which case apparent Successful Bidder will submit a substitute, Bidder's Bid price will be increased (or decreased) by the difference in cost occasioned by such substitution, and Owner may consider such price adjustment in evaluating Bids and making the Contract award.
- 11.03 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 and Suppliers. Declining to make requested substitutions will constitute grounds for forfeiture of the Bid security of any Bidder. Any Subcontractor or Supplier, so listed and against which Owner or Engineer

makes no written objection prior to the giving of the Notice of Award will be deemed acceptable to Owner and Engineer subject to subsequent revocation of such acceptance as provided in Paragraph 7.07 of the General Conditions.

ARTICLE 12—PREPARATION OF BID

- 12.01 The Bid Form is included with the Bidding Documents.
- A. All blanks on the Bid Form must be completed in ink and the Bid Form signed in ink. Erasures or alterations must be initialed in ink by the person signing the Bid Form. A Bid price must be indicated for each section, Bid item, alternate, adjustment unit price item, and unit price item listed therein.
 - B. If the Bid Form expressly indicates that submitting pricing on a specific alternate item is optional, and Bidder elects to not furnish pricing for such optional alternate item, then Bidder may enter the words "No Bid" or "Not Applicable."
- 12.02 If Bidder has obtained the Bidding Documents as Electronic Documents, then Bidder shall prepare its Bid on a paper copy of the Bid Form printed from the Electronic Documents version of the Bidding Documents. The printed copy of the Bid Form must be clearly legible, printed on 8½ inch by 11-inch paper and as closely identical in appearance to the Electronic Document version of the Bid Form as may be practical. The Owner reserves the right to accept Bid Forms which nominally vary in appearance from the original paper version of the Bid Form, providing that all required information and submittals are included with the Bid.
- 12.03 A Bid by a corporation must be executed in the corporate name by a corporate officer (whose title must appear under the signature), accompanied by evidence of authority to sign. The corporate address and state of incorporation must be shown.
- 12.04 A Bid by a partnership must 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 must be shown.
- 12.05 A Bid by a limited liability company must be executed in the name of the firm by a member or other authorized person and accompanied by evidence of authority to sign. The state of formation of the firm and the official address of the firm must be shown.
- 12.06 A Bid by an individual must show the Bidder's name and official address.
- 12.07 A Bid by a joint venture must be executed by an authorized representative of each joint venturer in the manner indicated on the Bid Form. The joint venture must have been formally established prior to submittal of a Bid, and the official address of the joint venture must be shown.
- 12.08 All names must be printed in ink below the signatures.
- 12.09 The Bid must contain an acknowledgment of receipt of all Addenda, the numbers of which must be filled in on the Bid Form.
- 12.10 Postal and e-mail addresses and telephone number for communications regarding the Bid must be shown.
- 12.11 The Bid must contain evidence of Bidder's authority to do business in the state where the Project is located, or Bidder must certify in writing that it will obtain such authority within the time for acceptance of Bids and attach such certification to the Bid.

- 12.12 If Bidder is required to be licensed to submit a Bid or perform the Work in the state where the Project is located, the Bid must contain evidence of Bidder's licensure, or Bidder must certify in writing that it will obtain such licensure within the time for acceptance of Bids and attach such certification to the Bid. Bidder's state contractor license number, if any, must also be shown on the Bid Form.

ARTICLE 13—BASIS OF BID

13.01 *Unit Price*

- A. Bidders must submit a Bid on a unit price basis for each item of Work listed in the unit price section of the Bid Form.
- B. The "Bid Price" (sometimes referred to as the extended price) for each unit price Bid item will be the product of the "Estimated Quantity", which Owner or its representative has set forth in the Bid Form, for the item and the corresponding "Bid Unit Price" offered by the Bidder. The total of all unit price Bid items will be the sum of these "Bid Prices"; such total will be used by Owner for Bid comparison purposes. The final quantities and Contract Price will be determined in accordance with Paragraph 13.03 of the General Conditions.
- C. Discrepancies between the multiplication of units of Work and unit prices will be resolved in favor of the unit prices. Discrepancies between the indicated sum of any column of figures and the correct sum thereof will be resolved in favor of the correct sum.

ARTICLE 14—SUBMITTAL OF BID

- 14.01 The Bidding Documents include one separate unbound copy of the Bid Form, and, if required, the Bid Bond Form. The unbound copy of the Bid Form is to be completed and submitted with the Bid security and the other documents required to be submitted under the terms of Article 2 of the Bid Form.
- 14.02 A Bid must be received no later than the date and time prescribed and at the place indicated in the Advertisement or invitation to bid and must be enclosed in a plainly marked package with the Project title, and, if applicable, the designated portion of the Project for which the Bid is submitted, the name and address of Bidder, and must 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 must be enclosed in a separate package plainly marked on the outside with the notation "BID ENCLOSED." A mailed Bid must be addressed to the location designated in the Advertisement.
- 14.03 Bids received after the date and time prescribed for the opening of bids, or not submitted at the correct location or in the designated manner, will not be accepted and will be returned to the Bidder unopened.

ARTICLE 15—MODIFICATION AND WITHDRAWAL OF BID

- 15.01 An unopened Bid may be withdrawn by an appropriate document duly executed in the same manner that a Bid must be executed and delivered to the place where Bids are to be submitted

prior to the date and time for the opening of Bids. Upon receipt of such notice, the unopened Bid will be returned to the Bidder.

- 15.02 If a Bidder wishes to modify its Bid prior to Bid opening, Bidder must withdraw its initial Bid in the manner specified in Paragraph 15.01 and submit a new Bid prior to the date and time for the opening of Bids.
- 15.03 If within 24 hours after Bids are opened any Bidder files a duly signed written notice with Owner and promptly thereafter demonstrates to the reasonable satisfaction of Owner that there was a material and substantial mistake in the preparation of its Bid, the Bidder may withdraw its Bid, and the Bid security will be returned. Thereafter, if the Work is rebid, the Bidder will be disqualified from further bidding on the Work.

ARTICLE 16—OPENING OF BIDS

- 16.01 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 17—BIDS TO REMAIN SUBJECT TO ACCEPTANCE

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

ARTICLE 18—EVALUATION OF BIDS AND AWARD OF CONTRACT

- 18.01 Owner reserves the right to reject any or all Bids, including without limitation, nonconforming, nonresponsive, unbalanced, or conditional Bids. Owner also reserves the right to waive all minor Bid informalities not involving price, time, or changes in the Work.
- 18.02 Owner will reject the Bid of any Bidder that Owner finds, after reasonable inquiry and evaluation, to not be responsible.
- 18.03 If Bidder purports to add terms or conditions to its Bid, takes exception to any provision of the Bidding Documents, or attempts to alter the contents of the Contract Documents for purposes of the Bid, whether in the Bid itself or in a separate communication to Owner or Engineer, then Owner will reject the Bid as nonresponsive.
- 18.04 If Owner awards the contract for the Work, such award will be to the responsible Bidder submitting the lowest responsive Bid.
- 18.05 *Evaluation of Bids*
 - A. In evaluating Bids, Owner will consider whether the Bids comply with the prescribed requirements, and such alternates, unit prices, and other data, as may be requested in the Bid Form or prior to the Notice of Award.
 - B. In the comparison of Bids, alternates will be applied in the same order of priority as listed in the Bid Form. To determine the Bid prices for purposes of comparison, Owner will announce to all bidders a “Base Bid plus alternates” budget after receiving all Bids, but prior to opening them. For comparison purposes alternates will be accepted, following the order of priority established in the Bid Form, until doing so would cause the budget to be exceeded. After

determination of the Successful Bidder based on this comparative process and on the responsiveness, responsibility, and other factors set forth in these Instructions, the award may be made to said Successful Bidder on its base Bid and any combination of its additive alternate Bids for which Owner determines funds will be available at the time of award.

- C. For determination of the apparent low Bidder(s) when sectional bids are submitted, Bids will be compared on the basis of the aggregate of the Bids for separate sections and the Bids for combined sections that result in the lowest total amount for all of the Work.
 - D. For the determination of the apparent low Bidder when unit price bids are submitted, Bids will be compared on the basis of the total of the products of the estimated quantity of each item and unit price Bid for that item, together with any lump sum items.
 - E. For the determination of the apparent low Bidder when cost-plus-fee bids are submitted, Bids will be compared on the basis of the Guaranteed Maximum Price set forth by Bidder on the Bid Form.
 - F. Bid prices will be compared after adjusting for differences in time of Substantial Completion (total number of calendar days to substantially complete the Work) designated by Bidders. The adjusting amount will be determined at the rate set forth in the Agreement for liquidated damages for failing to achieve Substantial Completion, or such other amount that Owner has designated in the Bid Form.
 - 1. The method for calculating the lowest bid for comparison will be the summation of the Bid price shown in the Bid Form plus the product of the Bidder-specified time of Substantial Completion in calendar days times the rate for liquidated damages in dollars per day.
 - 2. This procedure is only used to determine the lowest bid for comparison and contractor selection purposes. The Contract Price for compensation and payment purposes remains the Bid price shown in the Bid Form.
- 18.06 In evaluating whether a Bidder is responsible, Owner will consider the qualifications of the Bidder and may consider the qualifications and experience of Subcontractors and Suppliers proposed for those portions of the Work for which the identity of Subcontractors and Suppliers must be submitted as provided in the Bidding Documents.
- 18.07 Owner may conduct such investigations as Owner deems necessary to establish the responsibility, qualifications, and financial ability of Bidders and any proposed Subcontractors or Suppliers.

ARTICLE 19—BONDS AND INSURANCE

- 19.01 Article 6 of the General Conditions, as may be modified by the Supplementary Conditions, sets forth Owner's requirements as to performance and payment bonds, other required bonds (if any),

and insurance. When the Successful Bidder delivers the executed Agreement to Owner, it must be accompanied by required bonds and insurance documentation.

- 19.02 Article 8, Bid Security, of these Instructions, addresses any requirements for providing bid bonds as part of the bidding process.

ARTICLE 20—SIGNING OF AGREEMENT

- 20.01 When Owner issues a Notice of Award to the Successful Bidder, it will be accompanied by the unexecuted counterparts of the Agreement along with the other Contract Documents as identified in the Agreement. Within 15 days thereafter, Successful Bidder must execute and deliver the required number of counterparts of the Agreement and any bonds and insurance documentation required to be delivered by the Contract Documents to Owner. Within 10 days thereafter, Owner will deliver one fully executed counterpart of the Agreement to Successful Bidder, together with printed and electronic copies of the Contract Documents as stated in Paragraph 2.02 of the General Conditions.

ARTICLE 21—BUILD AMERICA, BUY AMERICA ACT (BABAA)

- 21.01 This agreement is for services related to a project that is subject to the Build America, Buy America Act (BABAA) requirements under Title IX of the Infrastructure Investment and Jobs Act ("IIJA"), Pub. L. 117-58. Absent an approved waiver, all iron, steel, manufactured products, and construction materials used in this project must be produced in the United States, as further outlined by the Office of Management and Budget's Memorandum M-22-11, Initial Implementation Guidance on Application of Buy America Preference in Federal Financial Assistance Programs for Infrastructure, April 18, 2022.
- 21.02 See Appendix A for additional requirements.

BID FORM FOR CONSTRUCTION CONTRACT

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

ARTICLE 1—OWNER AND BIDDER

- 1.01 This Bid is submitted to: Haring Charter Township, 515 Bell Ave., Cadillac, MI 49601
- 1.02 The undersigned Bidder proposes and agrees, if this Bid is accepted, to enter into an Agreement with Owner in the form included in the Bidding Documents to perform all Work as specified or indicated in the Bidding Documents for the prices and within the times indicated in this Bid and in accordance with the other terms and conditions of the Bidding Documents.

ARTICLE 2—ATTACHMENTS TO THIS BID

- 2.01 The following documents are submitted with and made a condition of this Bid:
 - A. Required Bid security;
 - B. List of Proposed Subcontractors;
 - C. List of Proposed Suppliers;
 - D. Evidence of authority to do business in the state of the Project; or a written covenant to obtain such authority within the time for acceptance of Bids;
 - E. Contractor's license number as evidence of Bidder's State Contractor's License or a covenant by Bidder to obtain said license within the time for acceptance of Bids;
 - F. Non-Collusive Affidavit
 - G. Appendix A – DBE Good Faith Efforts Worksheet.
 - H. Appendix A – Certification Regarding Debarment, Suspension, and Other Responsibilities

ARTICLE 3—BASIS OF BID—LUMP SUM BID AND UNIT PRICES

- 3.01 *Unit Price Bids*
 - A. Bidder will perform the following Work at the indicated unit prices according to the attached bid form.
 - B. Bidder acknowledges that:
 - 1. each Bid Unit Price includes an amount considered by Bidder to be adequate to cover Contractor's overhead and profit for each separately identified item, and
 - 2. estimated quantities are not guaranteed, and are solely for the purpose of comparison of Bids, and final payment for all Unit Price Work will be based on actual quantities, determined as provided in the Contract Documents.

ARTICLE 4—TIME OF COMPLETION

- 4.01 Bidder agrees that the Work will be substantially complete and will be completed and ready for final payment in accordance with Paragraph 15.06 of the General Conditions on or before the dates or within the number of calendar days indicated in the Agreement.
- 4.02 Bidder agrees that the Work will be substantially complete within 365 calendar days after the date when the Contract Times commence to run as provided in Paragraph 4.01 of the General Conditions, and will be completed and ready for final payment in accordance with Paragraph 15.06 of the General Conditions within 380 calendar days after the date when the Contract Times commence to run.
- 4.03 Bidder accepts the provisions of the Agreement as to liquidated damages.

ARTICLE 5—BIDDER'S ACKNOWLEDGEMENTS: ACCEPTANCE PERIOD, INSTRUCTIONS, AND RECEIPT OF ADDENDA

5.01 *Bid Acceptance Period*

- A. This Bid will remain subject to acceptance for 60 days after the Bid opening, or for such longer period of time that Bidder may agree to in writing upon request of Owner.

5.02 *Instructions to Bidders*

- A. Bidder accepts all of the terms and conditions of the Instructions to Bidders, including without limitation those dealing with the disposition of Bid security.

5.03 *Receipt of Addenda*

- A. Bidder hereby acknowledges receipt of the following Addenda: [Add rows as needed. Bidder is to complete table.]

Addendum Number	Addendum Date

ARTICLE 6—BIDDER'S REPRESENTATIONS AND CERTIFICATIONS

6.01 *Bidder's Representations*

- A. In submitting this Bid, Bidder represents the following:
1. Bidder has examined and carefully studied the Bidding Documents, including Addenda.
 2. Bidder 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. Bidder is familiar with all Laws and Regulations that may affect cost, progress, and performance of the Work.
 4. Bidder 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

Supplementary Conditions, with respect to the Technical Data in such reports and drawings.

5. Bidder 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 Supplementary Conditions, with respect to Technical Data in such reports and drawings.
6. Bidder has considered the information known to Bidder itself; information commonly known to contractors doing business in the locality of the Site; information and observations obtained from visits to the Site; the Bidding Documents; and the Technical Data identified in the Supplementary Conditions 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 Bidder, if selected as Contractor; and (c) Bidder's (Contractor's) safety precautions and programs.
7. Based on the information and observations referred to in the preceding paragraph, Bidder 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.
8. Bidder is aware of the general nature of work to be performed by Owner and others at the Site that relates to the Work as indicated in the Bidding Documents.
9. Bidder has given Engineer written notice of all conflicts, errors, ambiguities, or discrepancies that Bidder has discovered in the Bidding Documents, and of discrepancies between Site conditions and the Contract Documents, and the written resolution thereof by Engineer is acceptable to Contractor.
10. The Bidding Documents are generally sufficient to indicate and convey understanding of all terms and conditions for performance and furnishing of the Work.
11. The submission of this Bid constitutes an incontrovertible representation by Bidder that without exception the Bid and all prices in the Bid are premised upon performing and furnishing the Work required by the Bidding Documents.

6.02 *Bidder's Certifications*

A. The Bidder certifies the following:

1. This Bid is genuine and not made in the interest of or on behalf of any undisclosed individual or entity and is not submitted in conformity with any collusive agreement or rules of any group, association, organization, or corporation.
2. Bidder has not directly or indirectly induced or solicited any other Bidder to submit a false or sham Bid.
3. Bidder has not solicited or induced any individual or entity to refrain from bidding.
4. Bidder has not engaged in corrupt, fraudulent, collusive, or coercive practices in competing for the Contract. For the purposes of this Paragraph 8.02.A:
 - a. 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.

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

BIDDER hereby submits this Bid as set forth above:

Bidder:

(typed or printed name of organization)

By:

(individual's signature)

Name:

(typed or printed)

Title:

(typed or printed)

Date:

(typed or printed)

If Bidder is a corporation, a partnership, or a joint venture, attach evidence of authority to sign.

Attest:

(individual's signature)

Name:

(typed or printed)

Title:

(typed or printed)

Date:

(typed or printed)

Address for giving notices:

Bidder's Contact:

Name:

(typed or printed)

Title:

(typed or printed)

Phone:

Email:

Address:

Bidder's Contractor License No.: (if applicable)

BID SCHEDULE - HARING CHARTER TOWNSHIP - WATER SUPPLY WELL NO. 3 SITE IMPROVEMENTS

Item No.	Description	Est. Qty.	Unit	Unit Price (Each)	Total
1	Mobilization	1	LS	\$ -	
2	Traffic Control	1	LS	\$ -	
3	Soil Erosion and Sediment Control	1	LS	\$ -	
4	Site Preparation	1	LS	\$ -	
5	Wellhouse	1	LS	\$ -	
6	Wellhouse Piping & Appurtenances	1	LS	\$ -	
7	Blow Off Pond	1	LS	\$ -	
8	Wellhouse Electrical	1	LS	\$ -	
9	Instrumentation & Controls	1	LS	\$ -	
10	Generator	1	LS	\$ -	
11	8-inch DI CL 52	175	LF	\$ -	
12	12-inch DI CL 52	218	LF	\$ -	
13	12" Gate Valve & Box	1	EA	\$ -	
14	Connect to Existing Watermain	1	EA	\$ -	
15	1-inch Water Service	1	EA	\$ -	
16	6-foot Fence Installation	750	LF	\$ -	
17	6-foot Sliding Gate Fence Installation	1	LS	\$ -	
18	6-inch Aggregate Base and Drive	908	SY	\$ -	
19	Site Restoration	1	LS	\$ -	
20	Project Sign	1	LS	\$ -	
		Sub-Total of Bid			
		TOTAL OF BID			

BID BOND (PENAL SUM FORM)

<p>Bidder</p> <p>Name: [Full formal name of Bidder]</p> <p>Address (<i>principal place of business</i>): [Address of Bidder's principal place of business]</p>	<p>Surety</p> <p>Name: [Full formal name of Surety]</p> <p>Address (<i>principal place of business</i>): [Address of Surety's principal place of business]</p>
<p>Owner</p> <p>Name: Haring Charter Township</p> <p>Address (<i>principal place of business</i>): 515 Bell Ave, Cadillac, MI 49601</p>	<p>Bid</p> <p>Project (<i>name and location</i>): Water Supply Well No. 3 Site Improvements</p> <p>Bid Due Date: [Enter date bid is due]</p>
<p>Bond</p> <p>Penal Sum: [Amount]</p> <p>Date of Bond: [Date]</p>	
<p>Surety and Bidder, intending to be legally bound hereby, subject to the terms set forth in this Bid Bond, do each cause this Bid Bond to be duly executed by an authorized officer, agent, or representative.</p>	
<p>Bidder</p>	<p>Surety</p>
<p>_____ (Full formal name of Bidder)</p>	<p>_____ (Full formal name of Surety) (corporate seal)</p>
<p>By: _____ (Signature)</p>	<p>By: _____ (Signature) (Attach Power of Attorney)</p>
<p>Name: _____ (Printed or typed)</p>	<p>Name: _____ (Printed or typed)</p>
<p>Title: _____</p>	<p>Title: _____</p>
<p>Attest: _____ (Signature)</p>	<p>Attest: _____ (Signature)</p>
<p>Name: _____ (Printed or typed)</p>	<p>Name: _____ (Printed or typed)</p>
<p>Title: _____</p>	<p>Title: _____</p>
<p><i>Notes: (1) Note: Addresses are to be used for giving any required notice. (2) Provide execution by any additional parties, such as joint venturers, if necessary.</i></p>	

1. Bidder and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors, and assigns to pay to Owner upon default of Bidder the penal sum set forth on the face of this Bond. Payment of the penal sum is the extent of Bidder's and Surety's liability. Recovery of such penal sum under the terms of this Bond will be Owner's sole and exclusive remedy upon default of Bidder.
2. Default of Bidder occurs upon the failure of Bidder to deliver within the time required by the Bidding Documents (or any extension thereof agreed to in writing by Owner) the executed Agreement required by the Bidding Documents and any performance and payment bonds required by the Bidding Documents.
3. This obligation will be null and void if:
 - 3.1. Owner accepts Bidder's Bid and Bidder delivers within the time required by the Bidding Documents (or any extension thereof agreed to in writing by Owner) the executed Agreement required by the Bidding Documents and any performance and payment bonds required by the Bidding Documents, or
 - 3.2. All Bids are rejected by Owner, or
 - 3.3. Owner fails to issue a Notice of Award to Bidder within the time specified in the Bidding Documents (or any extension thereof agreed to in writing by Bidder and, if applicable, consented to by Surety when required by Paragraph 5 hereof).
4. Payment under this Bond will be due and payable upon default of Bidder and within 30 calendar days after receipt by Bidder and Surety of written notice of default from Owner, which notice will be given with reasonable promptness, identifying this Bond and the Project and including a statement of the amount due.
5. Surety waives notice of any and all defenses based on or arising out of any time extension to issue Notice of Award agreed to in writing by Owner and Bidder, provided that the total time for issuing Notice of Award including extensions does not in the aggregate exceed 120 days from the Bid due date without Surety's written consent.
6. No suit or action will be commenced under this Bond prior to 30 calendar days after the notice of default required in Paragraph 4 above is received by Bidder and Surety, and in no case later than one year after the Bid due date.
7. Any suit or action under this Bond will be commenced only in a court of competent jurisdiction located in the state in which the Project is located.
8. Notices required hereunder must be in writing and sent to Bidder and Surety at their respective addresses shown on the face of this Bond. Such notices may be sent by personal delivery, commercial courier, or by United States Postal Service registered or certified mail, return receipt requested, postage pre-paid, and will be deemed to be effective upon receipt by the party concerned.
9. Surety shall cause to be attached to this Bond a current and effective Power of Attorney evidencing the authority of the officer, agent, or representative who executed this Bond on behalf of Surety to execute, seal, and deliver such Bond and bind the Surety thereby.
10. This Bond is intended to conform to all applicable statutory requirements. Any applicable requirement of any applicable statute that has been omitted from this Bond will be deemed to be included herein as if set forth at length. If any provision of this Bond conflicts with any applicable statute, then the provision of said statute governs and the remainder of this Bond that is not in conflict therewith continues in full force and effect.
11. The term "Bid" as used herein includes a Bid, offer, or proposal as applicable.

NON-COLLUSIVE AFFIDAVIT

The Undersigned, _____
being _____ and duly authorized so to act,
being duly sworn, deposes and says that _____
is the contractor submitting this bid, and that its agents, officers, or employees have not
directly or indirectly entered into any agreements, participated in any collusion, or
otherwise taken any action in restraint of free competitive bidding in connection with this
proposal for the above project.

Name

Title

Taken, subscribed and sworn before me this _____ day of _____

(Notary's Signature)

Notary Public in and for

County

My Commission Expires:

NOTICE OF AWARD

Date of Issuance:

Owner: Haring Charter Township Owner's Project No.:
Gosling Czubak Engineering Sciences,
Engineer: Inc. Engineer's Project No.: 240359
Project: Water Supply Well No. 3 Site Improvements
Contract Name: Water Supply Well No. 3 Site Improvements
Bidder:
Bidder's Address:

You are notified that Owner has accepted your Bid dated [date] for the above Contract, and that you are the Successful Bidder and are awarded a Contract for:

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

The Contract Price of the awarded Contract is \$[Contract Price]. Contract Price is subject to adjustment based on the provisions of the Contract, including but not limited to those governing changes, Unit Price Work, and Work performed on a cost-plus-fee basis, as applicable.

1 unexecuted counterparts of the Agreement accompany this Notice of Award, and one copy of the Contract Documents accompanies this Notice of Award, or has been transmitted or made available to Bidder electronically.

☐ Drawings will be delivered separately from the other Contract Documents.

You must comply with the following conditions precedent within 15 days of the date of receipt of this Notice of Award:

1. Deliver to Owner 1 counterparts of the Agreement, signed by Bidder (as Contractor).
2. Deliver with the signed Agreement(s) the Contract security (such as required performance and payment bonds) and insurance documentation, as specified in the Instructions to Bidders and in the General Conditions, Articles 2 and 6.
3. Other conditions precedent (if any): [Describe other conditions that require Successful Bidder's compliance]

Failure to comply with these conditions within the time specified will entitle Owner to consider you in default, annul this Notice of Award, and declare your Bid security forfeited.

Within 10 days after you comply with the above conditions, Owner will return to you one fully signed counterpart of the Agreement, together with any additional copies of the Contract Documents as indicated in Paragraph 2.02 of the General Conditions.

Owner: [Full formal name of Owner]

By (signature): _____

Name (printed): _____

Title: _____

Copy: Engineer

AGREEMENT BETWEEN OWNER AND CONTRACTOR FOR CONSTRUCTION CONTRACT (STIPULATED PRICE)

This Agreement is by and between Haring Charter Township ("Owner") and [name of contracting entity] ("Contractor").

Terms used in this Agreement have the meanings stated in the General Conditions and the Supplementary Conditions.

Owner and Contractor hereby agree as follows:

ARTICLE 1—WORK

- 1.01 Contractor shall complete all Work as specified or indicated in the Contract Documents. The Work is generally described as follows:
- A. Yard piping: 175 LF ~ 8-inch watermain, 218 LF ~ 12-inch watermain, associated valves and fittings, connection to existing water system, one 1-inch water service to well house.
 - B. Well house: CMU block structure w/ metal crimp seem roof, concrete floor, concrete apron, and metal security doors, lighting, HVAC, process piping, VFD, flow meter, pressure gauges, pressure switches, basic I&C, liquid chlorine treatment and storage, water sampling and testing, security, furnishings, paint and coatings, eye wash and shower station, signage, and personal protective equipment.
 - C. Backup Power – Natural Gas Generator and Automatic Transfer Switch.
 - D. Site Improvements: Site Clearing, access drive, 6-foot tall chain-link fence, 6-foot tall sliding chain link gate, blow-off pond, and restoration.

ARTICLE 2—THE PROJECT

- 2.01 The Project, of which the Work under the Contract Documents is a part, is generally described as follows: Water Supply Well No. 3 Site Improvements

ARTICLE 3—ENGINEER

- 3.01 The Owner has retained Gosling Czubak Engineering Sciences, Inc. ("Engineer") to act as Owner's representative, assume all duties and responsibilities of Engineer, and have the rights and authority assigned to Engineer in the Contract.
- 3.02 The part of the Project that pertains to the Work has been designed by Gosling Czubak Engineering Sciences, Inc.

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.

4.01 4.02 Contract Times: Days

- A. The Work will be substantially complete within 365 days after the date when the Contract Times commence to run as provided in Paragraph 4.01 of the General Conditions, and completed and ready for final payment in accordance with Paragraph 15.06 of the General Conditions within 380 days after the date when the Contract Times commence to run.

4.03 *Milestones*

- A. Parts of the Work must be substantially completed on or before the following Milestone(s):
1. Milestone 1 Well House and yard piping complete and ready to connect and startup well - 180 days from authorization to proceed

4.04 *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 \$ 300 for each 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 \$ 300 for each day that expires after such time until the Work is completed and ready for final payment.
 3. *Milestones*: Contractor shall pay Owner \$ 300 for each day that expires after the time (as duly adjusted pursuant to the Contract) specified above for achievement of Milestone 1, until Milestone 1 is achieved, or until the time specified for Substantial Completion is reached, at which time the rate indicated in Paragraph 4.05.A.1 will apply, rather than the Milestone rate.
 4. Liquidated damages for failing to timely attain Milestones, Substantial Completion, and final completion are not additive, and will not be imposed concurrently.
- 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, for such delay, except for special damages (if any) specified in this Agreement.

4.05 *Special Damages*

- A. Contractor shall reimburse Owner (1) for any fines or penalties 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 4.02 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 4.02 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 any liquidated damages for delayed completion established in this Agreement.

ARTICLE 5—CONTRACT PRICE

5.01 Owner shall pay Contractor for completion of the Work in accordance with the Contract Documents, the amounts that follow, subject to adjustment under the Contract:

- A. 5.01 Owner shall pay Contractor for completion of the Work in accordance with the Contract Documents, the amounts that follow, subject to adjustment under the Contract:
 - A. For all Work, at the prices stated in Contractor's Bid, attached hereto as an exhibit.

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 on or about the 10th day of each month during performance of the Work as provided in Paragraph 6.02.A.1 below, provided that such Applications for Payment have been submitted in a timely manner and otherwise meet the requirements of the Contract. All such payments will be measured by the Schedule of Values established as provided in the General Conditions (and in the case of Unit Price Work based on the number of units completed) or, in the event there is no Schedule of Values, as provided elsewhere in the Contract.
 - 1. Prior to Substantial Completion, progress payments will be made in an amount equal to the percentage indicated below but, in each case, less the aggregate of payments previously made and less such amounts as Owner may withhold, including but not limited to liquidated damages, in accordance with the Contract.
 - a. 10% percent 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; and

- b. 10% 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 95% percent of the Work completed, less such amounts set off by Owner pursuant to Paragraph 15.01.E of the General Conditions, and less 5% 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, 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 0.01% percent per annum.

ARTICLE 7—CONTRACT DOCUMENTS

7.01 *Contents*

- A. The Contract Documents consist of all of the following:
 - 1. This Agreement.
 - 2. Bonds:
 - a. Performance bond (together with power of attorney).
 - b. Payment bond (together with power of attorney).
 - 3. General Conditions.
 - 4. Supplementary Conditions.
 - 5. Specifications as listed in the table of contents of the project manual (copy of list attached).
 - 6. Drawings (not attached but incorporated by reference) consisting of [number] sheets with each sheet bearing the following general title: [title on Drawings].
 - 7. Drawings listed on the attached sheet index.
 - 8. Addenda (numbers [number] to [number], inclusive).
 - 9. Exhibits to this Agreement (enumerated as follows):
 - a. [list exhibits]
 - 10. The following which may be delivered or issued on or after the Effective Date of the Contract and are not attached hereto:
 - a. Notice to Proceed.

- b. Work Change Directives.
 - c. Change Orders.
 - d. Field Orders.
 - e. Warranty Bond, if any.
- B. The Contract Documents listed in Paragraph 7.01.A are attached to this Agreement (except as expressly noted otherwise above).
 - C. There are no Contract Documents other than those listed above in this Article 7.
 - D. The Contract Documents may only be amended, modified, or supplemented as provided in the Contract.

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.
 - 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 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 Supplementary Conditions, 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 Supplementary Conditions, 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 Supplementary Conditions 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. Based on the information and observations referred to in the preceding paragraph, Contractor agrees that no further examinations, investigations, explorations, tests, studies, or data are necessary for the performance of the Work at the Contract Price,

within the Contract Times, and in accordance with the other terms and conditions of the Contract.

8. 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.
9. 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.
10. The Contract Documents are generally sufficient to indicate and convey understanding of all terms and conditions for performance and furnishing of the Work.
11. 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*

- A. Owner stipulates that if the General Conditions that are made a part of this Contract are EJCDC® C-700, Standard General Conditions for the Construction Contract (2018), published by the Engineers Joint Contract Documents Committee, and if Owner is the party that has furnished said General Conditions, then Owner has plainly shown all modifications to the standard wording of such published document to the Contractor, through a process such as highlighting or "track changes" (redline/strikeout), or in the Supplementary Conditions.

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

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

Owner:

Contractor:

(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.)

(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: _____

PERFORMANCE BOND

Contractor Name: [Full formal name of Contractor] Address <i>(principal place of business)</i> : [Address of Contractor's principal place of business]	Surety Name: [Full formal name of Surety] Address <i>(principal place of business)</i> : [Address of Surety's principal place of business]
Owner Name: Haring Charter Township Mailing address <i>(principal place of business)</i> : 515 Bell Ave, Cadillac, MI 49601	Contract Description <i>(name and location)</i> : Water Supply Well No. 3 Site Improvements Contract Price: [Amount from Contract] Effective Date of Contract: [Date from Contract]
Bond Bond Amount: [Amount] Date of Bond: [Date] <i>(Date of Bond cannot be earlier than Effective Date of Contract)</i> Modifications to this Bond form: <input type="checkbox"/> None <input type="checkbox"/> See Paragraph 16	
Surety and Contractor, intending to be legally bound hereby, subject to the terms set forth in this Performance Bond, do each cause this Performance Bond to be duly executed by an authorized officer, agent, or representative.	
Contractor as Principal	Surety
<i>(Full formal name of Contractor)</i>	<i>(Full formal name of Surety) (corporate seal)</i>
By: _____	By: _____
<i>(Signature)</i>	<i>(Signature)(Attach Power of Attorney)</i>
Name: _____	Name: _____
<i>(Printed or typed)</i>	<i>(Printed or typed)</i>
Title: _____	Title: _____
Attest: _____	Attest: _____
<i>(Signature)</i>	<i>(Signature)</i>
Name: _____	Name: _____
<i>(Printed or typed)</i>	<i>(Printed or typed)</i>
Title: _____	Title: _____
<i>Notes: (1) Provide supplemental execution by any additional parties, such as joint venturers. (2) Any singular reference to Contractor, Surety, Owner, or other party is considered plural where applicable.</i>	

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 will 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 may indicate whether the Owner is requesting a conference among the Owner, Contractor, and Surety to discuss the Contractor's performance. If the Owner does not request a conference, the Surety may, within five (5) business days after receipt of the Owner's notice, request such a conference. If the Surety timely requests a conference, the Owner shall attend. Unless the Owner agrees otherwise, any conference requested under this Paragraph 3.1 will be held within ten (10) business days of the Surety's receipt of the Owner's notice. If the Owner, the Contractor, and the Surety agree, the Contractor shall be allowed a reasonable time to perform the Construction Contract, but such an agreement does not waive the Owner's right, if any, subsequently to declare a Contractor Default;
 - 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 does not constitute a failure to comply with a condition precedent to the Surety's obligations, or release the Surety from its obligations, except to the extent the Surety demonstrates actual prejudice.
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 will not be greater than those of the Contractor under the Construction Contract, and the responsibilities of the Owner to the Surety will not be greater than those of the Owner under the Construction Contract. Subject to the commitment by the Owner to pay the Balance of the Contract Price, the Surety is obligated, without duplication for:
 - 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 will not be reduced or set off on account of any such unrelated obligations. No right of action will accrue on this Bond to any person or entity other than the Owner or its heirs, executors, administrators, successors, and assigns.
- 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 must be instituted in any court of competent jurisdiction in the location in which the work or part of the work is located and must be instituted within two years after a declaration of Contractor Default or within two years after the Contractor ceased working or within two years after the Surety refuses or fails to perform its obligations under this Bond, whichever occurs first. If the provisions of this paragraph are void or prohibited by law, the minimum periods of limitations available to sureties as a defense in the jurisdiction of the suit will be applicable.
- 12. Notice to the Surety, the Owner, or the Contractor must be mailed or delivered to the address shown on the page on which their signature appears.
- 13. When this Bond has been furnished to comply with a statutory or other legal requirement in the location where the construction was to be performed, any provision in this Bond conflicting with said statutory or legal requirement will be deemed deleted therefrom and provisions conforming to such

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

14. Definitions

- 14.1. *Balance of the Contract Price*—The total amount payable by the Owner to the Contractor under the Construction Contract after all proper adjustments have been made including allowance for the Contractor for any amounts received or to be received by the Owner in settlement of insurance or other claims for damages to which the Contractor is entitled, reduced by all valid and proper payments made to or on behalf of the Contractor under the Construction Contract.
 - 14.2. *Construction Contract*—The agreement between the Owner and Contractor identified on the cover page, including all Contract Documents and changes made to the agreement and the Contract Documents.
 - 14.3. *Contractor Default*—Failure of the Contractor, which has not been remedied or waived, to perform or otherwise to comply with a material term of the Construction Contract.
 - 14.4. *Owner Default*—Failure of the Owner, which has not been remedied or waived, to pay the Contractor as required under the Construction Contract or to perform and complete or comply with the other material terms of the Construction Contract.
 - 14.5. *Contract Documents*—All the documents that comprise the agreement between the Owner and Contractor.
15. If this Bond is issued for an agreement between a contractor and subcontractor, the term Contractor in this Bond will be deemed to be Subcontractor and the term Owner will be deemed to be Contractor.
16. Modifications to this Bond are as follows: None

PAYMENT BOND

Contractor Name: [Full formal name of Contractor] Address <i>(principal place of business)</i> : [Address of Contractor's principal place of business]	Surety Name: [Full formal name of Surety] Address <i>(principal place of business)</i> : [Address of Surety's principal place of business]
Owner Name: Haring Charter Township Mailing address <i>(principal place of business)</i> : 515 Bell Ave, Cadillac, MI 49601	Contract Description <i>(name and location)</i> : Water Supply Well No. 3 Site Improvements Contract Price: [Amount, from Contract] Effective Date of Contract: [Date, from Contract]
Bond Bond Amount: [Amount] Date of Bond: [Date] <i>(Date of Bond cannot be earlier than Effective Date of Contract)</i> Modifications to this Bond form: <input type="checkbox"/> None <input type="checkbox"/> See Paragraph 18	
Surety and Contractor, intending to be legally bound hereby, subject to the terms set forth in this Payment Bond, do each cause this Payment Bond to be duly executed by an authorized officer, agent, or representative.	
Contractor as Principal	Surety
<i>(Full formal name of Contractor)</i>	<i>(Full formal name of Surety) (corporate seal)</i>
By: _____ <div style="text-align: center;"><i>(Signature)</i></div>	By: _____ <div style="text-align: center;"><i>(Signature)(Attach Power of Attorney)</i></div>
Name: _____ <div style="text-align: center;"><i>(Printed or typed)</i></div>	Name: _____ <div style="text-align: center;"><i>(Printed or typed)</i></div>
Title: _____	Title: _____
Attest: _____ <div style="text-align: center;"><i>(Signature)</i></div>	Attest: _____ <div style="text-align: center;"><i>(Signature)</i></div>
Name: _____ <div style="text-align: center;"><i>(Printed or typed)</i></div>	Name: _____ <div style="text-align: center;"><i>(Printed or typed)</i></div>
Title: _____	Title: _____
<i>Notes: (1) Provide supplemental execution by any additional parties, such as joint venturers. (2) Any singular reference to Contractor, Surety, Owner, or other party is considered plural where applicable.</i>	

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 will arise after the Owner has promptly notified the Contractor and the Surety (at the address described in Paragraph 13) of claims, demands, liens, or suits against the Owner or the Owner's property by any person or entity seeking payment for labor, materials, or equipment furnished for use in the performance of the Construction Contract, and tendered defense of such claims, demands, liens, or suits to the Contractor and the Surety.
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 will 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 will not be deemed to constitute a waiver of defenses the Surety or Contractor may have or acquire as to a Claim, except as to undisputed amounts for which the Surety and Claimant have reached agreement. If, however, the Surety fails to discharge its obligations under Paragraph 7.1 or 7.2, the Surety shall indemnify the Claimant for the reasonable attorney's fees the Claimant incurs thereafter to recover any sums found to be due and owing to the Claimant.

8. The Surety's total obligation will not exceed the amount of this Bond, plus the amount of reasonable attorney's fees provided under Paragraph 7.3, and the amount of this Bond will be credited for any payments made in good faith by the Surety.
9. Amounts owed by the Owner to the Contractor under the Construction Contract will be used for the performance of the Construction Contract and to satisfy claims, if any, under any construction performance bond. By the Contractor furnishing and the Owner accepting this Bond, they agree that all funds earned by the Contractor in the performance of the Construction Contract are dedicated to satisfying obligations of the Contractor and Surety under this Bond, subject to the Owner's priority to use the funds for the completion of the work.
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 will be commenced by a Claimant under this Bond other than in a court of competent jurisdiction in the state in which the project that is the subject of the Construction Contract is located or after the expiration of one year from the date (1) on which the Claimant sent a Claim to the Surety pursuant to Paragraph 5.1.2 or 5.2, or (2) on which the last labor or service was performed by anyone or the last materials or equipment were furnished by anyone under the Construction Contract, whichever of (1) or (2) first occurs. If the provisions of this paragraph are void or prohibited by law, the minimum period of limitation available to sureties as a defense in the jurisdiction of the suit will be applicable.
13. Notice and Claims to the Surety, the Owner, or the Contractor must be mailed or delivered to the address shown on the page on which their signature appears. Actual receipt of notice or Claims, however accomplished, will be sufficient compliance as of the date received.
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 will be deemed deleted here from and provisions conforming to such statutory or other legal requirement will be deemed incorporated herein. When so furnished, the intent is that this Bond will be construed as a statutory bond and not as a common law bond.
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:
 - 16.1.1. The name of the Claimant;
 - 16.1.2. The name of the person for whom the labor was done, or materials or equipment furnished;
 - 16.1.3. A copy of the agreement or purchase order pursuant to which labor, materials, or equipment was furnished for use in the performance of the Construction Contract;
 - 16.1.4. A brief description of the labor, materials, or equipment furnished;

- 16.1.5. The date on which the Claimant last performed labor or last furnished materials or equipment for use in the performance of the Construction Contract;
 - 16.1.6. The total amount earned by the Claimant for labor, materials, or equipment furnished as of the date of the Claim;
 - 16.1.7. The total amount of previous payments received by the Claimant; and
 - 16.1.8. 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 is to include without limitation in the terms of "labor, materials, or equipment" that part of the water, gas, power, light, heat, oil, gasoline, telephone service, or rental equipment used in the Construction Contract, architectural and engineering services required for performance of the work of the Contractor and the Contractor's subcontractors, and all other items for which a mechanic's lien may be asserted in the jurisdiction where the labor, materials, or equipment were furnished.
- 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 will be deemed to be Subcontractor and the term Owner will be deemed to be Contractor.
18. Modifications to this Bond are as follows: [Describe modification or enter "None"]

NOTICE TO PROCEED

Owner: _____ Owner's Project No.: _____
Engineer: Gosling Czubak Engineering Sciences,
 Inc. Engineer's Project No.: 240359
Contractor: _____ Contractor's Project No.: _____
Project: Water Supply Well No. 3 Site Improvements
Contract Name: Water Supply Well No. 3 Site Improvements
Effective Date of Contract: _____

Owner hereby notifies Contractor that the Contract Times under the above Contract will commence to run on [date Contract Times are to start] pursuant to Paragraph 4.01 of the General Conditions.

On that date, Contractor shall start performing its obligations under the Contract Documents. No Work will be done at the Site prior to such date.

In accordance with the Agreement:

The date by which Substantial Completion must be achieved is [date for Substantial Completion, from Agreement], and the date by which readiness for final payment must be achieved is [date for readiness, from Agreement].

Before starting any Work at the Site, Contractor must comply with the following:

[Note any access limitations, security procedures, or other restrictions]

Owner: [Full formal name of Owner]
By (*signature*): _____
Name (*printed*): _____
Title: _____
Date Issued: _____
Copy: Engineer

CHANGE ORDER NO.: [Number of Change Order]

Owner: Haring Charter Township Owner's Project No.:
 Gosling Czubak Engineering Sciences,
 Engineer: Inc. Engineer's Project No.: 240359
 Contractor: Contractor's Project No.:
 Project: Water Supply Well No. 3 Site Improvements
 Contract Name: Water Supply Well No. 3 Site Improvements
 Date Issued: Effective Date of Change Order:

The Contract is modified as follows upon execution of this Change Order:

Description:

[Description of the change]

Attachments:

[List documents related to the change]

Change in Contract Price	Change in Contract Times [State Contract Times as either a specific date or a number of days]
Original Contract Price: \$ _____	Original Contract Times: Substantial Completion: _____ Ready for final payment: _____
[Increase] [Decrease] from previously approved Change Orders No. 1 to No. [Number of previous Change Order]: \$ _____	[Increase] [Decrease] from previously approved Change Orders No.1 to No. [Number of previous Change Order]: Substantial Completion: _____ Ready for final payment: _____
Contract Price prior to this Change Order: \$ _____	Contract Times prior to this Change Order: Substantial Completion: _____ Ready for final payment: _____
[Increase] [Decrease] this Change Order: \$ _____	[Increase] [Decrease] this Change Order: Substantial Completion: _____ Ready for final payment: _____
Contract Price incorporating this Change Order: \$ _____	Contract Times with all approved Change Orders: Substantial Completion: _____ Ready for final payment: _____

Recommended by Engineer (if required)	Accepted by Contractor
By: _____	_____
Title: _____	_____
Date: _____	_____
Authorized by Owner	Approved by Funding Agency (if applicable)
By: _____	_____
Title: _____	_____
Date: _____	_____

WORK CHANGE DIRECTIVE NO.: [Number of Work Change Directive]

Owner: Haring Charter Township
Engineer: Gosling Czubak Engineering Sciences, Inc.
Contractor:
Project: Water Supply Well No. 3 Site Improvements
Contract Name: Water Supply Well No. 3 Site Improvements
Date Issued: Effective Date of Work Change Directive:

Owner's Project No.:
Engineer's Project No.: 240359
Contractor's Project No.:

Contractor is directed to proceed promptly with the following change(s):

Description:

[Description of the change to the Work]

Attachments:

[List documents related to the change to the Work]

Purpose for the Work Change Directive:

[Describe the purpose for the change to the Work]

Directive to proceed promptly with the Work described herein, prior to agreeing to change in Contract Price and Contract Time, is issued due to:

Notes to User—Check one or both of the following

☐ Non-agreement on pricing of proposed change. ☐ Necessity to proceed for schedule or other reasons.

Estimated Change in Contract Price and Contract Times (non-binding, preliminary):

Contract Price: \$ _____ [increase] [decrease] [not yet estimated].
Contract Time: _____ days [increase] [decrease] [not yet estimated].

Basis of estimated change in Contract Price:

☐ Lump Sum ☐ Unit Price ☐ Cost of the Work ☐ Other

Recommended by Engineer

Authorized by Owner

By:

Title:

Date:

FIELD ORDER NO.: [Number of Field Order]

Owner: Haring Charter Township Owner's Project No.:
Engineer: Gosling Czubak Engineering Sciences, Inc. Engineer's Project No.: 240359
Contractor: Contractor's Project No.:
Project: Water Supply Well No. 3 Site Improvements
Contract Name: Water Supply Well No. 3 Site Improvements
Date Issued: Effective Date of Field Order:

Contractor is hereby directed to promptly perform the Work described in this Field Order, issued in accordance with Paragraph 11.04 of the General Conditions, for minor changes in the Work without changes in Contract Price or Contract Times. If Contractor considers that a change in Contract Price or Contract Times is required, submit a Change Proposal before proceeding with this Work.

Reference:

Specification Section(s):

Drawing(s) / Details (s):

Description:

[Description of the change to the Work]

Attachments:

[List documents supporting change]

Issued by Engineer

By: _____

Title: _____

Date: _____

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

APPLICATION FOR PAYMENT

Prepared By



Endorsed By



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www.nspe.org

American Council of Engineering Companies
1015 15th Street N.W., Washington, DC 20005
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www.acec.org

American Society of Civil Engineers
1801 Alexander Bell Drive, Reston, VA 20191-4400
(800) 548-2723
www.asce.org

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GUIDELINES FOR THE INTENDED USE OF EJCDC C-620, APPLICATION FOR PAYMENT

1.0 PURPOSE AND INTENDED USE OF THE DOCUMENT

The Application for Payment is used to facilitate periodic progress payments to the Contractor for Work completed and for stored materials and equipment (referred to in this document as "Stored Materials").

For additional information regarding the Application for Payment, see EJCDC® C-700, Standard General Conditions of the Construction Contract (2018), Paragraph 15.01, and EJCDC® C-001, Commentary on the 2018 EJCDC Construction Documents (2018).

2.0 APPLICATION FOR PAYMENT OVERVIEW

This document was prepared in Microsoft Excel due to the number of calculations involved in the preparation of the Application for Payment. The application consists of a Summary worksheet, and 3 supporting worksheets: Lump Sum worksheet, Unit Price worksheet, and Stored Materials worksheet.

- 2.1 *Summary Worksheet* — calculates the amount to be paid to the Contractor at the end of each Application for Payment period. This calculation imports numbers from the supporting worksheets to determine the value of the Work completed and Stored Materials, calculate retainage, and deduct amounts previously paid to determine the amount the Contractor should be paid for the current application period. Application periods are typically one month; however these periods may be extended when Contractor's efforts do not result in the billable completion of Work or storage of materials and equipment during the payment period.
- 2.2 *Lump Sum Worksheet* — calculates the total value for completed Work for which compensation is paid on a Lump Sum basis. The schedule of values included in this worksheet reflects a breakdown of lump sum Work items to which Contractor and Engineer have agreed, pursuant to Article 2 of the General Conditions. Costs for Stored Materials associated with lump sum items are included on this worksheet to calculate the total value for completed lump sum Work and associated Stored Materials. This total is exported to the Summary worksheet. Separate totals for Work Completed and for materials currently stored are also exported to the Summary worksheet for use in calculating the amount of retainage to be held for each.
- 2.3 *Unit Price Worksheet* — calculates the total value for completed Work for which compensation is paid on a Unit Price basis. The schedule of values included in this spreadsheet is typically a tabulation of Unit Price items from the Agreement. Costs for Stored Materials associated with unit price items are included in this worksheet to calculate the total value for completed Unit Price Work and associated Stored Materials. This total is exported to the Summary worksheet. Separate totals for Work Completed and for Materials Currently Stored are also exported to the Summary worksheet for use in calculating the amount of retainage to be held for each.

2.4 *Stored Materials Worksheet* — calculates the total value for materials and equipment that have been purchased and are being stored until they are incorporated into the Work. This worksheet adds materials and equipment to the worksheet as they are brought to the site and stored; such Stored Materials are then deducted from the Stored Materials worksheet total as they are incorporated into the Work, providing a running net value for the materials and equipment remaining in storage. The values of Stored Materials must be manually added to the Lump Sum or Unit Price line items. These do not automatically update when changes are made. The amount of materials remaining in storage is eligible for payment but must be tracked separately from Work completed since different retainage rates may apply to Work completed and Stored Materials.

3.0 Instructions for filling out the Payment Application form

- 3.1 Project-specific information is to be entered in the top portion (header) of the Summary worksheet. This same information will automatically be copied to the other worksheets to complete the headers on all other worksheets.
- 3.2 Outside of the header, data can be entered in non-shaded cells when the sheet is protected. Cells shaded light blue contain equations that will automatically transfer data from other cells or make calculations to complete the worksheet. Altering any of these cells can result in errors in the Application for Payment. It is recommended that the worksheets be protected at all times unless alterations are deliberately being made to the Application for Payment form other than to enter data. See Paragraph 4.0 below for information on Protection of Worksheets.
- 3.3 Enter information regarding each item in the Lump Sum and/or Unit Price worksheets. For Lump Sum projects, each item should represent an item in the schedule of values prepared by the Contractor and approved by the Engineer/Owner, breaking down the Lump Sum amount into measurable components. For Unit Price contracts, use numbers from the Agreement as the schedule of values. Specific information on the data to be entered into each column may be seen by clicking on the header description for that column. Similar comments may be seen for cells in the "Totals" row that indicates how the number is calculated and where this number is exported to another part of the spreadsheet. See the Commentary for additional information.
- 3.4 The equations in the Summary worksheet use numbers imported from both the Lump Sum and Unit Price worksheets. Projects will typically either use the Lump Sum or the Unit Price worksheet, but some projects may use both. If one of the worksheets is not used, it should be hidden and not deleted. If it is deleted, Users will need to correct the equations in the Summary worksheet by unprotecting the worksheet and editing the equations. To hide a worksheet, right click on the worksheet tab at the bottom of the worksheet and select "Hide." To unhide a worksheet, right click on any worksheet tab and select "Unhide," and then select the worksheet to unhide and click "Okay." This same process may be used to hide these Guidelines for Use.

4.0 Protection of Worksheets

- 4.1 The cells in this Workbook that create the forms or contain equations have been coded to "lock" the cells that should not be altered. It is recommended that the Workbook be Protected (cells locked) at all times unless it is necessary to add or delete rows. Directions for adding and deleting rows are provided in the next section. Passwords can be used to lock the Protect / Unprotect settings on spreadsheets, however the worksheets in this workbook do not require a password.
- 4.2 To unprotect a worksheet, click on the "Review" menu tab at the top of Excel, then click "Unprotect Sheet." To protect a worksheet, click on the "Review" menu tab at the top of Excel, then click "Protect Sheet." This will open a dialog box in which the User is allowed to select protection options. It is recommended that only the top two checkboxes for "Select Locked Cells" and "Select Unlocked Cells" be checked. This will reset the protection for the Worksheet.

5.0 Adding and Deleting Rows

- 5.1 A limited number of blank rows are provided in the Lump Sum, Unit Price, and Stored Material worksheets. Additional rows may be added to these worksheets by the User. The first step in this process is to unprotect the worksheet as previously discussed. After the sheet is unprotected, move with caution to prevent inadvertently deleting any cells that contain equations. To insert a row, right click in the row heading at the left of the spreadsheet and select "Insert." A new row will be inserted at the location where the cursor was placed in the row heading. If more than one new row is desired, left click and drag the cursor to include the desired number of rows, right click in the selected row headings and then select "Insert." It is important that the line immediately above the "Totals" row not be included in the rows selected. Doing so will require that equations in the "Totals" row be adjusted. When rows are inserted, Excel automatically adjusts the equations to include the new rows, unless the row directly above the "Totals" row is also selected.
- 5.2 After new rows are inserted, it is important to copy a line from one of the original rows so correct formatting and equations are copied into each new row. To do this, select the row to be copied by clicking the cell in Column A and dragging the cursor to the last column in the table. Then select "Copy" from the menu or type CTRL+C to copy the cells. Excel will show that this row has been copied by showing a moving dashed line around the cells that are to be copied. Then select the new rows into which the information is to be copied as before and select Paste from the menu or type CTRL+V.
- 5.3 To delete an unused row, right click in the row heading on the left of the spreadsheet for the row to be deleted and select "Delete." The selected row will be deleted. If more than one row is to be deleted, left click and drag the cursor to the desired number of rows to be deleted and then right click to open the menu and select "Delete." Unlike the admonition on adding new rows, it is okay to delete the row just above the "Totals" row.
- 5.4 After rows have been added or deleted, it is important reset the worksheet protection.

6.0 Saving Files

This file is provided as a Microsoft® Excel Open XML workbook template (.xltx) to prevent this file from being inadvertently changed. When an application for payment is created for a specific project it should be saved as an Excel workbook (.xlsx) file. To do this, select Save As (F12), type in a new file name and select Excel Workbook (.xlsx) from the drop down Save As Type menu.

7.0 License Agreement

This document is subject to the terms and conditions of the License Agreement, 2018 EJCDC® Construction Series Documents. A copy of the License Agreement was furnished at the time of purchase of this document, and is available for review at www.ejcdc.org and the websites of EJCDC's sponsoring organizations.

Contractor's Application for Payment

Owner: _____ Engineer: _____ Contractor: _____ Project: _____ Contract: _____	Owner's Project No.: _____ Engineer's Project No.: _____ Contractor's Project No.: _____
Application No.: _____ Application Date: _____ Application Period: From _____ to _____	

1. Original Contract Price	\$	-
2. Net change by Change Orders	\$	-
3. Current Contract Price (Line 1 + Line 2)	\$	-
4. Total Work completed and materials stored to date (Sum of Column G Lump Sum Total and Column J Unit Price Total)	\$	-
5. Retainage		
a. _____ X \$ _____ Work Completed	\$	-
b. _____ X \$ _____ Stored Materials	\$	-
c. Total Retainage (Line 5.a + Line 5.b)	\$	-
6. Amount eligible to date (Line 4 - Line 5.c)	\$	-
7. Less previous payments (Line 6 from prior application)		
8. Amount due this application	\$	-
9. Balance to finish, including retainage (Line 3 - Line 4)	\$	-

Contractor's Certification

The undersigned Contractor certifies, to the best of its knowledge, the following:

(1) All previous progress payments received from Owner on account of Work done under the Contract have been applied on account to discharge Contractor's legitimate obligations incurred in connection with the Work covered by prior Applications for Payment;

(2) Title to all Work, materials and equipment incorporated in said Work, or otherwise listed in or covered by this Application for Payment, will pass to Owner at time of payment free and clear of all liens, security interests, and encumbrances (except such as are covered by a bond acceptable to Owner indemnifying Owner against any such liens, security interest, or encumbrances); and

(3) All the Work covered by this Application for Payment is in accordance with the Contract Documents and is not defective.

Contractor: _____	
Signature: _____	Date: _____

Recommended by Engineer By: _____ Title: _____ Date: _____	Approved by Owner By: _____ Title: _____ Date: _____
Approved by Funding Agency By: _____ Title: _____ Date: _____	By: _____ Title: _____ Date: _____

Progress Estimate - Lump Sum Work

Contractor's Application for Payment

Owner: _____					Owner's Project No.: _____			
Engineer: _____					Engineer's Project No.: _____			
Contractor: _____					Contractor's Project No.: _____			
Project: _____								
Contract: _____								
Application No.: _____ Application Period: From _____ to _____ Application Date: _____								
A	B	C	D	E	F	G	H	I
Item No.	Description	Scheduled Value (\$)	Work Completed		Materials Currently Stored (not in D or E) (\$)	Work Completed and Materials Stored to Date (D + E + F) (\$)	% of Scheduled Value (G / C) (%)	Balance to Finish (C - G) (\$)
			(D + E) From Previous Application (\$)	This Period (\$)				
Original Contract								
			-			-		-
						-		-
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						-		-
Original Contract Totals		\$ -	\$ -	\$ -	\$ -	\$ -		\$ -

Progress Estimate - Lump Sum Work

Contractor's Application for Payment

[illegible]

Progress Estimate - Unit Price Work

Contractor's Application for Payment

Owner:		Owner's Project No.:	
Engineer:		Engineer's Project No.:	
Contractor:		Contractor's Project No.:	
Project:			
Contract:			

Application No.: _____ Application Period: From _____ to _____ Application Date: _____

A	B	C	D	E	F	G	H	I	J	K	L
Bid Item No.		Contract Information				Work Completed		Materials Currently Stored (not in G) (\$)	Work Completed and Materials Stored to Date (H + I) (\$)	% of Value of Item (J / F) (%)	Balance to Finish (F - J) (\$)
		Item Quantity	Units	Unit Price (\$)	Value of Bid Item (C X E) (\$)	Estimated Quantity Incorporated in the Work	Value of Work Completed to Date (E X G) (\$)				
Original Contract											
					-		-		-		-
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Original Contract Totals					\$ -		\$ -	\$ -	\$ -		\$ -

Contractor's Application for Payment

Unit Price

Stored Materials Summary

Contractor's Application for Payment

<div style="float:left; width:80%;">Owner:</div> <div style="clear:both;"></div>							<div style="float:right;">Owner's Project No.: _____</div>						
<div style="float:left; width:80%;">Engineer:</div> <div style="clear:both;"></div>							<div style="float:right;">Engineer's Project No.: _____</div>						
<div style="float:left; width:80%;">Contractor:</div> <div style="clear:both;"></div>							<div style="float:right;">Contractor's Project No.: _____</div>						
<div style="float:left; width:80%;">Project:</div> <div style="clear:both;"></div>													
<div style="float:left; width:80%;">Contract:</div> <div style="clear:both;"></div>													
Application No.:		Application Period: From				to			Application Date:				
A	B	C	D	E	F	G	H	I	J	K	L	M	
Item No. (Lump Sum Tab) or Bid Item No. (Unit Price Tab)	Supplier Invoice No.	Submittal No. (with Specification Section No.)	Description of Materials or Equipment Stored	Storage Location	Application No. When Materials Placed in Storage	Materials Stored			Incorporated in Work			Materials Remaining in Storage (I-L) (\$)	
						Previous Amount Stored (\$)	Amount Stored this Period (\$)	Amount Stored to Date (G+H) (\$)	Amount Previously Incorporated in the Work (\$)	Amount Incorporated in the Work this Period (\$)	Total Amount Incorporated in the Work (J+K) (\$)		
								-			-	-	
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Totals						\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	

CERTIFICATE OF SUBSTANTIAL COMPLETION

Owner: Haring Charter Township Owner's Project No.:
Gosling Czubak Engineering Sciences,
Engineer: Inc. Engineer's Project No.: 240359
Contractor: Contractor's Project No.:
Project: Water Supply Well No. 3 Site Improvements
Contract Name: Water Supply Well No. 3 Site Improvements

This ☐ Preliminary ☐ Final Certificate of Substantial Completion applies to:

☐ All Work ☐ The following specified portions of the Work:

[Describe the portion of the work for which Certificate of Substantial Completion is issued]

Date of Substantial Completion: [Enter date, as determined by Engineer]

The Work to which this Certificate applies has been inspected by authorized representatives of Owner, Contractor, and Engineer, and found to be substantially complete. The Date of Substantial Completion of the Work or portion thereof designated above is hereby established, subject to the provisions of the Contract pertaining to Substantial Completion. The date of Substantial Completion in the final Certificate of Substantial Completion marks the commencement of the contractual correction period and applicable warranties required by the Contract.

A punch list of items to be completed or corrected is attached to this Certificate. This list may not be all-inclusive, and the failure to include any items on such list does not alter the responsibility of the Contractor to complete all Work in accordance with the Contract Documents.

Amendments of contractual responsibilities recorded in this Certificate should be the product of mutual agreement of Owner and Contractor; see Paragraph 15.03.D of the General Conditions.

The responsibilities between Owner and Contractor for security, operation, safety, maintenance, heat, utilities, insurance, and warranties upon Owner's use or occupancy of the Work must be as provided in the Contract, except as amended as follows:

Amendments to Owner's Responsibilities: ☐ None ☐ As follows:

[List amendments to Owner's Responsibilities]

Amendments to Contractor's Responsibilities: ☐ None ☐ As follows:

[List amendments to Contractor's Responsibilities]

The following documents are attached to and made a part of this Certificate:

[List attachments such as punch list; other documents]

This Certificate does not constitute an acceptance of Work not in accordance with the Contract Documents, nor is it a release of Contractor's obligation to complete the Work in accordance with the Contract Documents.

Engineer

By (signature): _____

Name (printed): _____

Title: _____

NOTICE OF ACCEPTABILITY OF WORK

Owner: Haring Charter Township Owner's Project No.:
Engineer: Gosling Czubak Engineering Sciences, Inc. Engineer's Project No.: 240359
Contractor: Contractor's Project No.:
Project: Water Supply Well No. 3 Site Improvements
Contract Name: Water Supply Well No. 3 Site Improvements
Notice Date: Effective Date of the Construction Contract:

The Engineer hereby gives notice to the Owner and Contractor that Engineer recommends final payment to Contractor, and that the Work furnished and performed by Contractor under the Construction Contract is acceptable, expressly subject to the provisions of the Construction Contract's Contract Documents ("Contract Documents") and of the Agreement between Owner and Engineer for Professional Services dated [date of professional services agreement] ("Owner-Engineer Agreement"). This Notice of Acceptability of Work (Notice) is made expressly subject to the following terms and conditions to which all who receive and rely on said Notice agree:

1. This Notice has been prepared with the skill and care ordinarily used by members of the engineering profession practicing under similar conditions at the same time and in the same locality.
2. This Notice reflects and is an expression of the Engineer's professional opinion.
3. This Notice has been prepared to the best of Engineer's knowledge, information, and belief as of the Notice Date.
4. This Notice is based entirely on and expressly limited by the scope of services Engineer has been employed by Owner to perform or furnish during construction of the Project (including observation of the Contractor's Work) under the Owner-Engineer Agreement, and applies only to facts that are within Engineer's knowledge or could reasonably have been ascertained by Engineer as a result of carrying out the responsibilities specifically assigned to Engineer under such Owner-Engineer Agreement.
5. This Notice is not a guarantee or warranty of Contractor's performance under the Construction Contract, an acceptance of Work that is not in accordance with the Contract Documents, including but not limited to defective Work discovered after final inspection, nor an assumption of responsibility for any failure of Contractor to furnish and perform the Work thereunder in accordance with the Contract Documents, or to otherwise comply with the Contract Documents or the terms of any special guarantees specified therein.
6. This Notice does not relieve Contractor of any surviving obligations under the Construction Contract, and is subject to Owner's reservations of rights with respect to completion and final payment.

Engineer

By *(signature)*: _____

Name *(printed)*: _____

Title: _____

STANDARD GENERAL CONDITIONS OF THE CONSTRUCTION CONTRACT

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STANDARD GENERAL CONDITIONS OF THE CONSTRUCTION CONTRACT

ARTICLE 1—DEFINITIONS AND TERMINOLOGY

1.01 *Defined Terms*

- A. Wherever used in the Bidding Requirements or Contract Documents, a term printed with initial capital letters, including the term's singular and plural forms, will have the meaning indicated in the definitions below. In addition to terms specifically defined, terms with initial capital letters in the Contract Documents include references to identified articles and paragraphs, and the titles of other documents or forms.
1. *Addenda*—Written or graphic instruments issued prior to the opening of Bids which clarify, correct, or change the Bidding Requirements or the proposed Contract Documents.
 2. *Agreement*—The written instrument, executed by Owner and Contractor, that sets forth the Contract Price and Contract Times, identifies the parties and the Engineer, and designates the specific items that are Contract Documents.
 3. *Application for Payment*—The document prepared by Contractor, in a form acceptable to Engineer, to request progress or final payments, and which is to be accompanied by such supporting documentation as is required by the Contract Documents.
 4. *Bid*—The offer of a Bidder submitted on the prescribed form setting forth the prices for the Work to be performed.
 5. *Bidder*—An individual or entity that submits a Bid to Owner.
 6. *Bidding Documents*—The Bidding Requirements, the proposed Contract Documents, and all Addenda.
 7. *Bidding Requirements*—The Advertisement or invitation to bid, Instructions to Bidders, Bid Bond or other Bid security, if any, the Bid Form, and the Bid with any attachments.
 8. *Change Order*—A document which is signed by Contractor and Owner and authorizes an addition, deletion, or revision in the Work or an adjustment in the Contract Price or the Contract Times, or other revision to the Contract, issued on or after the Effective Date of the Contract.
 9. *Change Proposal*—A written request by Contractor, duly submitted in compliance with the procedural requirements set forth herein, seeking an adjustment in Contract Price or Contract Times; contesting an initial decision by Engineer concerning the requirements of the Contract Documents or the acceptability of Work under the Contract Documents; challenging a set-off against payments due; or seeking other relief with respect to the terms of the Contract.
 10. *Claim*
 - a. A demand or assertion by Owner directly to Contractor, duly submitted in compliance with the procedural requirements set forth herein, seeking an adjustment of Contract Price or Contract Times; contesting an initial decision by Engineer concerning the

requirements of the Contract Documents or the acceptability of Work under the Contract Documents; contesting Engineer's decision regarding a Change Proposal; seeking resolution of a contractual issue that Engineer has declined to address; or seeking other relief with respect to the terms of the Contract.

- b. A demand or assertion by Contractor directly to Owner, duly submitted in compliance with the procedural requirements set forth herein, contesting Engineer's decision regarding a Change Proposal, or seeking resolution of a contractual issue that Engineer has declined to address.
 - c. A demand or assertion by Owner or Contractor, duly submitted in compliance with the procedural requirements set forth herein, made pursuant to Paragraph 12.01.A.4, concerning disputes arising after Engineer has issued a recommendation of final payment.
 - d. A demand for money or services by a third party is not a Claim.
11. *Constituent of Concern*—Asbestos, petroleum, radioactive materials, polychlorinated biphenyls (PCBs), lead-based paint (as defined by the HUD/EPA standard), hazardous waste, and any substance, product, waste, or other material of any nature whatsoever that is or becomes listed, regulated, or addressed pursuant to Laws and Regulations regulating, relating to, or imposing liability or standards of conduct concerning, any hazardous, toxic, or dangerous waste, substance, or material.
12. *Contract*—The entire and integrated written contract between Owner and Contractor concerning the Work.
13. *Contract Documents*—Those items so designated in the Agreement, and which together comprise the Contract.
14. *Contract Price*—The money that Owner has agreed to pay Contractor for completion of the Work in accordance with the Contract Documents.
15. *Contract Times*—The number of days or the dates by which Contractor shall: (a) achieve Milestones, if any; (b) achieve Substantial Completion; and (c) complete the Work.
16. *Contractor*—The individual or entity with which Owner has contracted for performance of the Work.
17. *Cost of the Work*—See Paragraph 13.01 for definition.
18. *Drawings*—The part of the Contract that graphically shows the scope, extent, and character of the Work to be performed by Contractor.
19. *Effective Date of the Contract*—The date, indicated in the Agreement, on which the Contract becomes effective.
20. *Electronic Document*—Any Project-related correspondence, attachments to correspondence, data, documents, drawings, information, or graphics, including but not limited to Shop Drawings and other Submittals, that are in an electronic or digital format.
21. *Electronic Means*—Electronic mail (email), upload/download from a secure Project website, or other communications methods that allow: (a) the transmission or communication of Electronic Documents; (b) the documentation of transmissions, including sending and receipt; (c) printing of the transmitted Electronic Document by the

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

22. *Engineer*—The individual or entity named as such in the Agreement.
23. *Field Order*—A written order issued by Engineer which requires minor changes in the Work but does not change the Contract Price or the Contract Times.
24. *Hazardous Environmental Condition*—The presence at the Site of Constituents of Concern in such quantities or circumstances that may present a danger to persons or property exposed thereto.
 - a. The presence at the Site of materials that are necessary for the execution of the Work, or that are to be incorporated into the Work, and that are controlled and contained pursuant to industry practices, Laws and Regulations, and the requirements of the Contract, is not a Hazardous Environmental Condition.
 - b. The presence of Constituents of Concern that are to be removed or remediated as part of the Work is not a Hazardous Environmental Condition.
 - c. The presence of Constituents of Concern as part of the routine, anticipated, and obvious working conditions at the Site, is not a Hazardous Environmental Condition.
25. *Laws and Regulations; Laws or Regulations*—Any and all applicable laws, statutes, rules, regulations, ordinances, codes, and binding decrees, resolutions, and orders of any and all governmental bodies, agencies, authorities, and courts having jurisdiction.
26. *Liens*—Charges, security interests, or encumbrances upon Contract-related funds, real property, or personal property.
27. *Milestone*—A principal event in the performance of the Work that the Contract requires Contractor to achieve by an intermediate completion date, or by a time prior to Substantial Completion of all the Work.
28. *Notice of Award*—The written notice by Owner to a Bidder of Owner's acceptance of the Bid.
29. *Notice to Proceed*—A written notice by Owner to Contractor fixing the date on which the Contract Times will commence to run and on which Contractor shall start to perform the Work.
30. *Owner*—The individual or entity with which Contractor has contracted regarding the Work, and which has agreed to pay Contractor for the performance of the Work, pursuant to the terms of the Contract.
31. *Progress Schedule*—A schedule, prepared and maintained by Contractor, describing the sequence and duration of the activities comprising Contractor's plan to accomplish the Work within the Contract Times.
32. *Project*—The total undertaking to be accomplished for Owner by engineers, contractors, and others, including planning, study, design, construction, testing, commissioning, and start-up, and of which the Work to be performed under the Contract Documents is a part.

33. *Resident Project Representative*—The authorized representative of Engineer assigned to assist Engineer at the Site. As used herein, the term Resident Project Representative (RPR) includes any assistants or field staff of Resident Project Representative.
34. *Samples*—Physical examples of materials, equipment, or workmanship that are representative of some portion of the Work and that establish the standards by which such portion of the Work will be judged.
35. *Schedule of Submittals*—A schedule, prepared and maintained by Contractor, of required submittals and the time requirements for Engineer's review of the submittals.
36. *Schedule of Values*—A schedule, prepared and maintained by Contractor, allocating portions of the Contract Price to various portions of the Work and used as the basis for reviewing Contractor's Applications for Payment.
37. *Shop Drawings*—All drawings, diagrams, illustrations, schedules, and other data or information that are specifically prepared or assembled by or for Contractor and submitted by Contractor to illustrate some portion of the Work. Shop Drawings, whether approved or not, are not Drawings and are not Contract Documents.
38. *Site*—Lands or areas indicated in the Contract Documents as being furnished by Owner upon which the Work is to be performed, including rights-of-way and easements, and such other lands or areas furnished by Owner which are designated for the use of Contractor.
39. *Specifications*—The part of the Contract that consists of written requirements for materials, equipment, systems, standards, and workmanship as applied to the Work, and certain administrative requirements and procedural matters applicable to the Work.
40. *Subcontractor*—An individual or entity having a direct contract with Contractor or with any other Subcontractor for the performance of a part of the Work.
41. *Submittal*—A written or graphic document, prepared by or for Contractor, which the Contract Documents require Contractor to submit to Engineer, or that is indicated as a Submittal in the Schedule of Submittals accepted by Engineer. Submittals may include Shop Drawings and Samples; schedules; product data; Owner-delegated designs; sustainable design information; information on special procedures; testing plans; results of tests and evaluations, source quality-control testing and inspections, and field or Site quality-control testing and inspections; warranties and certifications; Suppliers' instructions and reports; records of delivery of spare parts and tools; operations and maintenance data; Project photographic documentation; record documents; and other such documents required by the Contract Documents. Submittals, whether or not approved or accepted by Engineer, are not Contract Documents. Change Proposals, Change Orders, Claims, notices, Applications for Payment, and requests for interpretation or clarification are not Submittals.
42. *Substantial Completion*—The time at which the Work (or a specified part thereof) has progressed to the point where, in the opinion of Engineer, the Work (or a specified part thereof) is sufficiently complete, in accordance with the Contract Documents, so that the Work (or a specified part thereof) can be utilized for the purposes for which it is intended. The terms "substantially complete" and "substantially completed" as applied to all or part of the Work refer to Substantial Completion of such Work.

43. *Successful Bidder*—The Bidder to which the Owner makes an award of contract.
44. *Supplementary Conditions*—The part of the Contract that amends or supplements these General Conditions.
45. *Supplier*—A manufacturer, fabricator, supplier, distributor, or vendor having a direct contract with Contractor or with any Subcontractor to furnish materials or equipment to be incorporated in the Work by Contractor or a Subcontractor.
46. *Technical Data*
- a. Those items expressly identified as Technical Data in the Supplementary Conditions, with respect to either (1) existing subsurface conditions at or adjacent to the Site, or existing physical conditions at or adjacent to the Site including existing surface or subsurface structures (except Underground Facilities) or (2) Hazardous Environmental Conditions at the Site.
 - b. If no such express identifications of Technical Data have been made with respect to conditions at the Site, then Technical Data is defined, with respect to conditions at the Site under Paragraphs 5.03, 5.04, and 5.06, as the data contained in boring logs, recorded measurements of subsurface water levels, assessments of the condition of subsurface facilities, laboratory test results, and other factual, objective information regarding conditions at the Site that are set forth in any geotechnical, environmental, or other Site or facilities conditions report prepared for the Project and made available to Contractor.
 - c. Information and data regarding the presence or location of Underground Facilities are not intended to be categorized, identified, or defined as Technical Data, and instead Underground Facilities are shown or indicated on the Drawings.
47. *Underground Facilities*—All active or not-in-service underground lines, pipelines, conduits, ducts, encasements, cables, wires, manholes, vaults, tanks, tunnels, or other such facilities or systems at the Site, including but not limited to those facilities or systems that produce, transmit, distribute, or convey telephone or other communications, cable television, fiber optic transmissions, power, electricity, light, heat, gases, oil, crude oil products, liquid petroleum products, water, steam, waste, wastewater, storm water, other liquids or chemicals, or traffic or other control systems. An abandoned facility or system is not an Underground Facility.
48. *Unit Price Work*—Work to be paid for on the basis of unit prices.
49. *Work*—The entire construction or the various separately identifiable parts thereof required to be provided under the Contract Documents. Work includes and is the result of performing or providing all labor, services, and documentation necessary to produce such construction; furnishing, installing, and incorporating all materials and equipment into such construction; and may include related services such as testing, start-up, and commissioning, all as required by the Contract Documents.
50. *Work Change Directive*—A written directive to Contractor issued on or after the Effective Date of the Contract, signed by Owner and recommended by Engineer, ordering an addition, deletion, or revision in the Work.

1.02 Terminology

- A. The words and terms discussed in Paragraphs 1.02.B, C, D, and E are not defined terms that require initial capital letters, but, when used in the Bidding Requirements or Contract Documents, have the indicated meaning.
- B. *Intent of Certain Terms or Adjectives:* The Contract Documents include the terms "as allowed," "as approved," "as ordered," "as directed" or terms of like effect or import to authorize an exercise of professional judgment by Engineer. In addition, the adjectives "reasonable," "suitable," "acceptable," "proper," "satisfactory," or adjectives of like effect or import are used to describe an action or determination of Engineer as to the Work. It is intended that such exercise of professional judgment, action, or determination will be solely to evaluate, in general, the Work for compliance with the information in the Contract Documents and with the design concept of the Project as a functioning whole as shown or indicated in the Contract Documents (unless there is a specific statement indicating otherwise). The use of any such term or adjective is not intended to and shall not be effective to assign to Engineer any duty or authority to supervise or direct the performance of the Work, or any duty or authority to undertake responsibility contrary to the provisions of Article 10 or any other provision of the Contract Documents.
- C. *Day:* The word "day" means a calendar day of 24 hours measured from midnight to the next midnight.
- D. *Defective:* The word "defective," when modifying the word "Work," refers to Work that is unsatisfactory, faulty, or deficient in that it:
 - 1. does not conform to the Contract Documents;
 - 2. does not meet the requirements of any applicable inspection, reference standard, test, or approval referred to in the Contract Documents; or
 - 3. has been damaged prior to Engineer's recommendation of final payment (unless responsibility for the protection thereof has been assumed by Owner at Substantial Completion in accordance with Paragraph 15.03 or Paragraph 15.04).
- E. *Furnish, Install, Perform, Provide*
 - 1. The word "furnish," when used in connection with services, materials, or equipment, means to supply and deliver said services, materials, or equipment to the Site (or some other specified location) ready for use or installation and in usable or operable condition.
 - 2. The word "install," when used in connection with services, materials, or equipment, means to put into use or place in final position said services, materials, or equipment complete and ready for intended use.
 - 3. The words "perform" or "provide," when used in connection with services, materials, or equipment, means to furnish and install said services, materials, or equipment complete and ready for intended use.
 - 4. If the Contract Documents establish an obligation of Contractor with respect to specific services, materials, or equipment, but do not expressly use any of the four words "furnish," "install," "perform," or "provide," then Contractor shall furnish and install said services, materials, or equipment complete and ready for intended use.

- F. *Contract Price or Contract Times*: References to a change in “Contract Price or Contract Times” or “Contract Times or Contract Price” or similar, indicate that such change applies to (1) Contract Price, (2) Contract Times, or (3) both Contract Price and Contract Times, as warranted, even if the term “or both” is not expressed.
- G. Unless stated otherwise in the Contract Documents, words or phrases that have a well-known technical or construction industry or trade meaning are used in the Contract Documents in accordance with such recognized meaning.

ARTICLE 2—PRELIMINARY MATTERS

2.01 *Delivery of Performance and Payment Bonds; Evidence of Insurance*

- A. *Performance and Payment Bonds*: When Contractor delivers the signed counterparts of the Agreement to Owner, Contractor shall also deliver to Owner the performance bond and payment bond (if the Contract requires Contractor to furnish such bonds).
- B. *Evidence of Contractor's Insurance*: When Contractor delivers the signed counterparts of the Agreement to Owner, Contractor shall also deliver to Owner, with copies to each additional insured (as identified in the Contract), the certificates, endorsements, and other evidence of insurance required to be provided by Contractor in accordance with Article 6, except to the extent the Supplementary Conditions expressly establish other dates for delivery of specific insurance policies.
- C. *Evidence of Owner's Insurance*: After receipt of the signed counterparts of the Agreement and all required bonds and insurance documentation, Owner shall promptly deliver to Contractor, with copies to each additional insured (as identified in the Contract), the certificates and other evidence of insurance required to be provided by Owner under Article 6.

2.02 *Copies of Documents*

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

2.03 *Before Starting Construction*

- A. *Preliminary Schedules*: Within 10 days after the Effective Date of the Contract (or as otherwise required by the Contract Documents), Contractor shall submit to Engineer for timely review:
 - 1. a preliminary Progress Schedule indicating the times (numbers of days or dates) for starting and completing the various stages of the Work, including any Milestones specified in the Contract;
 - 2. a preliminary Schedule of Submittals; and
 - 3. a preliminary Schedule of Values for all of the Work which includes quantities and prices of items which when added together equal the Contract Price and subdivides the Work

into component parts in sufficient detail to serve as the basis for progress payments during performance of the Work. Such prices will include an appropriate amount of overhead and profit applicable to each item of Work.

2.04 *Preconstruction Conference; Designation of Authorized Representatives*

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

2.05 *Acceptance of Schedules*

- A. At least 10 days before submission of the first Application for Payment a conference, attended by Contractor, Engineer, and others as appropriate, will be held to review the schedules submitted in accordance with Paragraph 2.03.A. No progress payment will be made to Contractor until acceptable schedules are submitted to Engineer.
 - 1. The Progress Schedule will be acceptable to Engineer if it provides an orderly progression of the Work to completion within the Contract Times. Such acceptance will not impose on Engineer responsibility for the Progress Schedule, for sequencing, scheduling, or progress of the Work, nor interfere with or relieve Contractor from Contractor's full responsibility therefor.
 - 2. Contractor's Schedule of Submittals will be acceptable to Engineer if it provides a workable arrangement for reviewing and processing the required submittals.
 - 3. Contractor's Schedule of Values will be acceptable to Engineer as to form and substance if it provides a reasonable allocation of the Contract Price to the component parts of the Work.
 - 4. If a schedule is not acceptable, Contractor will have an additional 10 days to revise and resubmit the schedule.

2.06 *Electronic Transmittals*

- A. Except as otherwise stated elsewhere in the Contract, the Owner, Engineer, and Contractor may send, and shall accept, Electronic Documents transmitted by Electronic Means.
- B. If the Contract does not establish protocols for Electronic Means, then Owner, Engineer, and Contractor shall jointly develop such protocols.
- C. Subject to any governing protocols for Electronic Means, when transmitting Electronic Documents by Electronic Means, the transmitting party makes no representations as to long-term compatibility, usability, or readability of the Electronic Documents resulting from the recipient's use of software application packages, operating systems, or computer hardware differing from those used in the drafting or transmittal of the Electronic Documents.

ARTICLE 3—CONTRACT DOCUMENTS: INTENT, REQUIREMENTS, REUSE

3.01 *Intent*

- A. The Contract Documents are complementary; what is required by one Contract Document is as binding as if required by all.
- B. It is the intent of the Contract Documents to describe a functionally complete Project (or part thereof) to be constructed in accordance with the Contract Documents.
- C. Unless otherwise stated in the Contract Documents, if there is a discrepancy between the electronic versions of the Contract Documents (including any printed copies derived from such electronic versions) and the printed record version, the printed record version will govern.
- D. The Contract supersedes prior negotiations, representations, and agreements, whether written or oral.
- E. Engineer will issue clarifications and interpretations of the Contract Documents as provided herein.
- F. Any provision or part of the Contract Documents held to be void or unenforceable under any Law or Regulation will be deemed stricken, and all remaining provisions will continue to be valid and binding upon Owner and Contractor, which agree that the Contract Documents will be reformed to replace such stricken provision or part thereof with a valid and enforceable provision that comes as close as possible to expressing the intention of the stricken provision.
- G. Nothing in the Contract Documents creates:
 - 1. any contractual relationship between Owner or Engineer and any Subcontractor, Supplier, or other individual or entity performing or furnishing any of the Work, for the benefit of such Subcontractor, Supplier, or other individual or entity; or
 - 2. any obligation on the part of Owner or Engineer to pay or to see to the payment of any money due any such Subcontractor, Supplier, or other individual or entity, except as may otherwise be required by Laws and Regulations.

3.02 *Reference Standards*

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

inconsistent with the provisions of the part of the Contract Documents prepared by or for Engineer.

3.03 *Reporting and Resolving Discrepancies*

A. *Reporting Discrepancies*

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

B. *Resolving Discrepancies*

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

3.04 *Requirements of the Contract Documents*

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

- B. Engineer will, with reasonable promptness, render a written clarification, interpretation, or decision on the issue submitted, or initiate an amendment or supplement to the Contract Documents. Engineer's written clarification, interpretation, or decision will be final and binding on Contractor, unless it appeals by submitting a Change Proposal, and on Owner, unless it appeals by filing a Claim.
- C. If a submitted matter in question concerns terms and conditions of the Contract Documents that do not involve (1) the performance or acceptability of the Work under the Contract Documents, (2) the design (as set forth in the Drawings, Specifications, or otherwise), or (3) other engineering or technical matters, then Engineer will promptly notify Owner and Contractor in writing that Engineer is unable to provide a decision or interpretation. If Owner and Contractor are unable to agree on resolution of such a matter in question, either party may pursue resolution as provided in Article 12.

3.05 *Reuse of Documents*

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

ARTICLE 4—COMMENCEMENT AND PROGRESS OF THE WORK

4.01 *Commencement of Contract Times; Notice to Proceed*

- A. The Contract Times will commence to run on the 30th day after the Effective Date of the Contract or, if a Notice to Proceed is given, on the day indicated in the Notice to Proceed. A Notice to Proceed may be given at any time within 30 days after the Effective Date of the Contract. In no event will the Contract Times commence to run later than the 60th day after the day of Bid opening or the 30th day after the Effective Date of the Contract, whichever date is earlier.

4.02 *Starting the Work*

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

4.03 *Reference Points*

- A. Owner shall provide engineering surveys to establish reference points for construction which in Engineer's judgment are necessary to enable Contractor to proceed with the Work. Contractor shall be responsible for laying out the Work, shall protect and preserve the

established reference points and property monuments, and shall make no changes or relocations without the prior written approval of Owner. Contractor shall report to Engineer whenever any reference point or property monument is lost or destroyed or requires relocation because of necessary changes in grades or locations, and shall be responsible for the accurate replacement or relocation of such reference points or property monuments by professionally qualified personnel.

4.04 *Progress Schedule*

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

4.05 *Delays in Contractor's Progress*

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

- D. Contractor's entitlement to an adjustment of Contract Times or Contract Price is limited as follows:
1. Contractor's entitlement to an adjustment of the Contract Times is conditioned on the delay, disruption, or interference adversely affecting an activity on the critical path to completion of the Work, as of the time of the delay, disruption, or interference.
 2. Contractor shall not be entitled to an adjustment in Contract Price for any delay, disruption, or interference if such delay is concurrent with a delay, disruption, or interference caused by or within the control of Contractor. Such a concurrent delay by Contractor shall not preclude an adjustment of Contract Times to which Contractor is otherwise entitled.
 3. Adjustments of Contract Times or Contract Price are subject to the provisions of Article 11.
- E. Each Contractor request or Change Proposal seeking an increase in Contract Times or Contract Price must be supplemented by supporting data that sets forth in detail the following:
1. The circumstances that form the basis for the requested adjustment;
 2. The date upon which each cause of delay, disruption, or interference began to affect the progress of the Work;
 3. The date upon which each cause of delay, disruption, or interference ceased to affect the progress of the Work;
 4. The number of days' increase in Contract Times claimed as a consequence of each such cause of delay, disruption, or interference; and
 5. The impact on Contract Price, in accordance with the provisions of Paragraph 11.07.
- Contractor shall also furnish such additional supporting documentation as Owner or Engineer may require including, where appropriate, a revised progress schedule indicating all the activities affected by the delay, disruption, or interference, and an explanation of the effect of the delay, disruption, or interference on the critical path to completion of the Work.
- F. Delays, disruption, and interference to the performance or progress of the Work resulting from the existence of a differing subsurface or physical condition, an Underground Facility that was not shown or indicated by the Contract Documents, or not shown or indicated with reasonable accuracy, and those resulting from Hazardous Environmental Conditions, are governed by Article 5, together with the provisions of Paragraphs 4.05.D and 4.05.E.
- G. Paragraph 8.03 addresses delays, disruption, and interference to the performance or progress of the Work resulting from the performance of certain other work at or adjacent to the Site.

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

5.01 *Availability of Lands*

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

- B. Upon reasonable written request, Owner shall furnish Contractor with a current statement of record legal title and legal description of the lands upon which permanent improvements are to be made and Owner's interest therein as necessary for giving notice of or filing a mechanic's or construction lien against such lands in accordance with applicable Laws and Regulations.
- C. Contractor shall provide for all additional lands and access thereto that may be required for temporary construction facilities or storage of materials and equipment.

5.02 *Use of Site and Other Areas*

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

1. Contractor shall confine construction equipment, temporary construction facilities, the storage of materials and equipment, and the operations of workers to the Site, adjacent areas that Contractor has arranged to use through construction easements or otherwise, and other adjacent areas permitted by Laws and Regulations, and shall not unreasonably encumber the Site and such other adjacent areas with construction equipment or other materials or equipment. Contractor shall assume full responsibility for (a) damage to the Site; (b) damage to any such other adjacent areas used for Contractor's operations; (c) damage to any other adjacent land or areas, or to improvements, structures, utilities, or similar facilities located at such adjacent lands or areas; and (d) for injuries and losses sustained by the owners or occupants of any such land or areas; provided that such damage or injuries result from the performance of the Work or from other actions or conduct of the Contractor or those for which Contractor is responsible.
 2. If a damage or injury claim is made by the owner or occupant of any such land or area because of the performance of the Work, or because of other actions or conduct of the Contractor or those for which Contractor is responsible, Contractor shall (a) take immediate corrective or remedial action as required by Paragraph 7.13, or otherwise; (b) promptly attempt to settle the claim as to all parties through negotiations with such owner or occupant, or otherwise resolve the claim by arbitration or other dispute resolution proceeding, or in a court of competent jurisdiction; and (c) to the fullest extent permitted by Laws and Regulations, indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them, from and against any such claim, and against all costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to any claim or action, legal or equitable, brought by any such owner or occupant against Owner, Engineer, or any other party indemnified hereunder to the extent caused directly or indirectly, in whole or in part by, or based upon, Contractor's performance of the Work, or because of other actions or conduct of the Contractor or those for which Contractor is responsible.
- B. *Removal of Debris During Performance of the Work:* During the progress of the Work the Contractor shall keep the Site and other adjacent areas free from accumulations of waste materials, rubbish, and other debris. Removal and disposal of such waste materials, rubbish, and other debris will conform to applicable Laws and Regulations.
 - C. *Cleaning:* Prior to Substantial Completion of the Work Contractor shall clean the Site and the Work and make it ready for utilization by Owner. At the completion of the Work Contractor shall remove from the Site and adjacent areas all tools, appliances, construction equipment

and machinery, and surplus materials and shall restore to original condition all property not designated for alteration by the Contract Documents.

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

5.03 *Subsurface and Physical Conditions*

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

1. Those reports of explorations and tests of subsurface conditions at or adjacent to the Site that contain Technical Data;
2. Those drawings of existing physical conditions at or adjacent to the Site, including those drawings depicting existing surface or subsurface structures at or adjacent to the Site (except Underground Facilities), that contain Technical Data; and
3. Technical Data contained in such reports and drawings.

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

- C. *Reliance by Contractor on Technical Data:* Contractor may rely upon the accuracy of the Technical Data expressly identified in the Supplementary Conditions with respect to such reports and drawings, but such reports and drawings are not Contract Documents. If no such express identification has been made, then Contractor may rely upon the accuracy of the Technical Data as defined in Paragraph 1.01.A.46.b.

- D. *Limitations of Other Data and Documents:* Except for such reliance on Technical Data, Contractor may not rely upon or make any claim against Owner or Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors, with respect to:

1. the completeness of such reports and drawings for Contractor's purposes, including, but not limited to, any aspects of the means, methods, techniques, sequences, and procedures of construction to be employed by Contractor, and safety precautions and programs incident thereto;
2. other data, interpretations, opinions, and information contained in such reports or shown or indicated in such drawings;
3. the contents of other Site-related documents made available to Contractor, such as record drawings from other projects at or adjacent to the Site, or Owner's archival documents concerning the Site; or
4. any Contractor interpretation of or conclusion drawn from any Technical Data or any such other data, interpretations, opinions, or information.

5.04 *Differing Subsurface or Physical Conditions*

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

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

- B. *Engineer's Review:* After receipt of written notice as required by the preceding paragraph, Engineer will promptly review the subsurface or physical condition in question; determine whether it is necessary for Owner to obtain additional exploration or tests with respect to the condition; conclude whether the condition falls within any one or more of the differing site condition categories in Paragraph 5.04.A; obtain any pertinent cost or schedule information from Contractor; prepare recommendations to Owner regarding the Contractor's resumption of Work in connection with the subsurface or physical condition in question and the need for any change in the Drawings or Specifications; and advise Owner in writing of Engineer's findings, conclusions, and recommendations.
- C. *Owner's Statement to Contractor Regarding Site Condition:* After receipt of Engineer's written findings, conclusions, and recommendations, Owner shall issue a written statement to Contractor (with a copy to Engineer) regarding the subsurface or physical condition in question, addressing the resumption of Work in connection with such condition, indicating whether any change in the Drawings or Specifications will be made, and adopting or rejecting Engineer's written findings, conclusions, and recommendations, in whole or in part.
- D. *Early Resumption of Work:* If at any time Engineer determines that Work in connection with the subsurface or physical condition in question may resume prior to completion of Engineer's review or Owner's issuance of its statement to Contractor, because the condition in question has been adequately documented, and analyzed on a preliminary basis, then the Engineer may at its discretion instruct Contractor to resume such Work.
- E. *Possible Price and Times Adjustments*
1. Contractor shall be entitled to an equitable adjustment in Contract Price or Contract Times, to the extent that the existence of a differing subsurface or physical condition, or any related delay, disruption, or interference, causes an increase or decrease in

Contractor's cost of, or time required for, performance of the Work; subject, however, to the following:

- a. Such condition must fall within any one or more of the categories described in Paragraph 5.04.A;
 - b. With respect to Work that is paid for on a unit price basis, any adjustment in Contract Price will be subject to the provisions of Paragraph 13.03; and,
 - c. Contractor's entitlement to an adjustment of the Contract Times is subject to the provisions of Paragraphs 4.05.D and 4.05.E.
2. Contractor shall not be entitled to any adjustment in the Contract Price or Contract Times with respect to a subsurface or physical condition if:
- a. Contractor knew of the existence of such condition at the time Contractor made a commitment to Owner with respect to Contract Price and Contract Times by the submission of a Bid or becoming bound under a negotiated contract, or otherwise;
 - b. The existence of such condition reasonably could have been discovered or revealed as a result of any examination, investigation, exploration, test, or study of the Site and contiguous areas expressly required by the Bidding Requirements or Contract Documents to be conducted by or for Contractor prior to Contractor's making such commitment; or
 - c. Contractor failed to give the written notice required by Paragraph 5.04.A.
3. If Owner and Contractor agree regarding Contractor's entitlement to and the amount or extent of any adjustment in the Contract Price or Contract Times, then any such adjustment will be set forth in a Change Order.
4. Contractor may submit a Change Proposal regarding its entitlement to or the amount or extent of any adjustment in the Contract Price or Contract Times, no later than 30 days after Owner's issuance of the Owner's written statement to Contractor regarding the subsurface or physical condition in question.
- F. *Underground Facilities; Hazardous Environmental Conditions:* Paragraph 5.05 governs rights and responsibilities regarding the presence or location of Underground Facilities. Paragraph 5.06 governs rights and responsibilities regarding Hazardous Environmental Conditions. The provisions of Paragraphs 5.03 and 5.04 are not applicable to the presence or location of Underground Facilities, or to Hazardous Environmental Conditions.

5.05 *Underground Facilities*

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

3. verifying the actual location of those Underground Facilities shown or indicated in the Contract Documents as being within the area affected by the Work, by exposing such Underground Facilities during the course of construction;
 4. coordination of the Work with the owners (including Owner) of such Underground Facilities, during construction; and
 5. the safety and protection of all existing Underground Facilities at the Site, and repairing any damage thereto resulting from the Work.
- B. *Notice by Contractor:* If Contractor believes that an Underground Facility that is uncovered or revealed at the Site was not shown or indicated on the Drawings, or was not shown or indicated on the Drawings with reasonable accuracy, then Contractor shall, promptly after becoming aware thereof and before further disturbing conditions affected thereby or performing any Work in connection therewith (except in an emergency as required by Paragraph 7.15), notify Owner and Engineer in writing regarding such Underground Facility.
- C. *Engineer's Review:* Engineer will:
1. promptly review the Underground Facility and conclude whether such Underground Facility was not shown or indicated on the Drawings, or was not shown or indicated with reasonable accuracy;
 2. identify and communicate with the owner of the Underground Facility; prepare recommendations to Owner (and if necessary issue any preliminary instructions to Contractor) regarding the Contractor's resumption of Work in connection with the Underground Facility in question;
 3. obtain any pertinent cost or schedule information from Contractor; determine the extent, if any, to which a change is required in the Drawings or Specifications to reflect and document the consequences of the existence or location of the Underground Facility; and
 4. advise Owner in writing of Engineer's findings, conclusions, and recommendations.
- During such time, Contractor shall be responsible for the safety and protection of such Underground Facility.
- D. *Owner's Statement to Contractor Regarding Underground Facility:* After receipt of Engineer's written findings, conclusions, and recommendations, Owner shall issue a written statement to Contractor (with a copy to Engineer) regarding the Underground Facility in question addressing the resumption of Work in connection with such Underground Facility, indicating whether any change in the Drawings or Specifications will be made, and adopting or rejecting Engineer's written findings, conclusions, and recommendations in whole or in part.
- E. *Early Resumption of Work:* If at any time Engineer determines that Work in connection with the Underground Facility may resume prior to completion of Engineer's review or Owner's issuance of its statement to Contractor, because the Underground Facility in question and conditions affected by its presence have been adequately documented, and analyzed on a preliminary basis, then the Engineer may at its discretion instruct Contractor to resume such Work.
- F. *Possible Price and Times Adjustments*
1. Contractor shall be entitled to an equitable adjustment in the Contract Price or Contract Times, to the extent that any existing Underground Facility at the Site that was not shown

or indicated on the Drawings, or was not shown or indicated with reasonable accuracy, or any related delay, disruption, or interference, causes an increase or decrease in Contractor's cost of, or time required for, performance of the Work; subject, however, to the following:

- a. With respect to Work that is paid for on a unit price basis, any adjustment in Contract Price will be subject to the provisions of Paragraph 13.03;
 - b. Contractor's entitlement to an adjustment of the Contract Times is subject to the provisions of Paragraphs 4.05.D and 4.05.E; and
 - c. Contractor gave the notice required in Paragraph 5.05.B.
2. If Owner and Contractor agree regarding Contractor's entitlement to and the amount or extent of any adjustment in the Contract Price or Contract Times, then any such adjustment will be set forth in a Change Order.
 3. Contractor may submit a Change Proposal regarding its entitlement to or the amount or extent of any adjustment in the Contract Price or Contract Times, no later than 30 days after Owner's issuance of the Owner's written statement to Contractor regarding the Underground Facility in question.
 4. The information and data shown or indicated on the Drawings with respect to existing Underground Facilities at the Site is based on information and data (a) furnished by the owners of such Underground Facilities, or by others, (b) obtained from available records, or (c) gathered in an investigation conducted in accordance with the current edition of ASCE 38, Standard Guideline for the Collection and Depiction of Existing Subsurface Utility Data, by the American Society of Civil Engineers. If such information or data is incorrect or incomplete, Contractor's remedies are limited to those set forth in this Paragraph 5.05.F.

5.06 *Hazardous Environmental Conditions at Site*

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

1. those reports known to Owner relating to Hazardous Environmental Conditions that have been identified at or adjacent to the Site;
2. drawings known to Owner relating to Hazardous Environmental Conditions that have been identified at or adjacent to the Site; and
3. Technical Data contained in such reports and drawings.

B. *Reliance by Contractor on Technical Data Authorized:* Contractor may rely upon the accuracy of the Technical Data expressly identified in the Supplementary Conditions with respect to such reports and drawings, but such reports and drawings are not Contract Documents. If no such express identification has been made, then Contractor may rely on the accuracy of the Technical Data as defined in Paragraph 1.01.A.46.b. Except for such reliance on Technical Data, Contractor may not rely upon or make any claim against Owner or Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors, with respect to:

1. the completeness of such reports and drawings for Contractor's purposes, including, but not limited to, any aspects of the means, methods, techniques, sequences and procedures

- of construction to be employed by Contractor, and safety precautions and programs incident thereto;
2. other data, interpretations, opinions, and information contained in such reports or shown or indicated in such drawings; or
 3. any Contractor interpretation of or conclusion drawn from any Technical Data or any such other data, interpretations, opinions or information.
- C. Contractor shall not be responsible for removing or remediating any Hazardous Environmental Condition encountered, uncovered, or revealed at the Site unless such removal or remediation is expressly identified in the Contract Documents to be within the scope of the Work.
- D. Contractor shall be responsible for controlling, containing, and duly removing all Constituents of Concern brought to the Site by Contractor, Subcontractors, Suppliers, or anyone else for whom Contractor is responsible, and for any associated costs; and for the costs of removing and remediating any Hazardous Environmental Condition created by the presence of any such Constituents of Concern.
- E. If Contractor encounters, uncovers, or reveals a Hazardous Environmental Condition whose removal or remediation is not expressly identified in the Contract Documents as being within the scope of the Work, or if Contractor or anyone for whom Contractor is responsible creates a Hazardous Environmental Condition, then Contractor shall immediately: (1) secure or otherwise isolate such condition; (2) stop all Work in connection with such condition and in any area affected thereby (except in an emergency as required by Paragraph 7.15); and (3) notify Owner and Engineer (and promptly thereafter confirm such notice in writing). Owner shall promptly consult with Engineer concerning the necessity for Owner to retain a qualified expert to evaluate such condition or take corrective action, if any. Promptly after consulting with Engineer, Owner shall take such actions as are necessary to permit Owner to timely obtain required permits and provide Contractor the written notice required by Paragraph 5.06.F. If Contractor or anyone for whom Contractor is responsible created the Hazardous Environmental Condition in question, then Owner may remove and remediate the Hazardous Environmental Condition, and impose a set-off against payments to account for the associated costs.
- F. Contractor shall not resume Work in connection with such Hazardous Environmental Condition or in any affected area until after Owner has obtained any required permits related thereto, and delivered written notice to Contractor either (1) specifying that such condition and any affected area is or has been rendered safe for the resumption of Work, or (2) specifying any special conditions under which such Work may be resumed safely.
- G. If Owner and Contractor cannot agree as to entitlement to or on the amount or extent, if any, of any adjustment in Contract Price or Contract Times, as a result of such Work stoppage, such special conditions under which Work is agreed to be resumed by Contractor, or any costs or expenses incurred in response to the Hazardous Environmental Condition, then within 30 days of Owner's written notice regarding the resumption of Work, Contractor may submit a Change Proposal, or Owner may impose a set-off. Entitlement to any such adjustment is subject to the provisions of Paragraphs 4.05.D, 4.05.E, 11.07, and 11.08.
- H. If, after receipt of such written notice, Contractor does not agree to resume such Work based on a reasonable belief it is unsafe, or does not agree to resume such Work under such special

conditions, then Owner may order the portion of the Work that is in the area affected by such condition to be deleted from the Work, following the contractual change procedures in Article 11. Owner may have such deleted portion of the Work performed by Owner's own forces or others in accordance with Article 8.

- I. To the fullest extent permitted by Laws and Regulations, Owner shall indemnify and hold harmless Contractor, Subcontractors, and Engineer, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals, and all court, arbitration, or other dispute resolution costs) arising out of or relating to a Hazardous Environmental Condition, provided that such Hazardous Environmental Condition (1) was not shown or indicated in the Drawings, Specifications, or other Contract Documents, identified as Technical Data entitled to limited reliance pursuant to Paragraph 5.06.B, or identified in the Contract Documents to be included within the scope of the Work, and (2) was not created by Contractor or by anyone for whom Contractor is responsible. Nothing in this Paragraph 5.06.I obligates Owner to indemnify any individual or entity from and against the consequences of that individual's or entity's own negligence.
- J. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to the failure to control, contain, or remove a Constituent of Concern brought to the Site by Contractor or by anyone for whom Contractor is responsible, or to a Hazardous Environmental Condition created by Contractor or by anyone for whom Contractor is responsible. Nothing in this Paragraph 5.06.J obligates Contractor to indemnify any individual or entity from and against the consequences of that individual's or entity's own negligence.
- K. The provisions of Paragraphs 5.03, 5.04, and 5.05 do not apply to the presence of Constituents of Concern or to a Hazardous Environmental Condition uncovered or revealed at the Site.

ARTICLE 6—BONDS AND INSURANCE

6.01 *Performance, Payment, and Other Bonds*

- A. Contractor shall furnish a performance bond and a payment bond, each in an amount at least equal to the Contract Price, as security for the faithful performance and payment of Contractor's obligations under the Contract. These bonds must remain in effect until one year after the date when final payment becomes due or until completion of the correction period specified in Paragraph 15.08, whichever is later, except as provided otherwise by Laws or Regulations, the terms of a prescribed bond form, the Supplementary Conditions, or other provisions of the Contract.
- B. Contractor shall also furnish such other bonds (if any) as are required by the Supplementary Conditions or other provisions of the Contract.
- C. All bonds must be in the form included in the Bidding Documents or otherwise specified by Owner prior to execution of the Contract, except as provided otherwise by Laws or

Regulations, and must be issued and signed by a surety named in "Companies Holding Certificates of Authority as Acceptable Sureties on Federal Bonds and as Acceptable Reinsuring Companies" as published in Department Circular 570 (as amended and supplemented) by the Bureau of the Fiscal Service, U.S. Department of the Treasury. A bond signed by an agent or attorney-in-fact must be accompanied by a certified copy of that individual's authority to bind the surety. The evidence of authority must show that it is effective on the date the agent or attorney-in-fact signed the accompanying bond.

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

6.02 *Insurance—General Provisions*

- A. Owner and Contractor shall obtain and maintain insurance as required in this article and in the Supplementary Conditions.
- B. All insurance required by the Contract to be purchased and maintained by Owner or Contractor shall be obtained from insurance companies that are duly licensed or authorized in the state or jurisdiction in which the Project is located to issue insurance policies for the required limits and coverages. Unless a different standard is indicated in the Supplementary Conditions, all companies that provide insurance policies required under this Contract shall have an A.M. Best rating of A-VII or better.
- C. Alternative forms of insurance coverage, including but not limited to self-insurance and "Occupational Accident and Excess Employer's Indemnity Policies," are not sufficient to meet the insurance requirements of this Contract, unless expressly allowed in the Supplementary Conditions.
- D. Contractor shall deliver to Owner, with copies to each additional insured identified in the Contract, certificates of insurance and endorsements establishing that Contractor has obtained and is maintaining the policies and coverages required by the Contract. Upon request by Owner or any other insured, Contractor shall also furnish other evidence of such required insurance, including but not limited to copies of policies, documentation of applicable self-insured retentions (if allowed) and deductibles, full disclosure of all relevant exclusions, and evidence of insurance required to be purchased and maintained by

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

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

- L. Owner does not represent that insurance coverage and limits established in this Contract necessarily will be adequate to protect Contractor or Contractor's interests. Contractor is responsible for determining whether such coverage and limits are adequate to protect its interests, and for obtaining and maintaining any additional insurance that Contractor deems necessary.
- M. The insurance and insurance limits required herein will not be deemed as a limitation on Contractor's liability, or that of its Subcontractors or Suppliers, under the indemnities granted to Owner and other individuals and entities in the Contract or otherwise.
- N. All the policies of insurance required to be purchased and maintained under this Contract will contain a provision or endorsement that the coverage afforded will not be canceled, or renewal refused, until at least 10 days prior written notice has been given to the purchasing policyholder. Within three days of receipt of any such written notice, the purchasing policyholder shall provide a copy of the notice to each other insured and Engineer.

6.03 *Contractor's Insurance*

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

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

6.04 *Builder's Risk and Other Property Insurance*

- A. *Builder's Risk:* Unless otherwise provided in the Supplementary Conditions, Contractor shall purchase and maintain builder's risk insurance upon the Work on a completed value basis, in the amount of the Work's full insurable replacement cost (subject to such deductible amounts as may be provided in the Supplementary Conditions or required by Laws and Regulations). The specific requirements applicable to the builder's risk insurance are set forth in the Supplementary Conditions.
- B. *Property Insurance for Facilities of Owner Where Work Will Occur:* Owner is responsible for obtaining and maintaining property insurance covering each existing structure, building, or facility in which any part of the Work will occur, or to which any part of the Work will attach or be adjoined. Such property insurance will be written on a special perils (all-risk) form, on a replacement cost basis, providing coverage consistent with that required for the builder's risk insurance, and will be maintained until the Work is complete, as set forth in Paragraph 15.06.D.
- C. *Property Insurance for Substantially Complete Facilities:* Promptly after Substantial Completion, and before actual occupancy or use of the substantially completed Work, Owner will obtain property insurance for such substantially completed Work, and maintain such property insurance at least until the Work is complete, as set forth in Paragraph 15.06.D. Such property insurance will be written on a special perils (all-risk) form, on a replacement cost basis, and provide coverage consistent with that required for the builder's risk insurance. The builder's risk insurance may terminate upon written confirmation of Owner's procurement of such property insurance.
- D. *Partial Occupancy or Use by Owner:* If Owner will occupy or use a portion or portions of the Work prior to Substantial Completion of all the Work, as provided in Paragraph 15.04, then Owner (directly, if it is the purchaser of the builder's risk policy, or through Contractor) will provide advance notice of such occupancy or use to the builder's risk insurer, and obtain an endorsement consenting to the continuation of coverage prior to commencing such partial occupancy or use.
- E. *Insurance of Other Property; Additional Insurance:* If the express insurance provisions of the Contract do not require or address the insurance of a property item or interest, then the entity or individual owning such property item will be responsible for insuring it. If Contractor elects to obtain other special insurance to be included in or supplement the builder's risk or property insurance policies provided under this Paragraph 6.04, it may do so at Contractor's expense.

6.05 *Property Losses; Subrogation*

- A. The builder's risk insurance policy purchased and maintained in accordance with Paragraph 6.04 (or an installation floater policy if authorized by the Supplementary Conditions), will contain provisions to the effect that in the event of payment of any loss or damage the insurer will have no rights of recovery against any insureds thereunder, or against

Engineer or its consultants, or their officers, directors, members, partners, employees, agents, consultants, or subcontractors.

1. Owner and Contractor waive all rights against each other and the respective officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, for all losses and damages caused by, arising out of, or resulting from any of the perils, risks, or causes of loss covered by such policies and any other property insurance applicable to the Work; and, in addition, waive all such rights against Engineer, its consultants, all individuals or entities identified in the Supplementary Conditions as builder's risk or installation floater insureds, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, under such policies for losses and damages so caused.
 2. None of the above waivers extends to the rights that any party making such waiver may have to the proceeds of insurance held by Owner or Contractor as trustee or fiduciary, or otherwise payable under any policy so issued.
- B. Any property insurance policy maintained by Owner covering any loss, damage, or consequential loss to Owner's existing structures, buildings, or facilities in which any part of the Work will occur, or to which any part of the Work will attach or adjoin; to adjacent structures, buildings, or facilities of Owner; or to part or all of the completed or substantially completed Work, during partial occupancy or use pursuant to Paragraph 15.04, after Substantial Completion pursuant to Paragraph 15.03, or after final payment pursuant to Paragraph 15.06, will contain provisions to the effect that in the event of payment of any loss or damage the insurer will have no rights of recovery against any insureds thereunder, or against Contractor, Subcontractors, or Engineer, or the officers, directors, members, partners, employees, agents, consultants, or subcontractors of each and any of them, and that the insured is allowed to waive the insurer's rights of subrogation in a written contract executed prior to the loss, damage, or consequential loss.
1. Owner waives all rights against Contractor, Subcontractors, and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them, for all losses and damages caused by, arising out of, or resulting from fire or any of the perils, risks, or causes of loss covered by such policies.
- C. The waivers in this Paragraph 6.05 include the waiver of rights due to business interruption, loss of use, or other consequential loss extending beyond direct physical loss or damage to Owner's property or the Work caused by, arising out of, or resulting from fire or other insured peril, risk, or cause of loss.
- D. Contractor shall be responsible for assuring that each Subcontract contains provisions whereby the Subcontractor waives all rights against Owner, Contractor, all individuals or entities identified in the Supplementary Conditions as insureds, the Engineer and its consultants, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, for all losses and damages caused by, arising out of, relating to, or resulting from fire or other peril, risk, or cause of loss covered by builder's risk insurance, installation floater, and any other property insurance applicable to the Work.

6.06 *Receipt and Application of Property Insurance Proceeds*

- A. Any insured loss under the builder's risk and other policies of property insurance required by Paragraph 6.04 will be adjusted and settled with the named insured that purchased the policy. Such named insured shall act as fiduciary for the other insureds, and give notice to such other insureds that adjustment and settlement of a claim is in progress. Any other insured may state its position regarding a claim for insured loss in writing within 15 days after notice of such claim.
- B. Proceeds for such insured losses may be made payable by the insurer either jointly to multiple insureds, or to the named insured that purchased the policy in its own right and as fiduciary for other insureds, subject to the requirements of any applicable mortgage clause. A named insured receiving insurance proceeds under the builder's risk and other policies of insurance required by Paragraph 6.04 shall maintain such proceeds in a segregated account, and distribute such proceeds in accordance with such agreement as the parties in interest may reach, or as otherwise required under the dispute resolution provisions of this Contract or applicable Laws and Regulations.
- C. If no other special agreement is reached, Contractor shall repair or replace the damaged Work, using allocated insurance proceeds.

ARTICLE 7—CONTRACTOR'S RESPONSIBILITIES

7.01 *Contractor's Means and Methods of Construction*

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

7.02 *Supervision and Superintendence*

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

7.03 *Labor; Working Hours*

- A. Contractor shall provide competent, suitably qualified personnel to survey and lay out the Work and perform construction as required by the Contract Documents. Contractor shall maintain good discipline and order at the Site.

- B. Contractor shall be fully responsible to Owner and Engineer for all acts and omissions of Contractor's employees; of Suppliers and Subcontractors, and their employees; and of any other individuals or entities performing or furnishing any of the Work, just as Contractor is responsible for Contractor's own acts and omissions.
- C. Except as otherwise required for the safety or protection of persons or the Work or property at the Site or adjacent thereto, and except as otherwise stated in the Contract Documents, all Work at the Site will be performed during regular working hours, Monday through Friday. Contractor will not perform Work on a Saturday, Sunday, or any legal holiday. Contractor may perform Work outside regular working hours or on Saturdays, Sundays, or legal holidays only with Owner's written consent, which will not be unreasonably withheld.

7.04 *Services, Materials, and Equipment*

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

7.05 *"Or Equals"*

- A. *Contractor's Request; Governing Criteria:* Whenever an item of equipment or material is specified or described in the Contract Documents by using the names of one or more proprietary items or specific Suppliers, the Contract Price has been based upon Contractor furnishing such item as specified. The specification or description of such an item is intended to establish the type, function, appearance, and quality required. Unless the specification or description contains or is followed by words reading that no like, equivalent, or "or equal" item is permitted, Contractor may request that Engineer authorize the use of other items of equipment or material, or items from other proposed Suppliers, under the circumstances described below.
 - 1. If Engineer in its sole discretion determines that an item of equipment or material proposed by Contractor is functionally equal to that named and sufficiently similar so that no change in related Work will be required, Engineer will deem it an "or equal" item. For the purposes of this paragraph, a proposed item of equipment or material will be considered functionally equal to an item so named if:
 - a. in the exercise of reasonable judgment Engineer determines that the proposed item:
 - 1) is at least equal in materials of construction, quality, durability, appearance, strength, and design characteristics;

- 2) will reliably perform at least equally well the function and achieve the results imposed by the design concept of the completed Project as a functioning whole;
 - 3) has a proven record of performance and availability of responsive service; and
 - 4) is not objectionable to Owner.
- b. Contractor certifies that, if the proposed item is approved and incorporated into the Work:
 - 1) there will be no increase in cost to the Owner or increase in Contract Times; and
 - 2) the item will conform substantially to the detailed requirements of the item named in the Contract Documents.
- B. *Contractor's Expense*: Contractor shall provide all data in support of any proposed "or equal" item at Contractor's expense.
- C. *Engineer's Evaluation and Determination*: Engineer will be allowed a reasonable time to evaluate each "or-equal" request. Engineer may require Contractor to furnish additional data about the proposed "or-equal" item. Engineer will be the sole judge of acceptability. No "or-equal" item will be ordered, furnished, installed, or utilized until Engineer's review is complete and Engineer determines that the proposed item is an "or-equal," which will be evidenced by an approved Shop Drawing or other written communication. Engineer will advise Contractor in writing of any negative determination.
- D. *Effect of Engineer's Determination*: Neither approval nor denial of an "or-equal" request will result in any change in Contract Price. The Engineer's denial of an "or-equal" request will be final and binding, and may not be reversed through an appeal under any provision of the Contract.
- E. *Treatment as a Substitution Request*: If Engineer determines that an item of equipment or material proposed by Contractor does not qualify as an "or-equal" item, Contractor may request that Engineer consider the item a proposed substitute pursuant to Paragraph 7.06.

7.06 Substitutes

- A. *Contractor's Request; Governing Criteria*: Unless the specification or description of an item of equipment or material required to be furnished under the Contract Documents contains or is followed by words reading that no substitution is permitted, Contractor may request that Engineer authorize the use of other items of equipment or material under the circumstances described below. To the extent possible such requests must be made before commencement of related construction at the Site.
1. Contractor shall submit sufficient information as provided below to allow Engineer to determine if the item of material or equipment proposed is functionally equivalent to that named and an acceptable substitute therefor. Engineer will not accept requests for review of proposed substitute items of equipment or material from anyone other than Contractor.
 2. The requirements for review by Engineer will be as set forth in Paragraph 7.06.B, as supplemented by the Specifications, and as Engineer may decide is appropriate under the circumstances.

3. Contractor shall make written application to Engineer for review of a proposed substitute item of equipment or material that Contractor seeks to furnish or use. The application:
 - a. will certify that the proposed substitute item will:
 - 1) perform adequately the functions and achieve the results called for by the general design;
 - 2) be similar in substance to the item specified; and
 - 3) be suited to the same use as the item specified.
 - b. will state:
 - 1) the extent, if any, to which the use of the proposed substitute item will necessitate a change in Contract Times;
 - 2) whether use of the proposed substitute item in the Work will require a change in any of the Contract Documents (or in the provisions of any other direct contract with Owner for other work on the Project) to adapt the design to the proposed substitute item; and
 - 3) whether incorporation or use of the proposed substitute item in connection with the Work is subject to payment of any license fee or royalty.
 - c. will identify:
 - 1) all variations of the proposed substitute item from the item specified; and
 - 2) available engineering, sales, maintenance, repair, and replacement services.
 - d. will contain an itemized estimate of all costs or credits that will result directly or indirectly from use of such substitute item, including but not limited to changes in Contract Price, shared savings, costs of redesign, and claims of other contractors affected by any resulting change.
- B. *Engineer's Evaluation and Determination:* Engineer will be allowed a reasonable time to evaluate each substitute request, and to obtain comments and direction from Owner. Engineer may require Contractor to furnish additional data about the proposed substitute item. Engineer will be the sole judge of acceptability. No substitute will be ordered, furnished, installed, or utilized until Engineer's review is complete and Engineer determines that the proposed item is an acceptable substitute. Engineer's determination will be evidenced by a Field Order or a proposed Change Order accounting for the substitution itself and all related impacts, including changes in Contract Price or Contract Times. Engineer will advise Contractor in writing of any negative determination.
- C. *Special Guarantee:* Owner may require Contractor to furnish at Contractor's expense a special performance guarantee or other surety with respect to any substitute.
- D. *Reimbursement of Engineer's Cost:* Engineer will record Engineer's costs in evaluating a substitute proposed or submitted by Contractor. Whether or not Engineer approves a substitute so proposed or submitted by Contractor, Contractor shall reimburse Owner for the reasonable charges of Engineer for evaluating each such proposed substitute. Contractor shall also reimburse Owner for the reasonable charges of Engineer for making changes in the Contract Documents (or in the provisions of any other direct contract with Owner) resulting from the acceptance of each proposed substitute.

- E. *Contractor's Expense*: Contractor shall provide all data in support of any proposed substitute at Contractor's expense.
- F. *Effect of Engineer's Determination*: If Engineer approves the substitution request, Contractor shall execute the proposed Change Order and proceed with the substitution. The Engineer's denial of a substitution request will be final and binding, and may not be reversed through an appeal under any provision of the Contract. Contractor may challenge the scope of reimbursement costs imposed under Paragraph 7.06.D, by timely submittal of a Change Proposal.

7.07 *Concerning Subcontractors and Suppliers*

- A. Contractor may retain Subcontractors and Suppliers for the performance of parts of the Work. Such Subcontractors and Suppliers must be acceptable to Owner. The Contractor's retention of a Subcontractor or Supplier for the performance of parts of the Work will not relieve Contractor's obligation to Owner to perform and complete the Work in accordance with the Contract Documents.
- B. Contractor shall retain specific Subcontractors and Suppliers for the performance of designated parts of the Work if required by the Contract to do so.
- C. Subsequent to the submittal of Contractor's Bid or final negotiation of the terms of the Contract, Owner may not require Contractor to retain any Subcontractor or Supplier to furnish or perform any of the Work against which Contractor has reasonable objection.
- D. Prior to entry into any binding subcontract or purchase order, Contractor shall submit to Owner the identity of the proposed Subcontractor or Supplier (unless Owner has already deemed such proposed Subcontractor or Supplier acceptable during the bidding process or otherwise). Such proposed Subcontractor or Supplier shall be deemed acceptable to Owner unless Owner raises a substantive, reasonable objection within 5 days.
- E. Owner may require the replacement of any Subcontractor or Supplier. Owner also may require Contractor to retain specific replacements; provided, however, that Owner may not require a replacement to which Contractor has a reasonable objection. If Contractor has submitted the identity of certain Subcontractors or Suppliers for acceptance by Owner, and Owner has accepted it (either in writing or by failing to make written objection thereto), then Owner may subsequently revoke the acceptance of any such Subcontractor or Supplier so identified solely on the basis of substantive, reasonable objection after due investigation. Contractor shall submit an acceptable replacement for the rejected Subcontractor or Supplier.
- F. If Owner requires the replacement of any Subcontractor or Supplier retained by Contractor to perform any part of the Work, then Contractor shall be entitled to an adjustment in Contract Price or Contract Times, with respect to the replacement; and Contractor shall initiate a Change Proposal for such adjustment within 30 days of Owner's requirement of replacement.
- G. No acceptance by Owner of any such Subcontractor or Supplier, whether initially or as a replacement, will constitute a waiver of the right of Owner to the completion of the Work in accordance with the Contract Documents.

- H. On a monthly basis, Contractor shall submit to Engineer a complete list of all Subcontractors and Suppliers having a direct contract with Contractor, and of all other Subcontractors and Suppliers known to Contractor at the time of submittal.
- I. Contractor shall be solely responsible for scheduling and coordinating the work of Subcontractors and Suppliers.
- J. The divisions and sections of the Specifications and the identifications of any Drawings do not control Contractor in dividing the Work among Subcontractors or Suppliers, or in delineating the Work to be performed by any specific trade.
- K. All Work performed for Contractor by a Subcontractor or Supplier must be pursuant to an appropriate contractual agreement that specifically binds the Subcontractor or Supplier to the applicable terms and conditions of the Contract for the benefit of Owner and Engineer.
- L. Owner may furnish to any Subcontractor or Supplier, to the extent practicable, information about amounts paid to Contractor for Work performed for Contractor by the Subcontractor or Supplier.
- M. Contractor shall restrict all Subcontractors and Suppliers from communicating with Engineer or Owner, except through Contractor or in case of an emergency, or as otherwise expressly allowed in this Contract.

7.08 *Patent Fees and Royalties*

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

7.09 *Permits*

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

7.10 *Taxes*

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

7.11 *Laws and Regulations*

- A. Contractor shall give all notices required by and shall comply with all Laws and Regulations applicable to the performance of the Work. Neither Owner nor Engineer shall be responsible for monitoring Contractor's compliance with any Laws or Regulations.
- B. If Contractor performs any Work or takes any other action knowing or having reason to know that it is contrary to Laws or Regulations, Contractor shall bear all resulting costs and losses, and shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such Work or other action. It is not Contractor's responsibility to make certain that the Work described in the Contract Documents is in accordance with Laws and Regulations, but this does not relieve Contractor of its obligations under Paragraph 3.03.
- C. Owner or Contractor may give written notice to the other party of any changes after the submission of Contractor's Bid (or after the date when Contractor became bound under a negotiated contract) in Laws or Regulations having an effect on the cost or time of performance of the Work, including but not limited to changes in Laws or Regulations having an effect on procuring permits and on sales, use, value-added, consumption, and other similar taxes. If Owner and Contractor are unable to agree on entitlement to or on the amount or extent, if any, of any adjustment in Contract Price or Contract Times resulting from such changes, then within 30 days of such written notice Contractor may submit a Change Proposal, or Owner may initiate a Claim.

7.12 *Record Documents*

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

7.13 *Safety and Protection*

- A. Contractor shall be solely responsible for initiating, maintaining, and supervising all safety precautions and programs in connection with the Work. Such responsibility does not relieve Subcontractors of their responsibility for the safety of persons or property in the performance of their work, nor for compliance with applicable safety Laws and Regulations.
- B. Contractor shall designate a qualified and experienced safety representative whose duties and responsibilities are the prevention of Work-related accidents and the maintenance and supervision of safety precautions and programs.
- C. Contractor shall take all necessary precautions for the safety of, and shall provide the necessary protection to prevent damage, injury, or loss to:
 - 1. all persons on the Site or who may be affected by the Work;
 - 2. all the Work and materials and equipment to be incorporated therein, whether in storage on or off the Site; and
 - 3. other property at the Site or adjacent thereto, including trees, shrubs, lawns, walks, pavements, roadways, structures, other work in progress, utilities, and Underground Facilities not designated for removal, relocation, or replacement in the course of construction.
- D. All damage, injury, or loss to any property referred to in Paragraph 7.13.C.2 or 7.13.C.3 caused, directly or indirectly, in whole or in part, by Contractor, any Subcontractor, Supplier, or any other individual or entity directly or indirectly employed by any of them to perform any of the Work, or anyone for whose acts any of them may be liable, shall be remedied by Contractor at its expense (except damage or loss attributable to the fault of Drawings or Specifications or to the acts or omissions of Owner or Engineer or anyone employed by any of them, or anyone for whose acts any of them may be liable, and not attributable, directly or indirectly, in whole or in part, to the fault or negligence of Contractor or any Subcontractor, Supplier, or other individual or entity directly or indirectly employed by any of them).
- E. Contractor shall comply with all applicable Laws and Regulations relating to the safety of persons or property, or to the protection of persons or property from damage, injury, or loss; and shall erect and maintain all necessary safeguards for such safety and protection.
- F. Contractor shall notify Owner; the owners of adjacent property; the owners of Underground Facilities and other utilities (if the identity of such owners is known to Contractor); and other contractors and utility owners performing work at or adjacent to the Site, in writing, when Contractor knows that prosecution of the Work may affect them, and shall cooperate with them in the protection, removal, relocation, and replacement of their property or work in progress.
- G. Contractor shall comply with the applicable requirements of Owner's safety programs, if any. Any Owner's safety programs that are applicable to the Work are identified or included in the Supplementary Conditions or Specifications.
- H. Contractor shall inform Owner and Engineer of the specific requirements of Contractor's safety program with which Owner's and Engineer's employees and representatives must comply while at the Site.

- I. Contractor's duties and responsibilities for safety and protection will continue until all the Work is completed, Engineer has issued a written notice to Owner and Contractor in accordance with Paragraph 15.06.C that the Work is acceptable, and Contractor has left the Site (except as otherwise expressly provided in connection with Substantial Completion).
- J. Contractor's duties and responsibilities for safety and protection will resume whenever Contractor or any Subcontractor or Supplier returns to the Site to fulfill warranty or correction obligations, or to conduct other tasks arising from the Contract Documents.

7.14 *Hazard Communication Programs*

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

7.15 *Emergencies*

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

7.16 *Submittals*

A. *Shop Drawing and Sample Requirements*

1. Before submitting a Shop Drawing or Sample, Contractor shall:
 - a. review and coordinate the Shop Drawing or Sample with other Shop Drawings and Samples and with the requirements of the Work and the Contract Documents;
 - b. determine and verify:
 - 1) all field measurements, quantities, dimensions, specified performance and design criteria, installation requirements, materials, catalog numbers, and similar information with respect to the Submittal;
 - 2) the suitability of all materials and equipment offered with respect to the indicated application, fabrication, shipping, handling, storage, assembly, and installation pertaining to the performance of the Work; and
 - 3) all information relative to Contractor's responsibilities for means, methods, techniques, sequences, and procedures of construction, and safety precautions and programs incident thereto;
 - c. confirm that the Submittal is complete with respect to all related data included in the Submittal.
2. Each Shop Drawing or Sample must bear a stamp or specific written certification that Contractor has satisfied Contractor's obligations under the Contract Documents with respect to Contractor's review of that Submittal, and that Contractor approves the Submittal.

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

document any such approved variation from the requirements of the Contract Documents in a Field Order or other appropriate Contract modification.

5. Engineer's review and approval of a Shop Drawing or Sample will not relieve Contractor from responsibility for complying with the requirements of Paragraphs 7.16.A and B.
6. Engineer's review and approval of a Shop Drawing or Sample, or of a variation from the requirements of the Contract Documents, will not, under any circumstances, change the Contract Times or Contract Price, unless such changes are included in a Change Order.
7. Neither Engineer's receipt, review, acceptance, or approval of a Shop Drawing or Sample will result in such item becoming a Contract Document.
8. Contractor shall perform the Work in compliance with the requirements and commitments set forth in approved Shop Drawings and Samples, subject to the provisions of Paragraph 7.16.C.4.

D. Resubmittal Procedures for Shop Drawings and Samples

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

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

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

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

7.17 Contractor's General Warranty and Guarantee

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

9. Any correction of defective Work by Owner.
- E. If the Contract requires the Contractor to accept the assignment of a contract entered into by Owner, then the specific warranties, guarantees, and correction obligations contained in the assigned contract will govern with respect to Contractor's performance obligations to Owner for the Work described in the assigned contract.

7.18 *Indemnification*

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

7.19 *Delegation of Professional Design Services*

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

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

ARTICLE 8—OTHER WORK AT THE SITE

8.01 *Other Work*

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

- E. If the proper execution or results of any part of Contractor's Work depends upon work performed by others, Contractor shall inspect such other work and promptly report to Engineer in writing any delays, defects, or deficiencies in such other work that render it unavailable or unsuitable for the proper execution and results of Contractor's Work. Contractor's failure to so report will constitute an acceptance of such other work as fit and proper for integration with Contractor's Work except for latent defects and deficiencies in such other work.
- F. The provisions of this article are not applicable to work that is performed by third-party utilities or other third-party entities without a contract with Owner, or that is performed without having been arranged by Owner. If such work occurs, then any related delay, disruption, or interference incurred by Contractor is governed by the provisions of Paragraph 4.05.C.3.

8.02 *Coordination*

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

8.03 *Legal Relationships*

- A. If, in the course of performing other work for Owner at or adjacent to the Site, the Owner's employees, any other contractor working for Owner, or any utility owner that Owner has arranged to perform work, causes damage to the Work or to the property of Contractor or its Subcontractors, or delays, disrupts, interferes with, or increases the scope or cost of the performance of the Work, through actions or inaction, then Contractor shall be entitled to an equitable adjustment in the Contract Price or the Contract Times. Contractor must submit any Change Proposal seeking an equitable adjustment in the Contract Price or the Contract Times under this paragraph within 30 days of the damaging, delaying, disrupting, or interfering event. The entitlement to, and extent of, any such equitable adjustment will take into account information (if any) regarding such other work that was provided to Contractor in the Contract Documents prior to the submittal of the Bid or the final negotiation of the terms of the Contract, and any remedies available to Contractor under Laws or Regulations concerning utility action or inaction. When applicable, any such equitable adjustment in Contract Price will be conditioned on Contractor assigning to Owner all Contractor's rights against such other contractor or utility owner with respect to the damage, delay, disruption, or interference that is the subject of the adjustment. Contractor's entitlement to an adjustment of the Contract Times or Contract Price is subject to the provisions of Paragraphs 4.05.D and 4.05.E.

- B. Contractor shall take reasonable and customary measures to avoid damaging, delaying, disrupting, or interfering with the work of Owner, any other contractor, or any utility owner performing other work at or adjacent to the Site.
 - 1. If Contractor fails to take such measures and as a result damages, delays, disrupts, or interferes with the work of any such other contractor or utility owner, then Owner may impose a set-off against payments due Contractor, and assign to such other contractor or utility owner the Owner's contractual rights against Contractor with respect to the breach of the obligations set forth in this Paragraph 8.03.B.
 - 2. When Owner is performing other work at or adjacent to the Site with Owner's employees, Contractor shall be liable to Owner for damage to such other work, and for the reasonable direct delay, disruption, and interference costs incurred by Owner as a result of Contractor's failure to take reasonable and customary measures with respect to Owner's other work. In response to such damage, delay, disruption, or interference, Owner may impose a set-off against payments due Contractor.
- C. If Contractor damages, delays, disrupts, or interferes with the work of any other contractor, or any utility owner performing other work at or adjacent to the Site, through Contractor's failure to take reasonable and customary measures to avoid such impacts, or if any claim arising out of Contractor's actions, inactions, or negligence in performance of the Work at or adjacent to the Site is made by any such other contractor or utility owner against Contractor, Owner, or Engineer, then Contractor shall (1) promptly attempt to settle the claim as to all parties through negotiations with such other contractor or utility owner, or otherwise resolve the claim by arbitration or other dispute resolution proceeding or at law, and (2) indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them from and against any such claims, and against all costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such damage, delay, disruption, or interference.

ARTICLE 9—OWNER'S RESPONSIBILITIES

9.01 *Communications to Contractor*

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

9.02 *Replacement of Engineer*

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

9.03 *Furnish Data*

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

9.04 *Pay When Due*

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

- 9.05 *Lands and Easements; Reports, Tests, and Drawings*
- A. Owner's duties with respect to providing lands and easements are set forth in Paragraph 5.01.
 - B. Owner's duties with respect to providing engineering surveys to establish reference points are set forth in Paragraph 4.03.
 - C. Article 5 refers to Owner's identifying and making available to Contractor copies of reports of explorations and tests of conditions at the Site, and drawings of physical conditions relating to existing surface or subsurface structures at the Site.
- 9.06 *Insurance*
- A. Owner's responsibilities, if any, with respect to purchasing and maintaining liability and property insurance are set forth in Article 6.
- 9.07 *Change Orders*
- A. Owner's responsibilities with respect to Change Orders are set forth in Article 11.
- 9.08 *Inspections, Tests, and Approvals*
- A. Owner's responsibility with respect to certain inspections, tests, and approvals is set forth in Paragraph 14.02.B.
- 9.09 *Limitations on Owner's Responsibilities*
- A. The Owner shall not supervise, direct, or have control or authority over, nor be responsible for, Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work. Owner will not be responsible for Contractor's failure to perform the Work in accordance with the Contract Documents.
- 9.10 *Undisclosed Hazardous Environmental Condition*
- A. Owner's responsibility in respect to an undisclosed Hazardous Environmental Condition is set forth in Paragraph 5.06.
- 9.11 *Evidence of Financial Arrangements*
- A. Upon request of Contractor, Owner shall furnish Contractor reasonable evidence that financial arrangements have been made to satisfy Owner's obligations under the Contract (including obligations under proposed changes in the Work).
- 9.12 *Safety Programs*
- A. While at the Site, Owner's employees and representatives shall comply with the specific applicable requirements of Contractor's safety programs of which Owner has been informed.
 - B. Owner shall furnish copies of any applicable Owner safety programs to Contractor.

ARTICLE 10—ENGINEER'S STATUS DURING CONSTRUCTION

10.01 *Owner's Representative*

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

10.02 *Visits to Site*

- A. Engineer will make visits to the Site at intervals appropriate to the various stages of construction as Engineer deems necessary in order to observe, as an experienced and qualified design professional, the progress that has been made and the quality of the various aspects of Contractor's executed Work. Based on information obtained during such visits and observations, Engineer, for the benefit of Owner, will determine, in general, if the Work is proceeding in accordance with the Contract Documents. Engineer will not be required to make exhaustive or continuous inspections on the Site to check the quality or quantity of the Work. Engineer's efforts will be directed toward providing for Owner a greater degree of confidence that the completed Work will conform generally to the Contract Documents. On the basis of such visits and observations, Engineer will keep Owner informed of the progress of the Work and will endeavor to guard Owner against defective Work.
- B. Engineer's visits and observations are subject to all the limitations on Engineer's authority and responsibility set forth in Paragraph 10.07. Particularly, but without limitation, during or as a result of Engineer's visits or observations of Contractor's Work, Engineer will not supervise, direct, control, or have authority over or be responsible for Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work.

10.03 *Resident Project Representative*

- A. If Owner and Engineer have agreed that Engineer will furnish a Resident Project Representative to represent Engineer at the Site and assist Engineer in observing the progress and quality of the Work, then the authority and responsibilities of any such Resident Project Representative will be as provided in the Supplementary Conditions, and limitations on the responsibilities thereof will be as provided in the Supplementary Conditions and in Paragraph 10.07.
- B. If Owner designates an individual or entity who is not Engineer's consultant, agent, or employee to represent Owner at the Site, then the responsibilities and authority of such individual or entity will be as provided in the Supplementary Conditions.

10.04 *Engineer's Authority*

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

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

10.05 *Determinations for Unit Price Work*

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

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

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

10.07 *Limitations on Engineer's Authority and Responsibilities*

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

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

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

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

E. The limitations upon authority and responsibility set forth in this Paragraph 10.07 also apply to the Resident Project Representative, if any.

10.08 *Compliance with Safety Program*

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

ARTICLE 11—CHANGES TO THE CONTRACT

11.01 *Amending and Supplementing the Contract*

- A. The Contract may be amended or supplemented by a Change Order, a Work Change Directive, or a Field Order.
- B. If an amendment or supplement to the Contract includes a change in the Contract Price or the Contract Times, such amendment or supplement must be set forth in a Change Order.
- C. All changes to the Contract that involve (1) the performance or acceptability of the Work, (2) the design (as set forth in the Drawings, Specifications, or otherwise), or (3) other engineering or technical matters, must be supported by Engineer's recommendation. Owner and Contractor may amend other terms and conditions of the Contract without the recommendation of the Engineer.

11.02 *Change Orders*

- A. Owner and Contractor shall execute appropriate Change Orders covering:
 - 1. Changes in Contract Price or Contract Times which are agreed to by the parties, including any undisputed sum or amount of time for Work actually performed in accordance with a Work Change Directive;
 - 2. Changes in Contract Price resulting from an Owner set-off, unless Contractor has duly contested such set-off;
 - 3. Changes in the Work which are: (a) ordered by Owner pursuant to Paragraph 11.05, (b) required because of Owner's acceptance of defective Work under Paragraph 14.04 or Owner's correction of defective Work under Paragraph 14.07, or (c) agreed to by the parties, subject to the need for Engineer's recommendation if the change in the Work involves the design (as set forth in the Drawings, Specifications, or otherwise) or other engineering or technical matters; and
 - 4. Changes that embody the substance of any final and binding results under: Paragraph 11.03.B, resolving the impact of a Work Change Directive; Paragraph 11.09, concerning Change Proposals; Article 12, Claims; Paragraph 13.02.D, final adjustments resulting from allowances; Paragraph 13.03.D, final adjustments relating to determination of quantities for Unit Price Work; and similar provisions.
- B. If Owner or Contractor refuses to execute a Change Order that is required to be executed under the terms of Paragraph 11.02.A, it will be deemed to be of full force and effect, as if fully executed.

11.03 *Work Change Directives*

- A. A Work Change Directive will not change the Contract Price or the Contract Times but is evidence that the parties expect that the modification ordered or documented by a Work Change Directive will be incorporated in a subsequently issued Change Order, following negotiations by the parties as to the Work Change Directive's effect, if any, on the Contract Price and Contract Times; or, if negotiations are unsuccessful, by a determination under the terms of the Contract Documents governing adjustments, expressly including Paragraph 11.07 regarding change of Contract Price.

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

11.04 *Field Orders*

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

11.05 *Owner-Authorized Changes in the Work*

- A. Without invalidating the Contract and without notice to any surety, Owner may, at any time or from time to time, order additions, deletions, or revisions in the Work. Changes involving the design (as set forth in the Drawings, Specifications, or otherwise) or other engineering or technical matters will be supported by Engineer's recommendation.
- B. Such changes in the Work may be accomplished by a Change Order, if Owner and Contractor have agreed as to the effect, if any, of the changes on Contract Times or Contract Price; or by a Work Change Directive. Upon receipt of any such document, Contractor shall promptly proceed with the Work involved; or, in the case of a deletion in the Work, promptly cease construction activities with respect to such deleted Work. Added or revised Work must be performed under the applicable conditions of the Contract Documents.
- C. Nothing in this Paragraph 11.05 obligates Contractor to undertake work that Contractor reasonably concludes cannot be performed in a manner consistent with Contractor's safety obligations under the Contract Documents or Laws and Regulations.

11.06 *Unauthorized Changes in the Work*

- A. Contractor shall not be entitled to an increase in the Contract Price or an extension of the Contract Times with respect to any work performed that is not required by the Contract Documents, as amended, modified, or supplemented, except in the case of an emergency as provided in Paragraph 7.15 or in the case of uncovering Work as provided in Paragraph 14.05.C.2.

11.07 *Change of Contract Price*

- A. The Contract Price may only be changed by a Change Order. Any Change Proposal for an adjustment in the Contract Price must comply with the provisions of Paragraph 11.09. Any Claim for an adjustment of Contract Price must comply with the provisions of Article 12.
- B. An adjustment in the Contract Price will be determined as follows:

1. Where the Work involved is covered by unit prices contained in the Contract Documents, then by application of such unit prices to the quantities of the items involved (subject to the provisions of Paragraph 13.03);
 2. Where the Work involved is not covered by unit prices contained in the Contract Documents, then by a mutually agreed lump sum (which may include an allowance for overhead and profit not necessarily in accordance with Paragraph 11.07.C.2); or
 3. Where the Work involved is not covered by unit prices contained in the Contract Documents and the parties do not reach mutual agreement to a lump sum, then on the basis of the Cost of the Work (determined as provided in Paragraph 13.01) plus a Contractor's fee for overhead and profit (determined as provided in Paragraph 11.07.C).
- C. *Contractor's Fee:* When applicable, the Contractor's fee for overhead and profit will be determined as follows:
1. A mutually acceptable fixed fee; or
 2. If a fixed fee is not agreed upon, then a fee based on the following percentages of the various portions of the Cost of the Work:
 - a. For costs incurred under Paragraphs 13.01.B.1 and 13.01.B.2, the Contractor's fee will be 15 percent;
 - b. For costs incurred under Paragraph 13.01.B.3, the Contractor's fee will be 5 percent;
 - c. Where one or more tiers of subcontracts are on the basis of Cost of the Work plus a fee and no fixed fee is agreed upon, the intent of Paragraphs 11.07.C.2.a and 11.07.C.2.b is that the Contractor's fee will be based on: (1) a fee of 15 percent of the costs incurred under Paragraphs 13.01.B.1 and 13.01.B.2 by the Subcontractor that actually performs the Work, at whatever tier, and (2) with respect to Contractor itself and to any Subcontractors of a tier higher than that of the Subcontractor that actually performs the Work, a fee of 5 percent of the amount (fee plus underlying costs incurred) attributable to the next lower tier Subcontractor; provided, however, that for any such subcontracted Work the maximum total fee to be paid by Owner will be no greater than 27 percent of the costs incurred by the Subcontractor that actually performs the Work;
 - d. No fee will be payable on the basis of costs itemized under Paragraphs 13.01.B.4, 13.01.B.5, and 13.01.C;
 - e. The amount of credit to be allowed by Contractor to Owner for any change which results in a net decrease in Cost of the Work will be the amount of the actual net decrease in Cost of the Work and a deduction of an additional amount equal to 5 percent of such actual net decrease in Cost of the Work; and
 - f. When both additions and credits are involved in any one change or Change Proposal, the adjustment in Contractor's fee will be computed by determining the sum of the costs in each of the cost categories in Paragraph 13.01.B (specifically, payroll costs, Paragraph 13.01.B.1; incorporated materials and equipment costs, Paragraph 13.01.B.2; Subcontract costs, Paragraph 13.01.B.3; special consultants costs, Paragraph 13.01.B.4; and other costs, Paragraph 13.01.B.5) and applying to each such cost category sum the appropriate fee from Paragraphs 11.07.C.2.a through 11.07.C.2.e, inclusive.

11.08 *Change of Contract Times*

- A. The Contract Times may only be changed by a Change Order. Any Change Proposal for an adjustment in the Contract Times must comply with the provisions of Paragraph 11.09. Any Claim for an adjustment in the Contract Times must comply with the provisions of Article 12.
- B. Delay, disruption, and interference in the Work, and any related changes in Contract Times, are addressed in and governed by Paragraph 4.05.

11.09 *Change Proposals*

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

- B. *Change Proposal Procedures*

- 1. *Submittal:* Contractor shall submit each Change Proposal to Engineer within 30 days after the start of the event giving rise thereto, or after such initial decision.
- 2. *Supporting Data:* The Contractor shall submit supporting data, including the proposed change in Contract Price or Contract Time (if any), to the Engineer and Owner within 15 days after the submittal of the Change Proposal.
 - a. Change Proposals based on or related to delay, interruption, or interference must comply with the provisions of Paragraphs 4.05.D and 4.05.E.
 - b. Change proposals related to a change of Contract Price must include full and detailed accounts of materials incorporated into the Work and labor and equipment used for the subject Work.

The supporting data must be accompanied by a written statement that the supporting data are accurate and complete, and that any requested time or price adjustment is the entire adjustment to which Contractor believes it is entitled as a result of said event.

- 3. *Engineer's Initial Review:* Engineer will advise Owner regarding the Change Proposal, and consider any comments or response from Owner regarding the Change Proposal. If in its discretion Engineer concludes that additional supporting data is needed before conducting a full review and making a decision regarding the Change Proposal, then Engineer may request that Contractor submit such additional supporting data by a date specified by Engineer, prior to Engineer beginning its full review of the Change Proposal.
- 4. *Engineer's Full Review and Action on the Change Proposal:* Upon receipt of Contractor's supporting data (including any additional data requested by Engineer), Engineer will conduct a full review of each Change Proposal and, within 30 days after such receipt of the Contractor's supporting data, either approve the Change Proposal in whole, deny it in whole, or approve it in part and deny it in part. Such actions must be in writing, with a copy provided to Owner and Contractor. If Engineer does not take action on the Change

Proposal within 30 days, then either Owner or Contractor may at any time thereafter submit a letter to the other party indicating that as a result of Engineer's inaction the Change Proposal is deemed denied, thereby commencing the time for appeal of the denial under Article 12.

5. *Binding Decision*: Engineer's decision is final and binding upon Owner and Contractor, unless Owner or Contractor appeals the decision by filing a Claim under Article 12.
- C. *Resolution of Certain Change Proposals*: If the Change Proposal does not involve the design (as set forth in the Drawings, Specifications, or otherwise), the acceptability of the Work, or other engineering or technical matters, then Engineer will notify the parties in writing that the Engineer is unable to resolve the Change Proposal. For purposes of further resolution of such a Change Proposal, such notice will be deemed a denial, and Contractor may choose to seek resolution under the terms of Article 12.
- D. *Post-Completion*: Contractor shall not submit any Change Proposals after Engineer issues a written recommendation of final payment pursuant to Paragraph 15.06.B.

11.10 *Notification to Surety*

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

ARTICLE 12—CLAIMS

12.01 *Claims*

- A. *Claims Process*: The following disputes between Owner and Contractor are subject to the Claims process set forth in this article:
 1. Appeals by Owner or Contractor of Engineer's decisions regarding Change Proposals;
 2. Owner demands for adjustments in the Contract Price or Contract Times, or other relief under the Contract Documents;
 3. Disputes that Engineer has been unable to address because they do not involve the design (as set forth in the Drawings, Specifications, or otherwise), the acceptability of the Work, or other engineering or technical matters; and
 4. Subject to the waiver provisions of Paragraph 15.07, any dispute arising after Engineer has issued a written recommendation of final payment pursuant to Paragraph 15.06.B.
- B. *Submittal of Claim*: The party submitting a Claim shall deliver it directly to the other party to the Contract promptly (but in no event later than 30 days) after the start of the event giving rise thereto; in the case of appeals regarding Change Proposals within 30 days of the decision under appeal. The party submitting the Claim shall also furnish a copy to the Engineer, for its information only. The responsibility to substantiate a Claim rests with the party making the Claim. In the case of a Claim by Contractor seeking an increase in the Contract Times or Contract Price, Contractor shall certify that the Claim is made in good faith, that the supporting data are accurate and complete, and that to the best of Contractor's knowledge

and belief the amount of time or money requested accurately reflects the full amount to which Contractor is entitled.

- C. *Review and Resolution*: The party receiving a Claim shall review it thoroughly, giving full consideration to its merits. The two parties shall seek to resolve the Claim through the exchange of information and direct negotiations. The parties may extend the time for resolving the Claim by mutual agreement. All actions taken on a Claim will be stated in writing and submitted to the other party, with a copy to Engineer.
- D. *Mediation*
 - 1. At any time after initiation of a Claim, Owner and Contractor may mutually agree to mediation of the underlying dispute. The agreement to mediate will stay the Claim submittal and response process.
 - 2. If Owner and Contractor agree to mediation, then after 60 days from such agreement, either Owner or Contractor may unilaterally terminate the mediation process, and the Claim submittal and decision process will resume as of the date of the termination. If the mediation proceeds but is unsuccessful in resolving the dispute, the Claim submittal and decision process will resume as of the date of the conclusion of the mediation, as determined by the mediator.
 - 3. Owner and Contractor shall each pay one-half of the mediator's fees and costs.
- E. *Partial Approval*: If the party receiving a Claim approves the Claim in part and denies it in part, such action will be final and binding unless within 30 days of such action the other party invokes the procedure set forth in Article 17 for final resolution of disputes.
- F. *Denial of Claim*: If efforts to resolve a Claim are not successful, the party receiving the Claim may deny it by giving written notice of denial to the other party. If the receiving party does not take action on the Claim within 90 days, then either Owner or Contractor may at any time thereafter submit a letter to the other party indicating that as a result of the inaction, the Claim is deemed denied, thereby commencing the time for appeal of the denial. A denial of the Claim will be final and binding unless within 30 days of the denial the other party invokes the procedure set forth in Article 17 for the final resolution of disputes.
- G. *Final and Binding Results*: If the parties reach a mutual agreement regarding a Claim, whether through approval of the Claim, direct negotiations, mediation, or otherwise; or if a Claim is approved in part and denied in part, or denied in full, and such actions become final and binding; then the results of the agreement or action on the Claim will be incorporated in a Change Order or other written document to the extent they affect the Contract, including the Work, the Contract Times, or the Contract Price.

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

13.01 *Cost of the Work*

- A. *Purposes for Determination of Cost of the Work*: The term Cost of the Work means the sum of all costs necessary for the proper performance of the Work at issue, as further defined below. The provisions of this Paragraph 13.01 are used for two distinct purposes:
 - 1. To determine Cost of the Work when Cost of the Work is a component of the Contract Price, under cost-plus-fee, time-and-materials, or other cost-based terms; or

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

consumed in the performance of the Work, and cost, less market value, of such items used but not consumed which remain the property of Contractor.

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

c. *Construction Equipment Rental*

- 1) Rentals of all construction equipment and machinery, and the parts thereof, in accordance with rental agreements approved by Owner as to price (including any surcharge or special rates applicable to overtime use of the construction equipment or machinery), and the costs of transportation, loading, unloading, assembly, dismantling, and removal thereof. All such costs will be in accordance with the terms of said rental agreements. The rental of any such equipment, machinery, or parts must cease when the use thereof is no longer necessary for the Work.
 - 2) Costs for equipment and machinery owned by Contractor or a Contractor-related entity will be paid at a rate shown for such equipment in the equipment rental rate book specified in the Supplementary Conditions. An hourly rate will be computed by dividing the monthly rates by 176. These computed rates will include all operating costs.
 - 3) With respect to Work that is the result of a Change Order, Change Proposal, Claim, set-off, or other adjustment in Contract Price ("changed Work"), included costs will be based on the time the equipment or machinery is in use on the changed Work and the costs of transportation, loading, unloading, assembly, dismantling, and removal when directly attributable to the changed Work. The cost of any such equipment or machinery, or parts thereof, must cease to accrue when the use thereof is no longer necessary for the changed Work.
- d. Sales, consumer, use, and other similar taxes related to the Work, and for which Contractor is liable, as imposed by Laws and Regulations.
- e. Deposits lost for causes other than negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, and royalty payments and fees for permits and licenses.
- f. Losses and damages (and related expenses) caused by damage to the Work, not compensated by insurance or otherwise, sustained by Contractor in connection with the performance of the Work (except losses and damages within the deductible amounts of builder's risk or other property insurance established in accordance with Paragraph 6.04), provided such losses and damages have resulted from causes other than the negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable. Such losses include settlements made with the written consent and approval of Owner. No such losses, damages, and expenses will be included in the Cost of the Work for the purpose of determining Contractor's fee.

- g. The cost of utilities, fuel, and sanitary facilities at the Site.
- h. Minor expenses such as communication service at the Site, express and courier services, and similar petty cash items in connection with the Work.
- i. The costs of premiums for all bonds and insurance that Contractor is required by the Contract Documents to purchase and maintain.

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

- 1. Payroll costs and other compensation of Contractor's officers, executives, principals, general managers, engineers, architects, estimators, attorneys, auditors, accountants, purchasing and contracting agents, expeditors, timekeepers, clerks, and other personnel employed by Contractor, whether at the Site or in Contractor's principal or branch office for general administration of the Work and not specifically included in the agreed upon schedule of job classifications referred to in Paragraph 13.01.B.1 or specifically covered by Paragraph 13.01.B.4. The payroll costs and other compensation excluded here are to be considered administrative costs covered by the Contractor's fee.
- 2. The cost of purchasing, renting, or furnishing small tools and hand tools.
- 3. Expenses of Contractor's principal and branch offices other than Contractor's office at the Site.
- 4. Any part of Contractor's capital expenses, including interest on Contractor's capital employed for the Work and charges against Contractor for delinquent payments.
- 5. Costs due to the negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, including but not limited to, the correction of defective Work, disposal of materials or equipment wrongly supplied, and making good any damage to property.
- 6. Expenses incurred in preparing and advancing Claims.
- 7. Other overhead or general expense costs of any kind and the costs of any item not specifically and expressly included in Paragraph 13.01.B.

D. *Contractor's Fee*

- 1. When the Work as a whole is performed on the basis of cost-plus-a-fee, then:
 - a. Contractor's fee for the Work set forth in the Contract Documents as of the Effective Date of the Contract will be determined as set forth in the Agreement.
 - b. for any Work covered by a Change Order, Change Proposal, Claim, set-off, or other adjustment in Contract Price on the basis of Cost of the Work, Contractor's fee will be determined as follows:
 - 1) When the fee for the Work as a whole is a percentage of the Cost of the Work, the fee will automatically adjust as the Cost of the Work changes.
 - 2) When the fee for the Work as a whole is a fixed fee, the fee for any additions or deletions will be determined in accordance with Paragraph 11.07.C.2.
- 2. When the Work as a whole is performed on the basis of a stipulated sum, or any other basis other than cost-plus-a-fee, then Contractor's fee for any Work covered by a Change

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

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

13.02 Allowances

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

13.03 Unit Price Work

- A. Where the Contract Documents provide that all or part of the Work is to be Unit Price Work, initially the Contract Price will be deemed to include for all Unit Price Work an amount equal to the sum of the unit price for each separately identified item of Unit Price Work times the estimated quantity of each item as indicated in the Agreement.
- B. The estimated quantities of items of Unit Price Work are not guaranteed and are solely for the purpose of comparison of Bids and determining an initial Contract Price. Payments to Contractor for Unit Price Work will be based on actual quantities.
- C. Each unit price will be deemed to include an amount considered by Contractor to be adequate to cover Contractor's overhead and profit for each separately identified item.
- D. Engineer will determine the actual quantities and classifications of Unit Price Work performed by Contractor. Engineer will review with Contractor the Engineer's preliminary determinations on such matters before rendering a written decision thereon (by recommendation of an Application for Payment or otherwise). Engineer's written decision

thereon will be final and binding (except as modified by Engineer to reflect changed factual conditions or more accurate data) upon Owner and Contractor, and the final adjustment of Contract Price will be set forth in a Change Order, subject to the provisions of the following paragraph.

E. *Adjustments in Unit Price*

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

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

14.01 *Access to Work*

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

14.02 *Tests, Inspections, and Approvals*

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

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

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

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

14.03 *Defective Work*

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

losses, and damages resulting from defective Work, then Owner may impose a reasonable set-off against payments due under Article 15.

14.04 *Acceptance of Defective Work*

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

14.05 *Uncovering Work*

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

14.06 *Owner May Stop the Work*

- A. If the Work is defective, or Contractor fails to supply sufficient skilled workers or suitable materials or equipment, or fails to perform the Work in such a way that the completed Work will conform to the Contract Documents, then Owner may order Contractor to stop the Work,

or any portion thereof, until the cause for such order has been eliminated; however, this right of Owner to stop the Work will not give rise to any duty on the part of Owner to exercise this right for the benefit of Contractor, any Subcontractor, any Supplier, any other individual or entity, or any surety for, or employee or agent of any of them.

14.07 *Owner May Correct Defective Work*

- A. If Contractor fails within a reasonable time after written notice from Engineer to correct defective Work, or to remove and replace defective Work as required by Engineer, then Owner may, after 7 days' written notice to Contractor, correct or remedy any such deficiency.
- B. In exercising the rights and remedies under this Paragraph 14.07, Owner shall proceed expeditiously. In connection with such corrective or remedial action, Owner may exclude Contractor from all or part of the Site, take possession of all or part of the Work and suspend Contractor's services related thereto, and incorporate in the Work all materials and equipment stored at the Site or for which Owner has paid Contractor but which are stored elsewhere. Contractor shall allow Owner, Owner's representatives, agents and employees, Owner's other contractors, and Engineer and Engineer's consultants access to the Site to enable Owner to exercise the rights and remedies under this paragraph.
- C. All claims, costs, losses, and damages incurred or sustained by Owner in exercising the rights and remedies under this Paragraph 14.07 will be charged against Contractor as set-offs against payments due under Article 15. Such claims, costs, losses and damages will include but not be limited to all costs of repair, or replacement of work of others destroyed or damaged by correction, removal, or replacement of Contractor's defective Work.
- D. Contractor shall not be allowed an extension of the Contract Times because of any delay in the performance of the Work attributable to the exercise by Owner of Owner's rights and remedies under this Paragraph 14.07.

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

15.01 *Progress Payments*

- A. *Basis for Progress Payments:* The Schedule of Values established as provided in Article 2 will serve as the basis for progress payments and will be incorporated into a form of Application for Payment acceptable to Engineer. Progress payments for Unit Price Work will be based on the number of units completed during the pay period, as determined under the provisions of Paragraph 13.03. Progress payments for cost-based Work will be based on Cost of the Work completed by Contractor during the pay period.
- B. *Applications for Payments*
 - 1. At least 20 days before the date established in the Agreement for each progress payment (but not more often than once a month), Contractor shall submit to Engineer for review an Application for Payment filled out and signed by Contractor covering the Work completed as of the date of the Application and accompanied by such supporting documentation as is required by the Contract Documents.
 - 2. If payment is requested on the basis of materials and equipment not incorporated in the Work but delivered and suitably stored at the Site or at another location agreed to in writing, the Application for Payment must also be accompanied by: (a) a bill of sale, invoice, copies of subcontract or purchase order payments, or other documentation

establishing full payment by Contractor for the materials and equipment; (b) at Owner's request, documentation warranting that Owner has received the materials and equipment free and clear of all Liens; and (c) evidence that the materials and equipment are covered by appropriate property insurance, a warehouse bond, or other arrangements to protect Owner's interest therein, all of which must be satisfactory to Owner.

3. Beginning with the second Application for Payment, each Application must include an affidavit of Contractor stating that all previous progress payments received by Contractor have been applied to discharge Contractor's legitimate obligations associated with prior Applications for Payment.
4. The amount of retainage with respect to progress payments will be as stipulated in the Agreement.

C. *Review of Applications*

1. Engineer will, within 10 days after receipt of each Application for Payment, including each resubmittal, either indicate in writing a recommendation of payment and present the Application to Owner, or return the Application to Contractor indicating in writing Engineer's reasons for refusing to recommend payment. In the latter case, Contractor may make the necessary corrections and resubmit the Application.
2. Engineer's recommendation of any payment requested in an Application for Payment will constitute a representation by Engineer to Owner, based on Engineer's observations of the executed Work as an experienced and qualified design professional, and on Engineer's review of the Application for Payment and the accompanying data and schedules, that to the best of Engineer's knowledge, information and belief:
 - a. the Work has progressed to the point indicated;
 - b. the quality of the Work is generally in accordance with the Contract Documents (subject to an evaluation of the Work as a functioning whole prior to or upon Substantial Completion, the results of any subsequent tests called for in the Contract Documents, a final determination of quantities and classifications for Unit Price Work under Paragraph 13.03, and any other qualifications stated in the recommendation); and
 - c. the conditions precedent to Contractor's being entitled to such payment appear to have been fulfilled in so far as it is Engineer's responsibility to observe the Work.
3. By recommending any such payment Engineer will not thereby be deemed to have represented that:
 - a. inspections made to check the quality or the quantity of the Work as it has been performed have been exhaustive, extended to every aspect of the Work in progress, or involved detailed inspections of the Work beyond the responsibilities specifically assigned to Engineer in the Contract; or
 - b. there may not be other matters or issues between the parties that might entitle Contractor to be paid additionally by Owner or entitle Owner to withhold payment to Contractor.

4. Neither Engineer's review of Contractor's Work for the purposes of recommending payments nor Engineer's recommendation of any payment, including final payment, will impose responsibility on Engineer:
 - a. to supervise, direct, or control the Work;
 - b. for the means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto;
 - c. for Contractor's failure to comply with Laws and Regulations applicable to Contractor's performance of the Work;
 - d. to make any examination to ascertain how or for what purposes Contractor has used the money paid by Owner; or
 - e. to determine that title to any of the Work, materials, or equipment has passed to Owner free and clear of any Liens.
5. Engineer may refuse to recommend the whole or any part of any payment if, in Engineer's opinion, it would be incorrect to make the representations to Owner stated in Paragraph 15.01.C.2.
6. Engineer will recommend reductions in payment (set-offs) necessary in Engineer's opinion to protect Owner from loss because:
 - a. the Work is defective, requiring correction or replacement;
 - b. the Contract Price has been reduced by Change Orders;
 - c. Owner has been required to correct defective Work in accordance with Paragraph 14.07, or has accepted defective Work pursuant to Paragraph 14.04;
 - d. Owner has been required to remove or remediate a Hazardous Environmental Condition for which Contractor is responsible; or
 - e. Engineer has actual knowledge of the occurrence of any of the events that would constitute a default by Contractor and therefore justify termination for cause under the Contract Documents.

D. Payment Becomes Due

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

E. Reductions in Payment by Owner

1. In addition to any reductions in payment (set-offs) recommended by Engineer, Owner is entitled to impose a set-off against payment based on any of the following:
 - a. Claims have been made against Owner based on Contractor's conduct in the performance or furnishing of the Work, or Owner has incurred costs, losses, or damages resulting from Contractor's conduct in the performance or furnishing of the Work, including but not limited to claims, costs, losses, or damages from workplace injuries, adjacent property damage, non-compliance with Laws and Regulations, and patent infringement;

- b. Contractor has failed to take reasonable and customary measures to avoid damage, delay, disruption, and interference with other work at or adjacent to the Site;
 - c. Contractor has failed to provide and maintain required bonds or insurance;
 - d. Owner has been required to remove or remediate a Hazardous Environmental Condition for which Contractor is responsible;
 - e. Owner has incurred extra charges or engineering costs related to submittal reviews, evaluations of proposed substitutes, tests and inspections, or return visits to manufacturing or assembly facilities;
 - f. The Work is defective, requiring correction or replacement;
 - g. Owner has been required to correct defective Work in accordance with Paragraph 14.07, or has accepted defective Work pursuant to Paragraph 14.04;
 - h. The Contract Price has been reduced by Change Orders;
 - i. An event has occurred that would constitute a default by Contractor and therefore justify a termination for cause;
 - j. Liquidated or other damages have accrued as a result of Contractor's failure to achieve Milestones, Substantial Completion, or final completion of the Work;
 - k. Liens have been filed in connection with the Work, except where Contractor has delivered a specific bond satisfactory to Owner to secure the satisfaction and discharge of such Liens; or
 - l. Other items entitle Owner to a set-off against the amount recommended.
2. If Owner imposes any set-off against payment, whether based on its own knowledge or on the written recommendations of Engineer, Owner will give Contractor immediate written notice (with a copy to Engineer) stating the reasons for such action and the specific amount of the reduction, and promptly pay Contractor any amount remaining after deduction of the amount so withheld. Owner shall promptly pay Contractor the amount so withheld, or any adjustment thereto agreed to by Owner and Contractor, if Contractor remedies the reasons for such action. The reduction imposed will be binding on Contractor unless it duly submits a Change Proposal contesting the reduction.
 3. Upon a subsequent determination that Owner's refusal of payment was not justified, the amount wrongfully withheld will be treated as an amount due as determined by Paragraph 15.01.D.1 and subject to interest as provided in the Agreement.

15.02 *Contractor's Warranty of Title*

- A. Contractor warrants and guarantees that title to all Work, materials, and equipment furnished under the Contract will pass to Owner free and clear of (1) all Liens and other title defects, and (2) all patent, licensing, copyright, or royalty obligations, no later than 7 days after the time of payment by Owner.

15.03 *Substantial Completion*

- A. When Contractor considers the entire Work ready for its intended use Contractor shall notify Owner and Engineer in writing that the entire Work is substantially complete and request that Engineer issue a certificate of Substantial Completion. Contractor shall at the same time

submit to Owner and Engineer an initial draft of punch list items to be completed or corrected before final payment.

- B. Promptly after Contractor's notification, Owner, Contractor, and Engineer shall make an inspection of the Work to determine the status of completion. If Engineer does not consider the Work substantially complete, Engineer will notify Contractor in writing giving the reasons therefor.
- C. If Engineer considers the Work substantially complete, Engineer will deliver to Owner a preliminary certificate of Substantial Completion which will fix the date of Substantial Completion. Engineer shall attach to the certificate a punch list of items to be completed or corrected before final payment. Owner shall have 7 days after receipt of the preliminary certificate during which to make written objection to Engineer as to any provisions of the certificate or attached punch list. If, after considering the objections to the provisions of the preliminary certificate, Engineer concludes that the Work is not substantially complete, Engineer will, within 14 days after submission of the preliminary certificate to Owner, notify Contractor in writing that the Work is not substantially complete, stating the reasons therefor. If Owner does not object to the provisions of the certificate, or if despite consideration of Owner's objections Engineer concludes that the Work is substantially complete, then Engineer will, within said 14 days, execute and deliver to Owner and Contractor a final certificate of Substantial Completion (with a revised punch list of items to be completed or corrected) reflecting such changes from the preliminary certificate as Engineer believes justified after consideration of any objections from Owner.
- D. At the time of receipt of the preliminary certificate of Substantial Completion, Owner and Contractor will confer regarding Owner's use or occupancy of the Work following Substantial Completion, review the builder's risk insurance policy with respect to the end of the builder's risk coverage, and confirm the transition to coverage of the Work under a permanent property insurance policy held by Owner. Unless Owner and Contractor agree otherwise in writing, Owner shall bear responsibility for security, operation, protection of the Work, property insurance, maintenance, heat, and utilities upon Owner's use or occupancy of the Work.
- E. After Substantial Completion the Contractor shall promptly begin work on the punch list of items to be completed or corrected prior to final payment. In appropriate cases Contractor may submit monthly Applications for Payment for completed punch list items, following the progress payment procedures set forth above.
- F. Owner shall have the right to exclude Contractor from the Site after the date of Substantial Completion subject to allowing Contractor reasonable access to remove its property and complete or correct items on the punch list.

15.04 *Partial Use or Occupancy*

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

significant interference with Contractor's performance of the remainder of the Work, subject to the following conditions:

1. At any time, Owner may request in writing that Contractor permit Owner to use or occupy any such part of the Work that Owner believes to be substantially complete. If and when Contractor agrees that such part of the Work is substantially complete, Contractor, Owner, and Engineer will follow the procedures of Paragraph 15.03.A through 15.03.E for that part of the Work.
2. At any time, Contractor may notify Owner and Engineer in writing that Contractor considers any such part of the Work substantially complete and request Engineer to issue a certificate of Substantial Completion for that part of the Work.
3. Within a reasonable time after either such request, Owner, Contractor, and Engineer shall make an inspection of that part of the Work to determine its status of completion. If Engineer does not consider that part of the Work to be substantially complete, Engineer will notify Owner and Contractor in writing giving the reasons therefor. If Engineer considers that part of the Work to be substantially complete, the provisions of Paragraph 15.03 will apply with respect to certification of Substantial Completion of that part of the Work and the division of responsibility in respect thereof and access thereto.
4. No use or occupancy or separate operation of part of the Work may occur prior to compliance with the requirements of Paragraph 6.04 regarding builder's risk or other property insurance.

15.05 *Final Inspection*

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

15.06 *Final Payment*

A. *Application for Payment*

1. After Contractor has, in the opinion of Engineer, satisfactorily completed all corrections identified during the final inspection and has delivered, in accordance with the Contract Documents, all maintenance and operating instructions, schedules, guarantees, bonds, certificates or other evidence of insurance, certificates of inspection, annotated record documents (as provided in Paragraph 7.12), and other documents, Contractor may make application for final payment.
2. The final Application for Payment must be accompanied (except as previously delivered) by:
 - a. all documentation called for in the Contract Documents;
 - b. consent of the surety, if any, to final payment;
 - c. satisfactory evidence that all title issues have been resolved such that title to all Work, materials, and equipment has passed to Owner free and clear of any Liens or other title defects, or will so pass upon final payment.

- d. a list of all duly pending Change Proposals and Claims; and
 - e. complete and legally effective releases or waivers (satisfactory to Owner) of all Lien rights arising out of the Work, and of Liens filed in connection with the Work.
- 3. In lieu of the releases or waivers of Liens specified in Paragraph 15.06.A.2 and as approved by Owner, Contractor may furnish receipts or releases in full and an affidavit of Contractor that: (a) the releases and receipts include all labor, services, material, and equipment for which a Lien could be filed; and (b) all payrolls, material and equipment bills, and other indebtedness connected with the Work for which Owner might in any way be responsible, or which might in any way result in liens or other burdens on Owner's property, have been paid or otherwise satisfied. If any Subcontractor or Supplier fails to furnish such a release or receipt in full, Contractor may furnish a bond or other collateral satisfactory to Owner to indemnify Owner against any Lien, or Owner at its option may issue joint checks payable to Contractor and specified Subcontractors and Suppliers.
- B. *Engineer's Review of Final Application and Recommendation of Payment:* If, on the basis of Engineer's observation of the Work during construction and final inspection, and Engineer's review of the final Application for Payment and accompanying documentation as required by the Contract Documents, Engineer is satisfied that the Work has been completed and Contractor's other obligations under the Contract have been fulfilled, Engineer will, within 10 days after receipt of the final Application for Payment, indicate in writing Engineer's recommendation of final payment and present the final Application for Payment to Owner for payment. Such recommendation will account for any set-offs against payment that are necessary in Engineer's opinion to protect Owner from loss for the reasons stated above with respect to progress payments. Otherwise, Engineer will return the Application for Payment to Contractor, indicating in writing the reasons for refusing to recommend final payment, in which case Contractor shall make the necessary corrections and resubmit the Application for Payment.
- C. *Notice of Acceptability:* In support of its recommendation of payment of the final Application for Payment, Engineer will also give written notice to Owner and Contractor that the Work is acceptable, subject to stated limitations in the notice and to the provisions of Paragraph 15.07.
- D. *Completion of Work:* The Work is complete (subject to surviving obligations) when it is ready for final payment as established by the Engineer's written recommendation of final payment and issuance of notice of the acceptability of the Work.
- E. *Final Payment Becomes Due:* Upon receipt from Engineer of the final Application for Payment and accompanying documentation, Owner shall set off against the amount recommended by Engineer for final payment any further sum to which Owner is entitled, including but not limited to set-offs for liquidated damages and set-offs allowed under the provisions of this Contract with respect to progress payments. Owner shall pay the resulting balance due to Contractor within 30 days of Owner's receipt of the final Application for Payment from Engineer.

15.07 *Waiver of Claims*

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

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

- B. The acceptance of final payment by Contractor will constitute a waiver by Contractor of all claims and rights against Owner other than those pending matters that have been duly submitted as a Claim, or appealed under the provisions of Article 17.

15.08 *Correction Period*

- A. If within one year after the date of Substantial Completion (or such longer period of time as may be prescribed by the Supplementary Conditions or the terms of any applicable special guarantee required by the Contract Documents), Owner gives Contractor written notice that any Work has been found to be defective, or that Contractor's repair of any damages to the Site or adjacent areas has been found to be defective, then after receipt of such notice of defect Contractor shall promptly, without cost to Owner and in accordance with Owner's written instructions:
 - 1. correct the defective repairs to the Site or such adjacent areas;
 - 2. correct such defective Work;
 - 3. remove the defective Work from the Project and replace it with Work that is not defective, if the defective Work has been rejected by Owner, and
 - 4. satisfactorily correct or repair or remove and replace any damage to other Work, to the work of others, or to other land or areas resulting from the corrective measures.
- B. Owner shall give any such notice of defect within 60 days of the discovery that such Work or repairs is defective. If such notice is given within such 60 days but after the end of the correction period, the notice will be deemed a notice of defective Work under Paragraph 7.17.B.
- C. If, after receipt of a notice of defect within 60 days and within the correction period, Contractor does not promptly comply with the terms of Owner's written instructions, or in an emergency where delay would cause serious risk of loss or damage, Owner may have the defective Work corrected or repaired or may have the rejected Work removed and replaced. Contractor shall pay all costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such correction or repair or such removal and replacement (including but not limited to all costs of repair or replacement of work of others). Contractor's failure to pay such costs, losses, and damages within 10 days of invoice from Owner will be deemed the start of an event giving rise to a Claim under Paragraph 12.01.B, such that any related Claim must be brought within 30 days of the failure to pay.
- D. In special circumstances where a particular item of equipment is placed in continuous service before Substantial Completion of all the Work, the correction period for that item may start to run from an earlier date if so provided in the Specifications.
- E. Where defective Work (and damage to other Work resulting therefrom) has been corrected or removed and replaced under this paragraph, the correction period hereunder with respect to such Work will be extended for an additional period of one year after such correction or removal and replacement has been satisfactorily completed.

- F. Contractor's obligations under this paragraph are in addition to all other obligations and warranties. The provisions of this paragraph are not to be construed as a substitute for, or a waiver of, the provisions of any applicable statute of limitation or repose.

ARTICLE 16—SUSPENSION OF WORK AND TERMINATION

16.01 *Owner May Suspend Work*

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

16.02 *Owner May Terminate for Cause*

- A. The occurrence of any one or more of the following events will constitute a default by Contractor and justify termination for cause:
1. Contractor's persistent failure to perform the Work in accordance with the Contract Documents (including, but not limited to, failure to supply sufficient skilled workers or suitable materials or equipment, or failure to adhere to the Progress Schedule);
 2. Failure of Contractor to perform or otherwise to comply with a material term of the Contract Documents;
 3. Contractor's disregard of Laws or Regulations of any public body having jurisdiction; or
 4. Contractor's repeated disregard of the authority of Owner or Engineer.
- B. If one or more of the events identified in Paragraph 16.02.A occurs, then after giving Contractor (and any surety) 10 days' written notice that Owner is considering a declaration that Contractor is in default and termination of the Contract, Owner may proceed to:
1. declare Contractor to be in default, and give Contractor (and any surety) written notice that the Contract is terminated; and
 2. enforce the rights available to Owner under any applicable performance bond.
- C. Subject to the terms and operation of any applicable performance bond, if Owner has terminated the Contract for cause, Owner may exclude Contractor from the Site, take possession of the Work, incorporate in the Work all materials and equipment stored at the Site or for which Owner has paid Contractor but which are stored elsewhere, and complete the Work as Owner may deem expedient.
- D. Owner may not proceed with termination of the Contract under Paragraph 16.02.B if Contractor within 7 days of receipt of notice of intent to terminate begins to correct its failure to perform and proceeds diligently to cure such failure.
- E. If Owner proceeds as provided in Paragraph 16.02.B, Contractor shall not be entitled to receive any further payment until the Work is completed. If the unpaid balance of the Contract Price exceeds the cost to complete the Work, including all related claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects,

attorneys, and other professionals) sustained by Owner, such excess will be paid to Contractor. If the cost to complete the Work including such related claims, costs, losses, and damages exceeds such unpaid balance, Contractor shall pay the difference to Owner. Such claims, costs, losses, and damages incurred by Owner will be reviewed by Engineer as to their reasonableness and, when so approved by Engineer, incorporated in a Change Order. When exercising any rights or remedies under this paragraph, Owner shall not be required to obtain the lowest price for the Work performed.

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

16.03 *Owner May Terminate for Convenience*

- A. Upon 7 days' written notice to Contractor and Engineer, Owner may, without cause and without prejudice to any other right or remedy of Owner, terminate the Contract. In such case, Contractor shall be paid for (without duplication of any items):
 - 1. completed and acceptable Work executed in accordance with the Contract Documents prior to the effective date of termination, including fair and reasonable sums for overhead and profit on such Work;
 - 2. expenses sustained prior to the effective date of termination in performing services and furnishing labor, materials, or equipment as required by the Contract Documents in connection with uncompleted Work, plus fair and reasonable sums for overhead and profit on such expenses; and
 - 3. other reasonable expenses directly attributable to termination, including costs incurred to prepare a termination for convenience cost proposal.
- B. Contractor shall not be paid for any loss of anticipated profits or revenue, post-termination overhead costs, or other economic loss arising out of or resulting from such termination.

16.04 *Contractor May Stop Work or Terminate*

- A. If, through no act or fault of Contractor, (1) the Work is suspended for more than 90 consecutive days by Owner or under an order of court or other public authority, or (2) Engineer fails to act on any Application for Payment within 30 days after it is submitted, or (3) Owner fails for 30 days to pay Contractor any sum finally determined to be due, then Contractor may, upon 7 days' written notice to Owner and Engineer, and provided Owner or Engineer do not remedy such suspension or failure within that time, terminate the contract and recover from Owner payment on the same terms as provided in Paragraph 16.03.
- B. In lieu of terminating the Contract and without prejudice to any other right or remedy, if Engineer has failed to act on an Application for Payment within 30 days after it is submitted, or Owner has failed for 30 days to pay Contractor any sum finally determined to be due, Contractor may, 7 days after written notice to Owner and Engineer, stop the Work until payment is made of all such amounts due Contractor, including interest thereon. The

provisions of this paragraph are not intended to preclude Contractor from submitting a Change Proposal for an adjustment in Contract Price or Contract Times or otherwise for expenses or damage directly attributable to Contractor's stopping the Work as permitted by this paragraph.

ARTICLE 17—FINAL RESOLUTION OF DISPUTES

17.01 *Methods and Procedures*

- A. *Disputes Subject to Final Resolution:* The following disputed matters are subject to final resolution under the provisions of this article:
1. A timely appeal of an approval in part and denial in part of a Claim, or of a denial in full, pursuant to Article 12; and
 2. Disputes between Owner and Contractor concerning the Work, or obligations under the Contract Documents, that arise after final payment has been made.
- B. *Final Resolution of Disputes:* For any dispute subject to resolution under this article, Owner or Contractor may:
1. elect in writing to invoke the dispute resolution process provided for in the Supplementary Conditions;
 2. agree with the other party to submit the dispute to another dispute resolution process; or
 3. if no dispute resolution process is provided for in the Supplementary Conditions or mutually agreed to, give written notice to the other party of the intent to submit the dispute to a court of competent jurisdiction.

ARTICLE 18—MISCELLANEOUS

18.01 *Giving Notice*

- A. Whenever any provision of the Contract requires the giving of written notice to Owner, Engineer, or Contractor, it will be deemed to have been validly given only if delivered:
1. in person, by a commercial courier service or otherwise, to the recipient's place of business;
 2. by registered or certified mail, postage prepaid, to the recipient's place of business; or
 3. by e-mail to the recipient, with the words "Formal Notice" or similar in the e-mail's subject line.

18.02 *Computation of Times*

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

18.03 *Cumulative Remedies*

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

18.04 *Limitation of Damages*

- A. With respect to any and all Change Proposals, Claims, disputes subject to final resolution, and other matters at issue, neither Owner nor Engineer, nor any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors, shall be liable to Contractor for any claims, costs, losses, or damages sustained by Contractor on or in connection with any other project or anticipated project.

18.05 *No Waiver*

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

18.06 *Survival of Obligations*

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

18.07 *Controlling Law*

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

18.08 *Assignment of Contract*

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

18.09 *Successors and Assigns*

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

18.10 *Headings*

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

SUPPLEMENTARY CONDITIONS OF THE CONSTRUCTION CONTRACT

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SUPPLEMENTARY CONDITIONS OF THE CONSTRUCTION CONTRACT

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

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

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

ARTICLE 1—DEFINITIONS AND TERMINOLOGY

SC 1.01.A.8 Add to the following language at the end of last sentence of paragraph 1.01.A.8:

The Change Order form to be used on this Project is EJCDC C-941.

SC 1.01.A.48 Add the following language at the end of the last sentence of Paragraph 1.01.A.48:

A Work Change Directive cannot change Contract Price or Contract Times without subsequent Change Order.

SC 1.01.A.49 Add the following new Paragraph after Paragraph 1.01.A.48:

Abnormal Weather Conditions – Conditions of extreme or unusual weather for that given region, elevation, or season as determined by Engineer. Extreme or unusual weather that is typical for a given region, elevation, or season should not be considered Abnormal Weather Conditions.

SC 1.01.A Include the following:

Build America, Buy America Act (BABAA) – Requirements instituted by the Bipartisan Infrastructure Law of 2021 mandating domestic preference that all iron and steel, manufactured products, and construction materials are produced in the United States.

Construction Materials – Those articles, materials, or supply – other than an item of primarily iron or steel; a manufactured product; cement and cementitious materials; aggregates such as stone, sand, or gravel; or aggregate binding agents or additives – that are or consist primarily of: non-ferrous metals, plastic and polymer-based products, glass, lumber or drywall.

Manufactured Product – Items assembled out of components, or otherwise made or processed from raw materials into finished products. Manufactured products must be manufactured (assembled) in the United States, and the cost of components that were mined, produced, or manufactured in the United States must be greater than 55 percent of the total cost of all components of the project.

Manufacturer's Certification – Documentation provided by a Manufacturer, certifying that the items provided by Manufacturer meet the domestic preference requirements of BABAA.

ARTICLE 2—PRELIMINARY MATTERS

2.01 *Delivery of Bonds and Evidence of Insurance*

SC-2.01 Delete Paragraphs 2.01.B. and C. in their entirety and insert the following in their place:

- B. *Evidence of Contractor's Insurance:* When Contractor delivers the signed counterparts of the Agreement to Owner, Contractor shall also deliver to Owner copies of the policies (including all endorsements, and identification of applicable self-insured retentions and deductibles) of insurance required to be provided by Contractor in this Contract. Contractor may block out (redact) any confidential premium or pricing information contained in any policy or endorsement furnished under this provision.
- C. *Evidence of Owner's Insurance:* After receipt from Contractor of the signed counterparts of the Agreement and all required bonds and insurance documentation, Owner shall promptly deliver to Contractor copies of the policies of insurance to be provided by Owner in this Contract (if any). Owner may block out (redact) any confidential premium or pricing information contained in any policy or endorsement furnished under this provision.

2.02 *Copies of Documents*

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

Owner shall furnish to Contractor 0 printed copies of the Contract Documents (including one fully signed counterpart of the Agreement), and one copy in electronic portable document format (PDF).

2.06 *Electronic Transmittals*

SC-2.06 Delete Paragraphs 2.06.B and 2.06.C in their entirety and insert the following in their place:

- B. *Electronic Documents Protocol:* The parties shall conform to the following provisions in Paragraphs 2.06.B and 2.06.C, together referred to as the Electronic Documents Protocol ("EDP" or "Protocol") for exchange of electronic transmittals.

1. *Basic Requirements*

- a. To the fullest extent practical, the parties agree to and will transmit and accept Electronic Documents in an electronic or digital format using the procedures described in this Protocol. Use of the Electronic Documents and any information contained therein is subject to the requirements of this Protocol and other provisions of the Contract.
- b. The contents of the information in any Electronic Document will be the responsibility of the transmitting party.
- c. Electronic Documents as exchanged by this Protocol may be used in the same manner as the printed versions of the same documents that are exchanged using non-electronic format and methods, subject to the same governing requirements, limitations, and restrictions, set forth in the Contract Documents.
- d. Except as otherwise explicitly stated herein, the terms of this Protocol will be incorporated into any other agreement or subcontract between a party and any third party for any portion of the Work on the Project, or any Project-related services, where that third party is, either directly or indirectly, required to exchange Electronic Documents with a party or with Engineer. Nothing herein will modify the requirements of the Contract regarding communications between and among the parties and their subcontractors and consultants.

- e. When transmitting Electronic Documents, the transmitting party makes no representations as to long term compatibility, usability, or readability of the items resulting from the receiving party's use of software application packages, operating systems, or computer hardware differing from those established in this Protocol.
- f. Nothing herein negates any obligation 1) in the Contract to create, provide, or maintain an original printed record version of Drawings and Specifications, signed and sealed according to applicable Laws and Regulations; 2) to comply with any applicable Law or Regulation governing the signing and sealing of design documents or the signing and electronic transmission of any other documents; or 3) to comply with the notice requirements of Paragraph 18.01 of the General Conditions.

2. *System Infrastructure for Electronic Document Exchange*

- a. Each party will provide hardware, operating system(s) software, internet, e-mail, and large file transfer functions ("System Infrastructure") at its own cost and sufficient for complying with the EDP requirements. With the exception of minimum standards set forth in this EDP, and any explicit system requirements specified by attachment to this EDP, it is the obligation of each party to determine, for itself, its own System Infrastructure.
 - 1) The maximum size of an email attachment for exchange of Electronic Documents under this EDP is 24 MB. Attachments larger than that may be exchanged using large file transfer functions or physical media.
 - 2) Each Party assumes full and complete responsibility for any and all of its own costs, delays, deficiencies, and errors associated with converting, translating, updating, verifying, licensing, or otherwise enabling its System Infrastructure, including operating systems and software, for use with respect to this EDP.
- b. Each party is responsible for its own system operations, security, back-up, archiving, audits, printing resources, and other Information Technology ("IT") for maintaining operations of its System Infrastructure during the Project, including coordination with the party's individual(s) or entity responsible for managing its System Infrastructure and capable of addressing routine communications and other IT issues affecting the exchange of Electronic Documents.
- c. Each party will operate and maintain industry-standard, industry-accepted, ISO-standard, commercial-grade security software and systems that are intended to protect the other party from: software viruses and other malicious software like worms, trojans, adware; data breaches; loss of confidentiality; and other threats in the transmission to or storage of information from the other parties, including transmission of Electronic Documents by physical media such as CD/DVD/flash drive/hard drive. To the extent that a party maintains and operates such security software and systems, it shall not be liable to the other party for any breach of system security.
- d. In the case of disputes, conflicts, or modifications to the EDP required to address issues affecting System Infrastructure, the parties shall cooperatively resolve the issues; but, failing resolution, the Owner is authorized to make and require

reasonable and necessary changes to the EDP to effectuate its original intent. If the changes cause additional cost or time to Contractor, not reasonably anticipated under the original EDP, Contractor may seek an adjustment in price or time under the appropriate process in the Contract.

- e. Each party is responsible for its own back-up and archive of documents sent and received during the term of the contract under this EDP, unless this EDP establishes a Project document archive, either as part of a mandatory Project website or other communications protocol, upon which the parties may rely for document archiving during the specified term of operation of such Project document archive. Further, each party remains solely responsible for its own post-Project back-up and archive of Project documents after the term of the Contract, or after termination of the Project document archive, if one is established, for as long as required by the Contract and as each party deems necessary for its own purposes.
- f. If a receiving party receives an obviously corrupted, damaged, or unreadable Electronic Document, the receiving party will advise the sending party of the incomplete transmission.
- g. The parties will bring any non-conforming Electronic Documents into compliance with the EDP. The parties will attempt to complete a successful transmission of the Electronic Document or use an alternative delivery method to complete the communication.
- h. The Owner will operate a Project information management system (also referred to in this EDP as "Project Website") for use of Owner, Engineer and Contractor during the Project for exchange and storage of Project-related communications and information. Except as otherwise provided in this EDP or the General Conditions, use of the Project Website by the parties as described in this Paragraph will be mandatory for exchange of Project documents, communications, submittals, and other Project-related information. The following conditions and standards will govern use of the Project Website:
 - 1) Describe the period of time during which the Project Website will be operated and be available for reliance by the parties;
 - 2) Provide any minimum system infrastructure, software licensing and security standards for access to and use of the Project Website;
 - 3) Describe the types and extent of services to be provided at the Project Website (such as large file transfer, email, communication and document archives, etc.); and
 - 4) Include any other Project Website attributes that may be pertinent to Contractor's use of the facility and pricing of such use.

C. *Software Requirements for Electronic Document Exchange; Limitations*

- 1. Each party will acquire the software and software licenses necessary to create and transmit Electronic Documents and to read and to use any Electronic Documents received from the other party (and if relevant from third parties), using the software formats required in this section of the EDP.

- a. Prior to using any updated version of the software required in this section for sending Electronic Documents to the other party, the originating party will first notify and receive concurrence from the other party for use of the updated version or adjust its transmission to comply with this EDP.
2. The parties agree not to intentionally edit, reverse engineer, decrypt, remove security or encryption features, or convert to another format for modification purposes any Electronic Document or information contained therein that was transmitted in a software data format, including Portable Document Format (PDF), intended by sender not to be modified, unless the receiving party obtains the permission of the sending party or is citing or quoting excerpts of the Electronic Document for Project purposes.
3. Software and data formats for exchange of Electronic Documents will conform to the requirements set forth in Exhibit A to this EDP, including software versions, if listed.

SC-2.06 Supplement Paragraph 2.06 of the General Conditions by adding the following paragraph:

D. Requests by Contractor for Electronic Documents in Other Formats

1. Release of any Electronic Document versions of the Project documents in formats other than those identified in the Electronic Documents Protocol (if any) or elsewhere in the Contract will be at the sole discretion of the Owner.
2. To extent determined by Owner, in its sole discretion, to be prudent and necessary, release of Electronic Documents versions of Project documents and other Project information requested by Contractor ("Request") in formats other than those identified in the Electronic Documents Protocol (if any) or elsewhere in the Contract will be subject to the provisions of the Owner's response to the Request, and to the following conditions to which Contractor agrees:
 - a. The content included in the Electronic Documents created by Engineer and covered by the Request was prepared by Engineer as an internal working document for Engineer's purposes solely, and is being provided to Contractor on an "AS IS" basis without any warranties of any kind, including, but not limited to any implied warranties of fitness for any purpose. As such, Contractor is advised and acknowledges that the content may not be suitable for Contractor's application, or may require substantial modification and independent verification by Contractor. The content may include limited resolution of models, not-to-scale schematic representations and symbols, use of notes to convey design concepts in lieu of accurate graphics, approximations, graphical simplifications, undocumented intermediate revisions, and other devices that may affect subsequent reuse.
 - b. Electronic Documents containing text, graphics, metadata, or other types of data that are provided by Engineer to Contractor under the request are only for convenience of Contractor. Any conclusion or information obtained or derived from such data will be at the Contractor's sole risk and the Contractor waives any claims against Engineer or Owner arising from use of data in Electronic Documents covered by the Request.
 - c. Contractor shall indemnify and hold harmless Owner and Engineer and their subconsultants from all claims, damages, losses, and expenses, including attorneys'

fees and defense costs arising out of or resulting from Contractor's use, adaptation, or distribution of any Electronic Documents provided under the Request.

- d. Contractor agrees not to sell, copy, transfer, forward, give away or otherwise distribute this information (in source or modified file format) to any third party without the direct written authorization of Engineer, unless such distribution is specifically identified in the Request and is limited to Contractor's subcontractors. Contractor warrants that subsequent use by Contractor's subcontractors complies with all terms of the Contract Documents and Owner's response to Request.
3. In the event that Owner elects to provide or directs the Engineer to provide to Contractor any Contractor-requested Electronic Document versions of Project information that is not explicitly identified in the Contract Documents as being available to Contractor, the Owner shall be reimbursed by Contractor on an hourly basis (at \$ 150 per hour) for any engineering costs necessary to create or otherwise prepare the data in a manner deemed appropriate by Engineer.

ARTICLE 3—CONTRACT DOCUMENTS: INTENT, REQUIREMENTS, REUSE

ARTICLE 4—COMMENCEMENT AND PROGRESS OF THE WORK

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

SC 5.03 Delete Paragraphs 5.03.A and 5.03.B in their entirety and insert the following:

A. Soil Boring Logs can be found in Appendix B.

SC 5.06 Delete Paragraphs 5.06.A and 5.06.B in their entirety and insert the following:

A. No reports or drawings related to Hazardous Environmental Conditions at the Site are known to Owner.

B. Not Used.

ARTICLE 6—BONDS AND INSURANCE

6.03 *Contractor's Insurance*

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

D. *Other Additional Insureds:* As a supplement to the provisions of Paragraph 6.03.C of the General Conditions, the commercial general liability, automobile liability, umbrella or excess, pollution liability, and unmanned aerial vehicle liability policies must include as additional insureds (in addition to Owner and Engineer) the following:

(a) The Owner (Haring Charter Township)

(b) The Engineer (Gosling Czubak Engineering Sciences, Inc.)

E. *Workers' Compensation and Employer's Liability:* Contractor shall purchase and maintain workers' compensation and employer's liability insurance, including, as applicable, United

States Longshoreman and Harbor Workers' Compensation Act, Jones Act, stop-gap employer's liability coverage for monopolistic states, and foreign voluntary workers' compensation (from available sources, notwithstanding the jurisdictional requirement of Paragraph 6.02.B of the General Conditions).

Workers' Compensation and Related Policies	Policy limits of not less than:
Workers' Compensation	
State	Statutory
Applicable Federal (e.g., Longshoreman's)	Statutory
Foreign voluntary workers' compensation (employer's responsibility coverage), if applicable	Statutory
Jones Act (if applicable)	
Bodily injury by accident—each accident	\$
Bodily injury by disease—aggregate	\$
Employer's Liability	
Each accident	\$500,000
Each employee	\$
Policy limit	\$
Stop-gap Liability Coverage	
For work performed in monopolistic states, stop-gap liability coverage must be endorsed to either the worker's compensation or commercial general liability policy with a minimum limit of:	\$

- F. *Commercial General Liability—Claims Covered:* Contractor shall purchase and maintain commercial general liability insurance, covering all operations by or on behalf of Contractor, on an occurrence basis, against claims for:
1. damages because of bodily injury, sickness or disease, or death of any person other than Contractor's employees,
 2. damages insured by reasonably available personal injury liability coverage, and
 3. damages because of injury to or destruction of tangible property wherever located, including loss of use resulting therefrom.
- G. *Commercial General Liability—Form and Content:* Contractor's commercial liability policy must be written on a 1996 (or later) Insurance Services Organization, Inc. (ISO) commercial general liability form (occurrence form) and include the following coverages and endorsements:
1. Products and completed operations coverage.
 - a. Such insurance must be maintained for three years after final payment.
 - b. Contractor shall furnish Owner and each other additional insured (as identified in the Supplementary Conditions or elsewhere in the Contract) evidence of continuation of such insurance at final payment and three years thereafter.
 2. Blanket contractual liability coverage, including but not limited to coverage of Contractor's contractual indemnity obligations in Paragraph 7.18.

3. Severability of interests and no insured-versus-insured or cross-liability exclusions.
 4. Underground, explosion, and collapse coverage.
 5. Personal injury coverage.
 6. Additional insured endorsements that include both ongoing operations and products and completed operations coverage through ISO Endorsements CG 20 10 10 01 and CG 20 37 10 01 (together). If Contractor demonstrates to Owner that the specified ISO endorsements are not commercially available, then Contractor may satisfy this requirement by providing equivalent endorsements.
 7. For design professional additional insureds, ISO Endorsement CG 20 32 07 04 "Additional Insured—Engineers, Architects or Surveyors Not Engaged by the Named Insured" or its equivalent.
- H. *Commercial General Liability—Excluded Content*: The commercial general liability insurance policy, including its coverages, endorsements, and incorporated provisions, must not include any of the following:
1. Any modification of the standard definition of "insured contract" (except to delete the railroad protective liability exclusion if Contractor is required to indemnify a railroad or others with respect to Work within 50 feet of railroad property).
 2. Any exclusion for water intrusion or water damage.
 3. Any provisions resulting in the erosion of insurance limits by defense costs other than those already incorporated in ISO form CG 00 01.
 4. Any exclusion of coverage relating to earth subsidence or movement.
 5. Any exclusion for the insured's vicarious liability, strict liability, or statutory liability (other than worker's compensation).
 6. Any limitation or exclusion based on the nature of Contractor's work.
 7. Any professional liability exclusion broader in effect than the most recent edition of ISO form CG 22 79.
- I. *Commercial General Liability—Minimum Policy Limits*

Commercial General Liability	Policy limits of not less than:
General Aggregate	\$2,000,000
Products—Completed Operations Aggregate	\$2,000,000
Personal and Advertising Injury	\$1,000,000
Bodily Injury and Property Damage—Each Occurrence	\$1,000,000

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

Automobile Liability	Policy limits of not less than:
Bodily Injury	
Each Person	\$1,000,000
Each Accident	\$1,000,000
Property Damage	
Each Accident	\$1,000,000
[or]	
Combined Single Limit	
Combined Single Limit (Bodily Injury and Property Damage)	\$2,000,000

- K. *Umbrella or Excess Liability*: Contractor shall purchase and maintain umbrella or excess liability insurance written over the underlying employer's liability, commercial general liability, and automobile liability insurance described in the Paragraphs above. The coverage afforded must be at least as broad as that of each and every one of the underlying policies.

Excess or Umbrella Liability	Policy limits of not less than:
Each Occurrence	\$5,000,000
General Aggregate	\$5,000,000

- L. *Using Umbrella or Excess Liability Insurance to Meet CGL and Other Policy Limit Requirements*: Contractor may meet the policy limits specified for employer's liability, commercial general liability, and automobile liability through the primary policies alone, or through combinations of the primary insurance policy's policy limits and partial attribution of the policy limits of an umbrella or excess liability policy that is at least as broad in coverage as that of the underlying policy, as specified herein. If such umbrella or excess liability policy was required under this Contract, at a specified minimum policy limit, such umbrella or excess policy must retain a minimum limit of \$5,000,000 after accounting for partial attribution of its limits to underlying policies, as allowed above.
- M. *Contractor's Pollution Liability Insurance*: Contractor shall purchase and maintain a policy covering third-party injury and property damage, including cleanup costs, as a result of pollution conditions arising from Contractor's operations and completed operations. This insurance must be maintained for no less than three years after final completion.

Contractor's Pollution Liability	Policy limits of not less than:
Each Occurrence/Claim	\$0
General Aggregate	\$0

- N. *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 must cover negligent acts, errors, or omissions in the performance of professional design or related services by the insured or others for whom the insured is legally liable. The insurance must be maintained throughout the

duration of the Contract and for a minimum of two years after Substantial Completion. The retroactive date on the policy must pre-date the commencement of furnishing services on the Project.

Contractor's Professional Liability	Policy limits of not less than:
Each Claim	\$2,000,000
Annual Aggregate	\$2,000,000

- ~~O. *Railroad Protective Liability Insurance:* Prior to commencing any Work within 50 feet of railroad owned and controlled property, Contractor shall (1) endorse its commercial general liability policy with ISO CG 24 17, removing the contractual liability exclusion for work within 50 feet of a railroad, (2) purchase and maintain railroad protective liability insurance meeting the following requirements, (3) furnish a copy of the endorsement to Owner, and (4) submit a copy of the railroad protective policy and other railroad required documentation to the railroad, and notify Owner of such submittal.~~

Railroad Protective Liability Insurance	Policy limits of not less than:
Each Claim	\$
Aggregate	\$

- P. *Unmanned Aerial Vehicle Liability Insurance:* If Contractor uses unmanned aerial vehicles (UAV—commonly referred to as drones) at the Site or in support of any aspect of the Work, Contractor shall obtain UAV liability insurance in the amounts stated; name Owner, Engineer, and all individuals and entities identified in the Supplementary Conditions as additional insureds; and provide a certificate to Owner confirming Contractor's compliance with this requirement. Such insurance will provide coverage for property damage, bodily injury or death, and invasion of privacy.

Unmanned Aerial Vehicle Liability Insurance	Policy limits of not less than:
Each Claim	\$1,000,000
General Aggregate	\$1,000,000

- ~~Q. *Other Required Insurance:* [Here list additional types and amounts of insurance that Contractor is required to carry.]~~

ARTICLE 7—CONTRACTOR'S RESPONSIBILITIES

7.03 *Labor; Working Hours*

SC-7.03 Add the following new subparagraphs immediately after Paragraph 7.03.C:

- Regular working hours will be 7 AM to 7 PM.
- Owner's legal holidays are: New Years Day, Memorial Day, Independence Day, Labor Day, Veterans Day, Thanksgiving, Day After Thanksgiving, Christmas.

- SC-7.03 Amend the first and second sentences of Paragraph 7.03.C to state "...all Work at the Site must be performed during regular working hours, Monday through Friday. Contractor will not perform Work on a Saturday or Sunday, or any legal holiday."
- SC-7.03 Add the following new paragraph immediately after Paragraph 7.03.C:
- D. Contractor shall be responsible for the cost of any overtime pay or other expense incurred by the Owner for Engineer's services (including those of the Resident Project Representative, if any), Owner's representative, and construction observation services, occasioned by the performance of Work on Saturday, Sunday, any legal holiday, or as overtime on any regular work day. If Contractor is responsible but does not pay, or if the parties are unable to agree as to the amount owed, then Owner may impose a reasonable set-off against payments due under Article 15.
- SC-7.03 Add the following new subparagraph immediately after Paragraph SC-7.03.D:
1. For purposes of administering the foregoing requirement, additional overtime costs are defined as, all time on Saturday, Sunday, or Holiday, all time over 8 hours in a single day.
- SC 7.04.A Amend the third sentence of Paragraph 7.04.A by striking out the following words:
- Unless the specification or description contains or is followed by words reading that no like, equivalent, or "or-equal" item is permitted.
- SC 7.04.A.1 Amend the last sentence of Paragraph a.3 by striking out "and;" and adding a period at the end of Paragraph a.3.
- SC 7.04.1 Delete paragraph 7.04.A.1.a.4 in its entirety and insert the following in its place:
- [Deleted]
- SC 7.04.D. All products must meet BABAA requirements.
1. Contractor shall include Manufacturer's Certification for BABAA requirements with all applicable submittals. If a specific manufacture is used in the bidding, a statement that Manufacturer will comply with BABAA must be included with the bid submission. Contractor shall comply with BABAA requirements, including coordination with manufacturers, distributors, and suppliers to correct deficiencies in any BABAA documentation.
 2. Engineer/Architect approval of shop drawings or samples shall include review of BABAA documentation.
 3. Contractor shall certify upon completion that all work and materials have complied with BABAA requirements.
 4. For any change orders, Contractor shall provide BABAA documentation for any new products or materials required by the change.
 5. Installation of materials or products that are not compliant with BABAA requirements shall be considered defective work. Contractor should ensure that Engineer/Architect has an approved Manufacturer's Certification or waiver prior to items being delivered to the project site.

6. By submitting an application for payment, based in whole or in part on furnishing equipment or materials, Contractor certifies that such equipment and materials, to contractor's knowledge, are compliant with BABAA requirements.

- SC 7.06.A Amend Paragraph 7.06.A by adding the following text to the end of the Paragraph:
- The Contractor shall not award work valued at more than fifty percent of the Contract Price to Subcontractor(s), without prior written approval of Owner.
- SC 7.06.B Delete paragraph 7.06.B. in its entirety and insert the following in its place:
- [Deleted]
- SC 7.06.E Amend the second sentence of Paragraph 7.06.E by striking out "Owner may also require Contractor to retain replacements; provided, however, that".

ARTICLE 8—OTHER WORK AT THE SITE

ARTICLE 9—OWNER'S RESPONSIBILITIES

ARTICLE 10—ENGINEER'S STATUS DURING CONSTRUCTION

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

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

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

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

ARTICLE 11—CHANGES TO THE CONTRACT

ARTICLE 12—CLAIMS

ARTICLE 13—COST OF WORK; ALLOWANCES, UNIT PRICE WORK

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

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

SC 15.01.B Amend the second sentence of Paragraph 15.01.B.1 by striking out the following text: "a bill of sale, invoice, or other."

SC 15.01.B.3 Add the following language at the end of paragraph 15.01.B.3:

No payments will be made that would deplete the retainage, place in escrow any funds that are required for retainage, or invest the retainage for the benefit of the Contractor.

SC 15.01.B.4 Add the following new Paragraph after Paragraph 15.01.B.3:

The Application for Payment form to be used on this Project is EJCDC C-620.

SC 15.01.D.1 Delete Paragraph 15.01.D.1 in its entirety and insert the following in its place:

The Application for Payment with the Engineer's recommendations will be presented to the Owner for consideration. If the Owner finds the Application for Payment acceptable, the recommended amount less any reduction under the provisions of Paragraph 15.01.E will become twenty (20) days after the Application for Payment is presented to the Owner, and the Owner will make payment to the Contractor.

SC 15.02.A Amend Paragraph 15.02.A by striking out the following text: "no later than seven days after the time of payment by Owner" and insert "no later than the time of payment by Owner."

ARTICLE 16—SUSPENSION OF WORK AND TERMINATION

ARTICLE 17—FINAL RESOLUTIONS OF DISPUTES

ARTICLE 18—MISCELLANEOUS

Add SC 18.01 Domestic Preference:

- A. Iron and steel products, Manufactured Products, and Construction Materials used in this project comply with the Build America, Buy America Act (BABAA) requirements mandated by Title IX of the Infrastructure Investment and Jobs Act ("IIJA"), Pub. L. 177-58.

APPENDIX A

INDEPENDENT CONTRACTOR AGREEMENT



MICHIGAN DEPARTMENT OF ENVIRONMENT, GREAT LAKES, AND ENERGY

Finance Division

EQUIVALENCY PROJECTS CONTRACT BOILERPLATE LANGUAGE

Instructions:

The following is the required standard contract language that must appear in bidding documents of Clean Water State Revolving Fund and Drinking Water State Revolving Fund equivalency projects. Determination of equivalent vs. non-equivalent projects is made on a yearly basis as indicated in the Intended Use Plan (IUP) and will be communicated by your EGLE project manager. If you are unsure whether your project is equivalent, consult with your EGLE project manager.

- **Domestic Preference Requirements**
 - All projects must comply with federal domestic preference requirements. For equivalency projects this means compliance with Build America, Buy America (BABA) requirements unless a waiver is received, then the project must comply with existing American Iron and Steel (AIS) requirements. Only either [BABA Contract Language](#) or [AIS Contract Language](#) should appear in the bidding documents, not both.
- [Prohibition on Certain Telecommunications and Video Surveillance Services or Equipment](#)
- [Davis-Bacon and Related Acts/Prevailing Federal Wages](#)
- [Labor Standards Provisions for Federally Assisted Projects](#)
- [Disadvantaged Business Enterprise \(DBE\) Requirements](#)
- [Good Faith Efforts \(GFE\) Worksheet*](#)
- [Certification Regarding Debarment, Suspension, and Other Responsibility Matters*](#)

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

If you need this information in an alternate format, contact EGLE-Accessibility@Michigan.gov or call 800-662-9278.

EGLE does not discriminate on the basis of race, sex, religion, age, national origin, color, marital status, disability, political beliefs, height, weight, genetic information, or sexual orientation in the administration of any of its programs or activities, and prohibits intimidation and retaliation, as required by applicable laws and regulations. Questions or concerns should be directed to the Nondiscrimination Compliance Coordinator at EGLE-NondiscriminationCC@Michigan.gov or 517-249-0906.

Build America, Buy America Contract Language

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

Prohibition on Certain Telecommunications and Video Surveillance Services or Equipment

The Contractor acknowledges to and for the benefit of the Haring Charter Township ("Owner") and the Michigan Department of Environment, Great Lakes, and Energy (the "Funding Authority") that it understands:

This term and condition implements 2 CFR 200.216 and is effective for obligations and expenditures of the U.S. Environmental Protection Agency (or EPA)'s financial assistance funding on or after 8/13/2020.

As required by 2 CFR 200.216, EPA recipients and subrecipients, including borrowers under EPA funded revolving loan fund programs, are prohibited from obligating or expending loan or grant funds to procure or obtain; extend or renew a contract to procure or obtain; or enter into a contract (or extend or renew a contract) to procure or obtain equipment, services, or systems that use covered telecommunications equipment or services as a substantial or essential component of any system, or as critical technology as part of any system. As described in Public Law 115-232, section 889, covered telecommunications equipment is telecommunications equipment produced by Huawei Technologies Company or ZTE Corporation (or any subsidiary or affiliate of such entities). Recipients, subrecipients, and borrowers also may not use EPA funds to purchase:

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

Consistent with 2 CFR 200.471, costs incurred for telecommunications and video surveillance services or equipment such as phones, internet, video surveillance, and cloud servers are allowable except for the following circumstances:

- a. Obligating or expending EPA funds for covered telecommunications and video surveillance services or equipment or services as described in 2 CFR 200.216 to:
 - (1) Procure or obtain, extend or renew a contract to procure or obtain;
 - (2) Enter into a contract (or extend or renew a contract) to procure; or
 - (3) Obtain the equipment, services, or systems. Certain prohibited equipment, systems, or services, including equipment, systems, or services produced or provided by entities identified in section 889, are recorded in the System for Award Management exclusion list.

Davis-Bacon and Related Acts/Prevailing Federal Wages

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. The "Contracting Agency" or "Contracting Officer" for Davis-Bacon Wage Decision posters on jobsites is the loan applicant/bond issuer. A copy of the Labor Standards Provisions for Federally Assisted Projects is included and is hereby a part of this contract.

REPLACE THIS PAGE WITH THE APPROPRIATE WAGE DECISION AND MODIFICATIONS.

NOTE: The required/appropriate Wage Decision must be obtained from the United States Department of Labor (DOL) at: sam.gov/content/wage-determinations

The Wage Decision that appears in the contract specifications must be that which was in effect on the date 10 days before bid opening. Updated Wage Decisions can be included in the contract documents as an addendum.

A single category of Wage Determinations should be used unless multiple classifications can be justified as a substantial part of the project. If using multiple Wage Determination classifications, the contract must be at least \$1 million and must comprise at least 20 percent of the total project cost.

Questions regarding prevailing wage and labor standards provisions should be directed to the DOL Wage and Hour Division. Regional offices can be found on the DOL website at dol.gov/agencies/whd or by calling 866-487-9243. To submit an email inquiry, use the [WHD Contact Form](#)

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

§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 dol.gov/agencies/whd/government-contracts/construction/forms 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 Michigan Department of Environment, Great Lakes, and Energy 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 maybe 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 jobsite 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 29CFR 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 Michigan Department of Environment, Great Lakes, and Energy 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) Requirements

Prime contractors bidding on this project must follow, document, and maintain documentation of their Good Faith Efforts (GFE), 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 timeframes 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, 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 EGLE Water Infrastructure Financing Section 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.

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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.

Company Name	Contact Method	Date Contacted	Price Quote Received	Accepted or Rejected	If rejected, explain why

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.

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 email, letter, or fax for each area of work to be subcontracted out. Copies of the solicitation letters/emails 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 number 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 emails, faxes, or letters.
 - Copies of announcements/postings in newspapers, trade publications, or minority media that target DBE firms.

Disadvantaged Business Enterprise (DBE) and Good Faith Efforts (GFE) Requirements Frequently Asked Questions Regarding Contractor Compliance

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

A: The worksheet captures efforts by the prime contractor to solicit DBEs for each area of work type that will be subcontracted out. A separate GFE Worksheet must be provided by the prime contractor for each area of work type to be subcontracted out. There are specific instructions that accompany the worksheet 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 to be certified by MDOT can be found at

mdotjboss.state.mi.us/MUCPWeb/eligibilityRequirements.htm

To register with the U.S. Small Business Association visit sba.gov/federal-contracting/contracting-assistance-programs/small-disadvantaged-business

To be certified by EPA, a DBE must first have sought certification through SBA, MDOT, or a tribal, state, or local organization and be unsuccessful in that attempt.

Q: If a bidder follows the MDOT DBE requirements, will the bidder comply with the SRF DBE requirements?

A: No. Federally funded highway projects utilize DBE goals, which require a certain percentage of work be performed by DBE subcontractors. For SRF 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. However, if the SRF project is part of a joint project with MDOT, the project can be excluded from SRF DBE requirements (i.e., the Good Faith Efforts Worksheet is not required) as it would be difficult to comply with both programs' requirements.

Q: Should the Good Faith Efforts Worksheet and supporting documentation be submitted with bid proposals?

A: Yes. This is a requirement to document that the contractor has complied with the DBE requirements and GFE. 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 meeting. 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: What kinds of documentation should a contractor provide to document solicitation efforts?

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

- Q:** 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 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:** How much time will compliance with GFE 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:** MDOT has a directory of all Michigan certified entities located at mdotboss.state.mi.us/MUCPWeb/. Additionally, the federal System for Award Management (SAM) is another place to search and can be found at 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:** 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. GFE 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.

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Certification Regarding Debarment, Suspension, and Other Responsibility Matters

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.

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.

APPENDIX B

WAGE DETERMINATION BUILDING

WAGE DETERMINATION HEAVY

Superseded General Decision Number: MI20240154

State: Michigan

Construction Type: Building

County: Wexford 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)(1).

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 \$17.75 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 2025.
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 \$13.30 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 2025.

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	01/03/2025
1	01/24/2025

2	02/21/2025
3	07/04/2025
4	07/18/2025
5	08/01/2025
6	08/08/2025

ASBE0047-005 07/01/2025

	Rates	Fringes
ASBESTOS WORKER/HEAT & FROST INSULATOR.....	\$ 40.00	23.65

BOIL0169-002 07/01/2025

	Rates	Fringes
BOILERMAKER.....	\$ 43.50	37.64

BRMI0009-024 08/01/2024

	Rates	Fringes
BRICKLAYER.....	\$ 35.83	22.18
TILE SETTER.....	\$ 35.83	22.18

CARP0202-002 06/01/2025

	Rates	Fringes
CARPENTER (Drywall Hanger and Form Work).....	\$ 30.83	21.09

CARP0202-005 06/01/2025

	Rates	Fringes
CARPENTER (Exclude Drywall Hanger and Form Work).....	\$ 30.83	21.09

CARP1102-005 06/01/2024

	Rates	Fringes
MILLWRIGHT.....	\$ 33.50	26.47

ELEC0498-013 06/01/2024

	Rates	Fringes
ELECTRICIAN.....	\$ 36.62	36.6%+9.65

ENGI0324-021 06/01/2024

	Rates	Fringes
POWER EQUIPMENT OPERATOR:		
GROUP 1.....	\$ 47.28	25.25
GROUP 2.....	\$ 43.93	25.25
GROUP 3.....	\$ 41.28	25.25
GROUP 4.....	\$ 39.57	25.25
GROUP 5.....	\$ 33.71	25.25
GROUP 6.....	\$ 31.23	25.25

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 and whirley derrick
- GROUP 3: Crane; Paver; and Scraper; Stiff Leg Derrick
- GROUP 4: Fork Truck (over 20' lift)
- GROUP 5: Fork Truck (20' lift and under for masonry work)
- GROUP 6: Oiler

 * IRON0025-005 06/01/2025

	Rates	Fringes
IRONWORKER (REINFORCING).....	\$ 36.55	29.51
IRONWORKER (STRUCTURAL).....	\$ 36.55	29.51

 LAB01098-028 07/01/2025

	Rates	Fringes
LABORER		
Comon or General; Mason		
Tender - Brick; Mason		
Tender - Cement/Concrete;		
and Pipelayer.....	\$ 25.02	13.45
Sandblaster.....	\$ 26.23	13.45

 PLAS0016-036 04/01/2014

	Rates	Fringes
CEMENT MASON/CONCRETE FINISHER...	\$ 23.10	12.38

 PLUM0085-001 05/04/2023

	Rates	Fringes
PIPEFITTER (Excluding HVAC		
Pipe & System Installation).....	\$ 38.01	21.73
PIPEFITTER (HVAC Pipe		
Installation Only).....	\$ 38.01	21.73
PLUMBER (Excluding HVAC Pipe		
& System Installation).....	\$ 38.01	21.73
PLUMBER (HVAC System		
Installation Only).....	\$ 38.01	21.73

 SFMI0669-003 01/02/2025

	Rates	Fringes
SPRINKLER FITTER (Fire		
Sprinklers).....	\$ 41.34	27.39

 SHEE0007-003 05/01/2023

	Rates	Fringes
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SHEET METAL WORKER (Excluding HVAC Duct & System Installation).....	\$ 31.05	25.07
SHEET METAL WORKER (HVAC Duct Installation Only).....	\$ 31.05	25.07

 * SUMI2011-079 02/14/2011

	Rates	Fringes
GLAZIER.....	\$ 17.19 **	3.83
LABORER: Landscape & Irrigation.....	\$ 11.04 **	4.39
OPERATOR: Backhoe/Excavator.....	\$ 24.04	6.03
OPERATOR: Bulldozer.....	\$ 22.46	7.29
OPERATOR: Grader/Blade.....	\$ 24.04	6.03
OPERATOR: Roller.....	\$ 27.47	8.86
OPERATOR: Tractor.....	\$ 19.60	7.31
OPERATOR: Loader.....	\$ 24.04	6.03
PAINTER: Brush, Roller and Spray.....	\$ 16.20 **	2.19
ROOFER.....	\$ 13.64 **	4.58
TRUCK DRIVER, Includes Dump and Tandem Truck.....	\$ 16.56 **	3.50
TRUCK DRIVER: Flatbed Truck.....	\$ 17.44 **	4.51

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

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** Workers in this classification may be entitled to a higher minimum wage under Executive Order 14026 (\$17.75) or 13658 (\$13.30). Please see the Note at the top of the wage determination for more information. Please also note that the minimum wage requirements of Executive Order 14026 are not currently being enforced as to any contract or subcontract to which the states of Texas, Louisiana, or Mississippi, including their agencies, are a party.

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) (iii)).

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

Union Rate Identifiers

A four-letter identifier beginning with characters other than ""SU"", ""UAVG"", ?SA?, or ?SC? denotes that a union rate was prevailing for that classification in the survey. Example: PLUM0198-005 07/01/2024. PLUM is an identifier of the union whose collectively bargained rate prevailed in the survey for this classification, which in this example would be Plumbers. 0198 indicates the local union number or district council number where applicable, i.e., Plumbers Local 0198. The next number, 005 in the example, is an internal number used in processing the wage determination. The date, 07/01/2024 in the example, is the effective date of the most current negotiated rate.

Union prevailing wage rates are updated to reflect all changes over time that are reported to WHD in the rates in the collective bargaining agreement (CBA) governing the classification.

Union Average Rate Identifiers

The UAVG identifier indicates that no single rate prevailed for those classifications, but that 100% of the data reported for the classifications reflected union rates. EXAMPLE: UAVG-OH-0010 01/01/2024. UAVG indicates that the rate is a weighted union average rate. OH indicates the State of Ohio. The next number, 0010 in the example, is an internal number used in producing the wage determination. The date, 01/01/2024 in the example, indicates the date the wage determination was updated to reflect the most current union average rate.

A UAVG rate will be updated once a year, usually in January, to reflect a weighted average of the current rates in the collective bargaining agreements on which the rate is based.

Survey Rate Identifiers

The ""SU"" identifier indicates that either a single non-union rate prevailed (as defined in 29 CFR 1.2) for this classification in the survey or that the rate was derived by

computing a weighted average rate based on all the rates reported in the survey for that classification. As a weighted average rate includes all rates reported in the survey, it may include both union and non-union rates. Example: SUFL2022-007 6/27/2024. SU indicates the rate is a single non-union prevailing rate or a weighted average of survey data for that classification. FL indicates the State of Florida. 2022 is the year of the survey on which these classifications and rates are based. The next number, 007 in the example, is an internal number used in producing the wage determination. The date, 6/27/2024 in the example, indicates the survey completion date for the classifications and rates under that identifier.

?SU? wage rates typically remain in effect until a new survey is conducted. However, the Wage and Hour Division (WHD) has the discretion to update such rates under 29 CFR 1.6(c)(1).

State Adopted Rate Identifiers

The ""SA"" identifier indicates that the classifications and prevailing wage rates set by a state (or local) government were adopted under 29 C.F.R 1.3(g)-(h). Example: SAME2023-007 01/03/2024. SA reflects that the rates are state adopted. ME refers to the State of Maine. 2023 is the year during which the state completed the survey on which the listed classifications and rates are based. The next number, 007 in the example, is an internal number used in producing the wage determination. The date, 01/03/2024 in the example, reflects the date on which the classifications and rates under the ?SA? identifier took effect under state law in the state from which the rates were adopted.

----- WAGE DETERMINATION APPEALS PROCESS

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

- a) a survey underlying a wage determination
- b) an existing published wage determination
- c) an initial WHD letter setting forth a position on a wage determination matter
- d) an initial conformance (additional classification and rate) determination

On survey related matters, initial contact, including requests for summaries of surveys, should be directed to the WHD Branch of Wage Surveys. Requests can be submitted via email to davisbaconinfo@dol.gov or by mail to:

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

Regarding any other wage determination matter such as conformance decisions, requests for initial decisions should be directed to the WHD Branch of Construction Wage Determinations. Requests can be submitted via email to BCWD-Office@dol.gov or by mail to:

Branch of Construction Wage Determinations
Wage and Hour Division

U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

2) If an initial decision has been issued, then any interested party (those affected by the action) that disagrees with the decision can request review and reconsideration from the Wage and Hour Administrator (See 29 CFR Part 1.8 and 29 CFR Part 7). Requests for review and reconsideration can be submitted via email to dba.reconsideration@dol.gov or by mail to:

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

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

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

Administrative Review Board
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210.

=====
END OF GENERAL DECISION"

Superseded General Decision Number: MI20240043

State: Michigan

Construction Type: Heavy

Counties: Antrim, Charlevoix, Leelanau, Manistee, Missaukee and Wexford Counties in Michigan.

Heavy, Includes Water, Sewer Lines and Excavation (Excludes Hazardous Waste Removal; Coal, Oil, Gas, Duct and other similar Pipeline Construction)

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)(1).

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 \$17.75 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 2025.
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 \$13.30 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 2025.

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	01/03/2025
1	06/06/2025
2	07/04/2025
3	08/01/2025
4	08/08/2025

CARP0202-003 06/01/2025

	Rates	Fringes
CARPENTER, Includes Form Work....	\$ 30.83	21.09

ELEC0498-001 06/01/2024		

	Rates	Fringes
ELECTRICIAN.....	\$ 36.62	36.6%+9.65

ENGI0325-026 09/01/2024		

POWER EQUIPMENT OPERATORS: Underground Construction (Including Sewer)

	Rates	Fringes
POWER EQUIPMENT OPERATOR		
GROUP 1.....	\$ 43.48	25.25
GROUP 2.....	\$ 38.75	25.25
GROUP 3.....	\$ 38.02	25.25
GROUP 4.....	\$ 37.45	25.25

POWER EQUIPMENT OPERATOR CLASSIFICATIONS

GROUP 1: Boring Machine, Crane, Scraper, Trencher (over 8 ft. digging capacity)

GROUP 2: Trencher (8-ft digging capacity and smaller)

GROUP 3: Boom Truck (non-swinging, non- powered type boom)

GROUP 4: Broom/ Sweeper, Fork Truck, Tractor

ENGI0326-016 06/01/2025

EXCLUDES UNDERGROUND CONSTRUCTION

AREA 1: MANISTEE COUNTY

AREA 2: ANTRIM, CHARLEVOIX, LEELANAU, MISSAUKEE & WEXFORD COUNTIES

	Rates	Fringes
Operating Engineer:		
AREA 1		
Group 1.....	\$ 48.98	25.25
Group 2.....	\$ 45.68	25.25
Group 3.....	\$ 44.00	25.25
Group 4.....	\$ 41.32	25.25
Group 5.....	\$ 32.98	25.25
Operating Engineers:		

AREA 2

Group 1.....	\$ 48.98	25.25
Group 2.....	\$ 45.68	25.25
Group 3.....	\$ 44.00	25.25
Group 4.....	\$ 41.32	25.25
Group 5.....	\$ 32.98	25.25

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: Compactor; Crane; Scraper

GROUP 4: Boom truck (non-swinging)

GROUP 5: Oiler

 * IRON0025-011 06/01/2025

	Rates	Fringes
IRONWORKER (REINFORCING).....	\$ 36.55	34.04
IRONWORKER (STRUCTURAL).....	\$ 36.55	34.04

 LAB00334-025 09/01/2022

SCOPE OF WORK:

OPEN CUT CONSTRUCTION: Excavation of earth and sewer, utilities, and improvements, including underground piping/conduit (including inspection, cleaning, restoration, and relining)

	Rates	Fringes
LABORER		
(1) Common or General.....	\$ 22.42	12.95
(4) Grade Checker.....	\$ 22.73	12.95

 LAB00355-014 06/01/2022

EXCLUDES OPEN CUT CONSTRUCTION

MANISTEE COUNTY

	Rates	Fringes
LABORER		
Common or General.....	\$ 26.70	12.95

LAB01098-021 07/01/2025

EXCLUDES OPEN CUT CONSTRUCTION

ANTRIM, CHARLEVOIX, LEELANAU, MISSAUKEE & WXFORD COUNTIES

	Rates	Fringes
LABORER		
Common or General.....	\$ 25.02	13.45

PLAS0016-033 04/01/2014

	Rates	Fringes
CEMENT MASON/CONCRETE FINISHER...	\$ 23.10	12.38

PLUM0085-010 05/01/2023

ANTRIM, CHARLEVOIX, LEELANAU, MISSAUKEE & WEXFORD COUNTIES

	Rates	Fringes
PLUMBER.....	\$ 43.50	22.10

PLUM0174-014 07/01/2022

MANISTEE COUNTY

	Rates	Fringes
PLUMBER.....	\$ 39.89	23.82

TEAM0007-010 06/01/2025

	Rates	Fringes
TRUCK DRIVER		
Lowboy/Semi-Trailer Truck...	\$ 33.55	.75 + a+b

FOOTNOTE:

a. \$470.70 per week.

b. \$68.70 daily.

* SUMI2010-041 11/09/2010

	Rates	Fringes
LABORER: Landscape.....	\$ 10.89 **	1.74
LABORER: Mason Tender - Cement/Concrete.....	\$ 15.97 **	3.51
LABORER: Pipelayer.....	\$ 15.28 **	3.99
OPERATOR: Backhoe/Excavator.....	\$ 16.05 **	9.55
OPERATOR: Bobcat/Skid Steer/Skid Loader.....	\$ 12.98 **	6.12
OPERATOR: Bulldozer.....	\$ 16.17 **	9.51
OPERATOR: Grader/Blade.....	\$ 15.50 **	3.62
OPERATOR: Roller.....	\$ 13.74 **	7.93

OPERATOR: Loader.....\$ 13.68 ** 8.41

TRUCK DRIVER: Dump Truck.....\$ 12.63 ** 1.25

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 (\$17.75) or 13658 (\$13.30). Please see the Note at the top of the wage determination for more information. Please also note that the minimum wage requirements of Executive Order 14026 are not currently being enforced as to any contract or subcontract to which the states of Texas, Louisiana, or Mississippi, including their agencies, are a party.

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) (iii)).

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

Union Rate Identifiers

A four-letter identifier beginning with characters other than ""SU"", ""UAVG"", ?SA?, or ?SC? denotes that a union rate was prevailing for that classification in the survey. Example: PLUM0198-005 07/01/2024. PLUM is an identifier of the union whose collectively bargained rate prevailed in the survey for this classification, which in this example would be Plumbers. 0198 indicates the local union number or district council

number where applicable, i.e., Plumbers Local 0198. The next number, 005 in the example, is an internal number used in processing the wage determination. The date, 07/01/2024 in the example, is the effective date of the most current negotiated rate.

Union prevailing wage rates are updated to reflect all changes over time that are reported to WHD in the rates in the collective bargaining agreement (CBA) governing the classification.

Union Average Rate Identifiers

The UAVG identifier indicates that no single rate prevailed for those classifications, but that 100% of the data reported for the classifications reflected union rates. EXAMPLE:

UAVG-OH-0010 01/01/2024. UAVG indicates that the rate is a weighted union average rate. OH indicates the State of Ohio. The next number, 0010 in the example, is an internal number used in producing the wage determination. The date, 01/01/2024 in the example, indicates the date the wage determination was updated to reflect the most current union average rate.

A UAVG rate will be updated once a year, usually in January, to reflect a weighted average of the current rates in the collective bargaining agreements on which the rate is based.

Survey Rate Identifiers

The ""SU"" identifier indicates that either a single non-union rate prevailed (as defined in 29 CFR 1.2) for this classification in the survey or that the rate was derived by computing a weighted average rate based on all the rates reported in the survey for that classification. As a weighted average rate includes all rates reported in the survey, it may include both union and non-union rates. Example: SUFL2022-007 6/27/2024. SU indicates the rate is a single non-union prevailing rate or a weighted average of survey data for that classification. FL indicates the State of Florida. 2022 is the year of the survey on which these classifications and rates are based. The next number, 007 in the example, is an internal number used in producing the wage determination. The date, 6/27/2024 in the example, indicates the survey completion date for the classifications and rates under that identifier.

?SU? wage rates typically remain in effect until a new survey is conducted. However, the Wage and Hour Division (WHD) has the discretion to update such rates under 29 CFR 1.6(c)(1).

State Adopted Rate Identifiers

The ""SA"" identifier indicates that the classifications and prevailing wage rates set by a state (or local) government were adopted under 29 C.F.R 1.3(g)-(h). Example: SAME2023-007 01/03/2024. SA reflects that the rates are state adopted. ME refers to the State of Maine. 2023 is the year during which the state completed the survey on which the listed classifications and rates are based. The next number, 007 in the example, is an internal number used in producing the wage determination. The date, 01/03/2024 in the example, reflects the date on which the classifications and rates under the ?SA? identifier took effect under state law in the state from which the rates were adopted.

WAGE DETERMINATION APPEALS PROCESS

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

- a) a survey underlying a wage determination
- b) an existing published wage determination
- c) an initial WHD letter setting forth a position on a wage determination matter
- d) an initial conformance (additional classification and rate) determination

On survey related matters, initial contact, including requests for summaries of surveys, should be directed to the WHD Branch of Wage Surveys. Requests can be submitted via email to davisbaconinfo@dol.gov or by mail to:

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

Regarding any other wage determination matter such as conformance decisions, requests for initial decisions should be directed to the WHD Branch of Construction Wage Determinations. Requests can be submitted via email to BCWD-Office@dol.gov or by mail to:

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

2) If an initial decision has been issued, then any interested party (those affected by the action) that disagrees with the decision can request review and reconsideration from the Wage and Hour Administrator (See 29 CFR Part 1.8 and 29 CFR Part 7). Requests for review and reconsideration can be submitted via email to dba.reconsideration@dol.gov or by mail to:

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

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

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

Administrative Review Board
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210.

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END OF GENERAL DECISION"

"General Decision Number: MI 20250043 06/06/2025

Superseded General Decision Number: MI 20240043

State: Michigan

Construction Type: Heavy

Counties: Antrim, Charlevoix, Leelanau, Manistee, Missaukee and Wexford Counties in Michigan.

Heavy, Includes Water, Sewer Lines and Excavation (Excludes Hazardous Waste Removal; Coal, Oil, Gas, Duct and other similar Pipeline Construction)

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)(1).

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 \$17.75 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 2025.
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 \$13.30 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 2025.

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	01/03/2025
1	06/06/2025

CARP0202-003 06/01/2023

	Rates	Fringes
CARPENTER, Includes Form Work. . . .	\$ 25.61	20.92

ELEC0498-001 06/01/2024		

	Rates	Fringes
ELECTRICIAN.	\$ 36.62	36.6%+9.65

ENGI0325-026 09/01/2024		

POWER EQUIPMENT OPERATORS: Underground Construction (Including Sewer)

	Rates	Fringes
POWER EQUIPMENT OPERATOR		
GROUP 1.	\$ 43.48	25.25
GROUP 2.	\$ 38.75	25.25
GROUP 3.	\$ 38.02	25.25
GROUP 4.	\$ 37.45	25.25

POWER EQUIPMENT OPERATOR CLASSIFICATIONS

GROUP 1: Boring Machine, Crane, Scraper, Trencher (over 8 ft. digging capacity)

GROUP 2: Trencher (8-ft digging capacity and smaller)

GROUP 3: Boom Truck (non-swinging, non-powered type boom)

GROUP 4: Broom/ Sweeper, Fork Truck, Tractor

ENGI0326-016 06/01/2024

EXCLUDES UNDERGROUND CONSTRUCTION

AREA 1: MANISTEE COUNTY

AREA 2: ANTRIM, CHARLEVOIX, LEELANAU, MISSAUKEE & WEXFORD
COUNTIES

	Rates	Fringes
Operating Engineer:		
AREA 1		
Group 1.....	\$ 47.28	25.25
Group 2.....	\$ 43.93	25.25
Group 3.....	\$ 41.28	25.25
Group 4.....	\$ 39.57	25.25
Group 5.....	\$ 31.23	25.25
Operating Engineers:		
AREA 2		
Group 1.....	\$ 47.28	25.25
Group 2.....	\$ 43.93	25.25
Group 3.....	\$ 41.28	25.25
Group 4.....	\$ 39.57	25.25
Group 5.....	\$ 31.23	25.25

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: Compactor; Crane; Scraper

GROUP 4: Boom truck (non-swinging)

GROUP 5: Oiler

IRON0025-011 06/01/2024

	Rates	Fringes
IRONWORKER (REINFORCING).....	\$ 35.00	33.14
IRONWORKER (STRUCTURAL).....	\$ 35.55	33.14

LAB00334-025 09/01/2022

SCOPE OF WORK:

OPEN CUT CONSTRUCTION: Excavation of earth and sewer, utilities, and improvements, including underground piping/conduit (including inspection, cleaning, restoration, and relining)

	Rates	Fringes
LABORER		
(1) Common or General.....	\$ 22.42	12.95
(4) Grade Checker.....	\$ 22.73	12.95

LAB00355-014 06/01/2022

EXCLUDES OPEN CUT CONSTRUCTION

MANISTEE COUNTY

	Rates	Fringes
LABORER		
Common or General.....	\$ 26.70	12.95

LAB01098-021 07/01/2024

EXCLUDES OPEN CUT CONSTRUCTION

ANTRIM, CHARLEVOIX, LEELANAU, MISSAUKEE & WXFORD COUNTIES

	Rates	Fringes
LABORER		
Common or General.....	\$ 23.32	13.45

PLAS0016-033 04/01/2014

	Rates	Fringes
CEMENT MASON/CONCRETE FINISHER. . .	\$ 23.10	12.38

 PLUM0085-010 05/01/2023

ANTRIM, CHARLEVOIX, LEELANAU, MISSAUKEE & WEXFORD COUNTIES

	Rates	Fringes
PLUMBER.	\$ 43.50	22.10

 PLUM0174-014 07/01/2022

MANISTEE COUNTY

	Rates	Fringes
PLUMBER.	\$ 39.89	23.82

 * TEAM0007-010 06/01/2025

	Rates	Fringes
TRUCK DRIVER		
Lowboy/Semi -Trailer Truck. . .	\$ 33.55	.75 + a+b

FOOTNOTE:

- a. \$470.70 per week.
- b. \$68.70 dai l y.

 * SUMI 2010-041 11/09/2010

	Rates	Fringes
LABORER: Landscape.	\$ 10.89 **	1.74
LABORER: Mason Tender - Cement/Concrete.	\$ 15.97 **	3.51
LABORER: Pi pel ayer.	\$ 15.28 **	3.99
OPERATOR: Backhoe/Excavator.	\$ 16.05 **	9.55
OPERATOR: Bobcat/Ski d Steer/Ski d Loader.	\$ 12.98 **	6.12
OPERATOR: Bul l dozer.	\$ 16.17 **	9.51
OPERATOR: Grader/Bl ade.	\$ 15.50 **	3.62

OPERATOR: Roller.....	\$ 13.74 **	7.93
OPERATOR: Loader.....	\$ 13.68 **	8.41
TRUCK DRIVER: Dump Truck.....	\$ 12.63 **	1.25

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 (\$17.75) or 13658 (\$13.30). Please see the Note at the top of the wage determination for more information. Please also note that the minimum wage requirements of Executive Order 14026 are not currently being enforced as to any contract or subcontract to which the states of Texas, Louisiana, or Mississippi, including their agencies, are a party.

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) (iii)).

The body of each wage determination lists the classifications and wage rates that have been found to be prevailing for the type(s) of construction and geographic area covered by the wage

determination. The classifications are listed in alphabetical order under rate identifiers indicating whether the particular rate is a union rate (current union negotiated rate), a survey rate, a weighted union average rate, a state adopted rate, or a supplemental classification rate.

Union Rate Identifiers

A four-letter identifier beginning with characters other than ""SU"", ""UAVG"", ?SA?, or ?SC? denotes that a union rate was prevailing for that classification in the survey. Example: PLUM0198-005 07/01/2024. PLUM is an identifier of the union whose collectively bargained rate prevailed in the survey for this classification, which in this example would be Plumbers. 0198 indicates the local union number or district council number where applicable, i.e., Plumbers Local 0198. The next number, 005 in the example, is an internal number used in processing the wage determination. The date, 07/01/2024 in the example, is the effective date of the most current negotiated rate.

Union prevailing wage rates are updated to reflect all changes over time that are reported to WHD in the rates in the collective bargaining agreement (CBA) governing the classification.

Union Average Rate Identifiers

The UAVG identifier indicates that no single rate prevailed for those classifications, but that 100% of the data reported for the classifications reflected union rates. EXAMPLE: UAVG-OH-0010 01/01/2024. UAVG indicates that the rate is a weighted union average rate. OH indicates the State of Ohio. The next number, 0010 in the example, is an internal number used in producing the wage determination. The date, 01/01/2024 in the example, indicates the date the wage determination was updated to reflect the most current union average rate.

A UAVG rate will be updated once a year, usually in January, to reflect a weighted average of the current rates in the collective bargaining agreements on which the rate is based.

Survey Rate Identifiers

The ""SU"" identifier indicates that either a single non-union rate prevailed (as defined in 29 CFR 1.2) for this classification in the survey or that the rate was derived by computing a weighted average rate based on all the rates reported in the survey for that classification. As a weighted average rate includes all rates reported in the survey, it may include both union and non-union rates. Example: SUFL2022-007

6/27/2024. SU indicates the rate is a single non-union prevailing rate or a weighted average of survey data for that classification. FL indicates the State of Florida. 2022 is the year of the survey on which these classifications and rates are based. The next number, 007 in the example, is an internal number used in producing the wage determination. The date, 6/27/2024 in the example, indicates the survey completion date for the classifications and rates under that identifier.

?SU? wage rates typically remain in effect until a new survey is conducted. However, the Wage and Hour Division (WHD) has the discretion to update such rates under 29 CFR 1.6(c)(1).

State Adopted Rate Identifiers

The ""SA"" identifier indicates that the classifications and prevailing wage rates set by a state (or local) government were adopted under 29 C.F.R 1.3(g)-(h). Example: SAME2023-007 01/03/2024. SA reflects that the rates are state adopted. ME refers to the State of Maine. 2023 is the year during which the state completed the survey on which the listed classifications and rates are based. The next number, 007 in the example, is an internal number used in producing the wage determination. The date, 01/03/2024 in the example, reflects the date on which the classifications and rates under the ?SA? identifier took effect under state law in the state from which the rates were adopted.

WAGE DETERMINATION APPEALS PROCESS

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

- a) a survey underlying a wage determination
- b) an existing published wage determination
- c) an initial WHD letter setting forth a position on a wage determination matter
- d) an initial conformance (additional classification and rate) determination

On survey related matters, initial contact, including requests for summaries of surveys, should be directed to the WHD Branch of Wage Surveys. Requests can be submitted via email to davisbaconinfo@dol.gov or by mail to:

Branch of Wage Surveys
Wage and Hour Division
U. S. Department of Labor
200 Constitution Avenue, N.W.

Washington, DC 20210

Regarding any other wage determination matter such as conformance decisions, requests for initial decisions should be directed to the WHD Branch of Construction Wage Determinations. Requests can be submitted via email to BCWD-Office@dol.gov or by mail to:

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

2) If an initial decision has been issued, then any interested party (those affected by the action) that disagrees with the decision can request review and reconsideration from the Wage and Hour Administrator (See 29 CFR Part 1.8 and 29 CFR Part 7). Requests for review and reconsideration can be submitted via email to dba.reconsideration@dol.gov or by mail to:

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

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

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

Administrative Review Board
U. S. Department of Labor
200 Constitution Avenue, N. W.
Washington, DC 20210.

=====

END OF GENERAL DECISION"

APPENDIX C

INVESTING IN AMERICA BRAND GUIDE

INVESTING IN AMERICA

Investing In America Signage Guidelines

The Bipartisan Infrastructure Law

The CHIPS and Science Act

The Inflation Reduction Act

The American Rescue Plan



Guidelines for Logo Applications

The purpose of this document is to provide general guidelines for signs displayed at project sites for projects funded under the Bipartisan Infrastructure Law (also known as the Infrastructure Investment and Jobs Act), the CHIPS and Science Act, the Inflation Reduction Act, the American Rescue Plan, and other Federally-funded projects as appropriate. The first part of this document pertains to signs for Federally-funded projects that are not installed in the highway right-of-way. For highway signage guidance that is MUTCD compliant please see pages 13 and 14. For all other signs please start here. This document provides information about the Investing In America logo mark as well as how logos, marks and seals of states, cities, and counties can be incorporated into signage. Logos of contractors are not permitted on the signage. When logos are included in signage, the placement should conform to these brand guidelines.

Variations and Usage




There is one approved mark associated with the Investing In America logo. To preserve the integrity of the Investing In America logo mark, make sure to apply them correctly. Altering, distorting, or recreating the ‘marks’ in any way weakens the power of the image and what it represents. Layout and design of signs and communication materials will vary, so care must be taken when applying the logo mark.

Primary Logo Mark



Colors

The colors, graphics, and fonts used should conform to graphic standards.

COLOR	CMYK	RGB	HEX	PMS
 Blue	83, 48, 0, 48	22 / 68 / 132	#164484	PMS 7687 C
 Red	0, 100, 81, 0	255 / 0 / 49	#FF0031	PMS 185 C
 White	2, 2, 0, 3	242 / 244 / 248	#F2F4F8	Bright White

Logos



White background: logo in red and blue

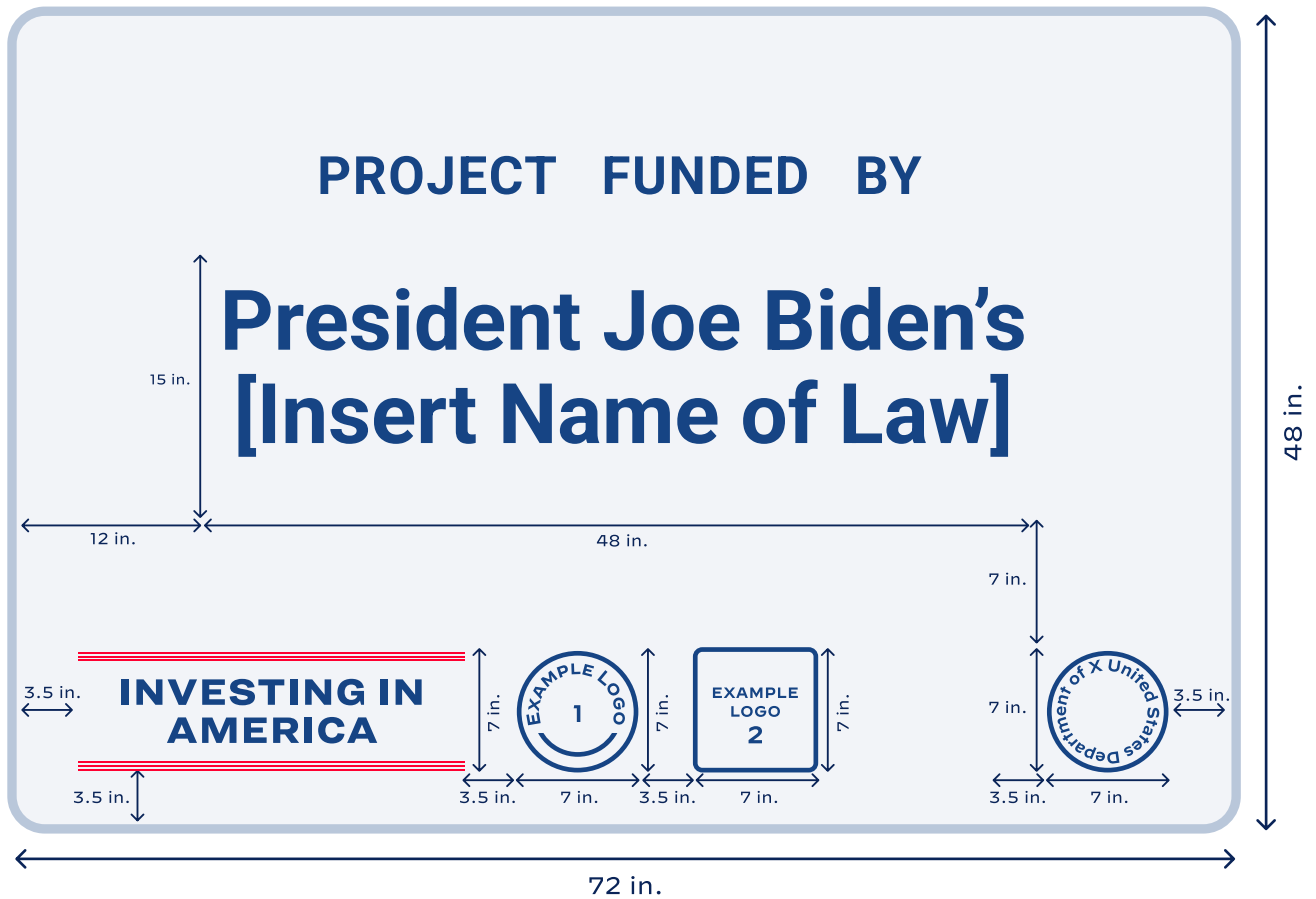


Gray background: logo in red and blue



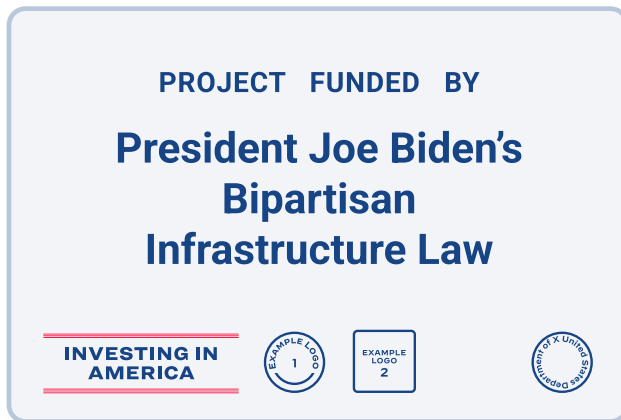
Blue background: logo in all white

Investing In America General Guidelines for Logo Applications

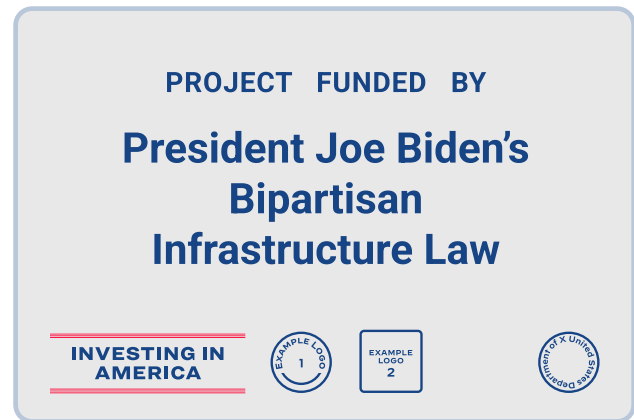


Sign Colors

1. The Bipartisan Infrastructure Law



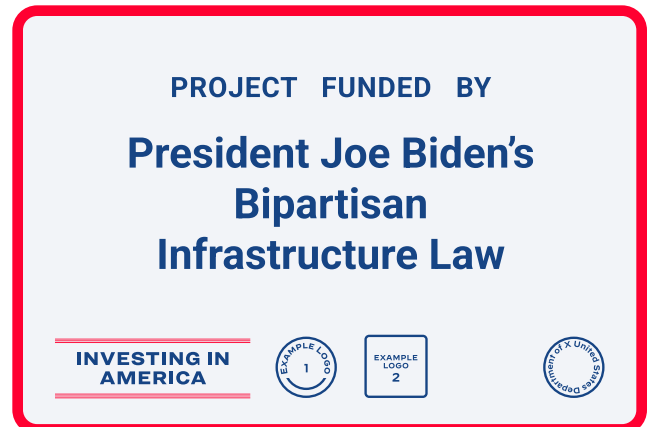
White



Gray



Blue



Red Border

Sign Colors

2. The CHIPS and Science Act



White



Gray



Blue



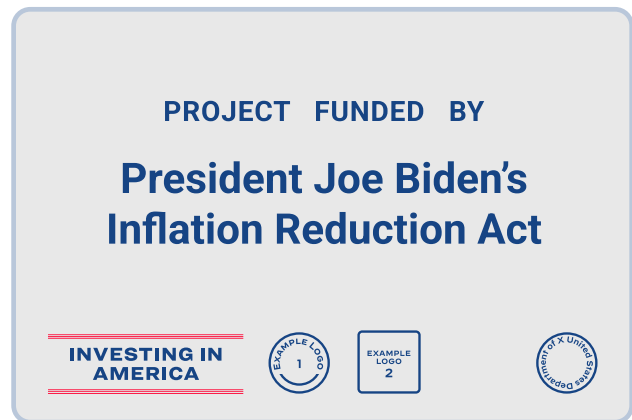
Red Border

Sign Colors

3. The Inflation Reduction Act



White



Gray



Blue



Red Border

Sign Colors

4. The American Rescue Plan



White



Gray



Blue



Red Border

State, City, and County Logo Variations



Square or Circular State Logo: 7x7 in.

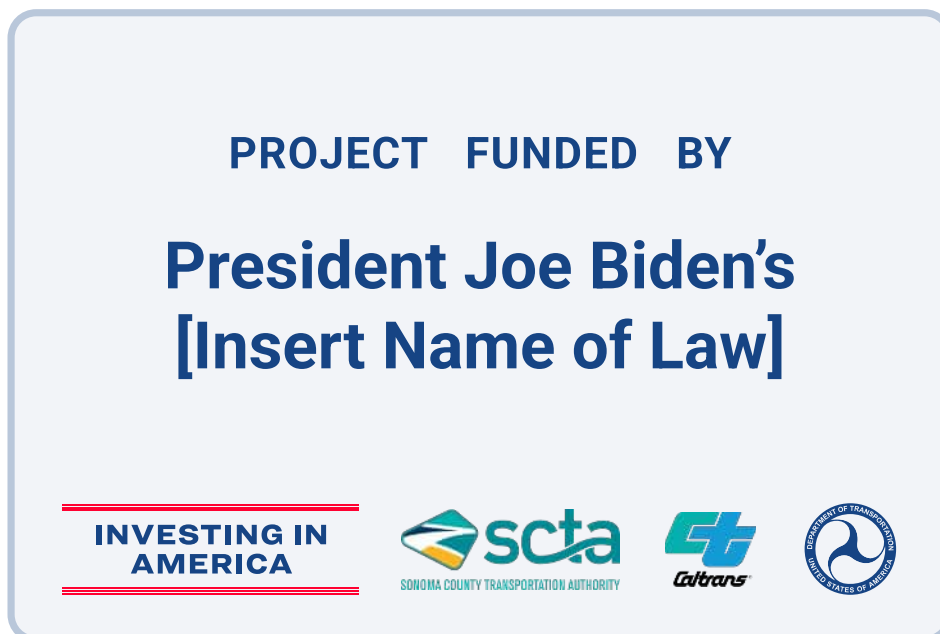


Rectangular or Oval State Logo: **not** to exceed 17.5 x 7 in.

3 Logo Samples



Circular City Logo 7 x 7 in. State rectangular logo should **not** exceed 17.5 x 7 in.



Rectangular State Logo: **not** to exceed 17.5 x 7 in.

2 Logo Samples

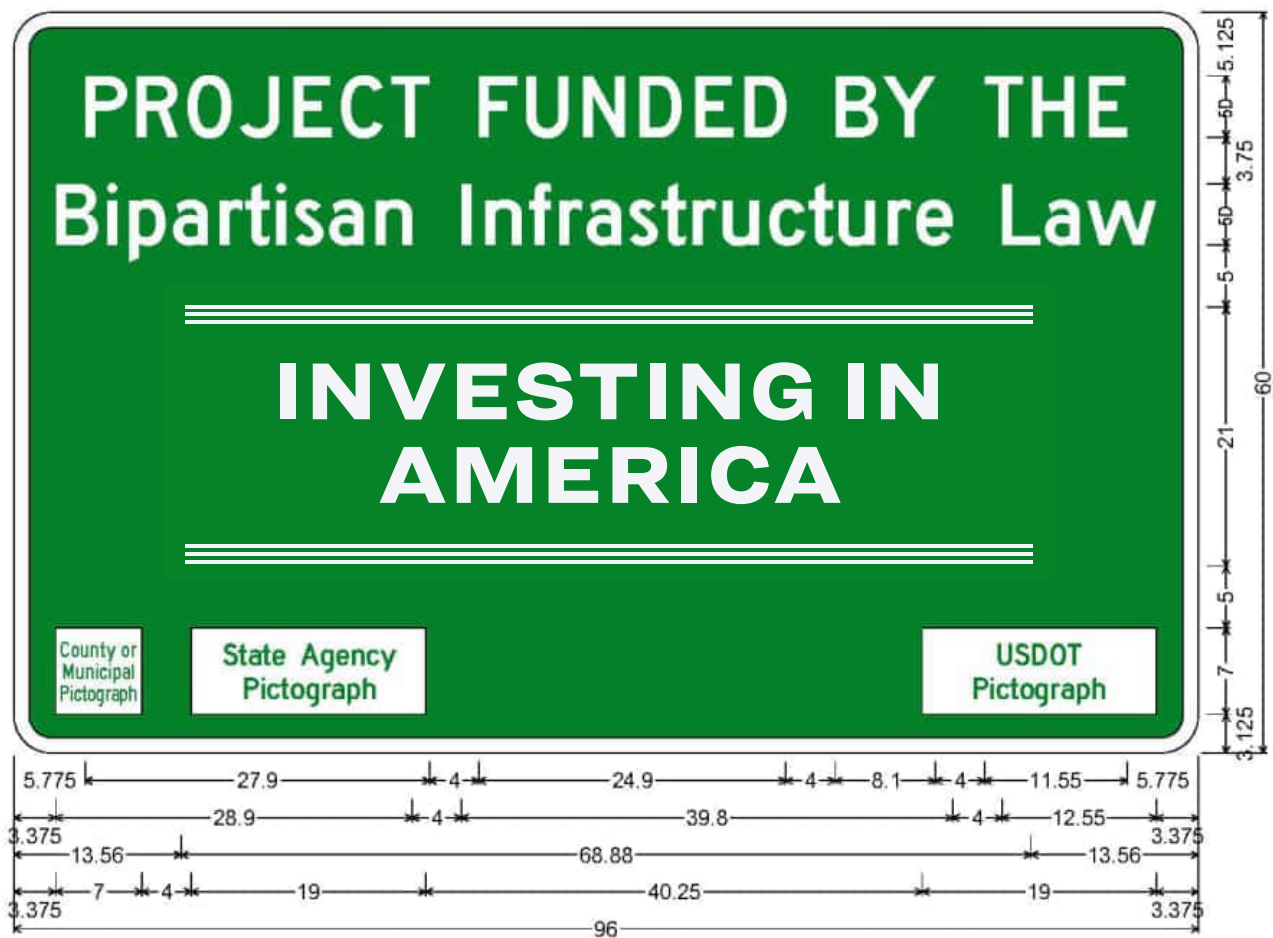


Circular State Logo: 7 x 7 in.

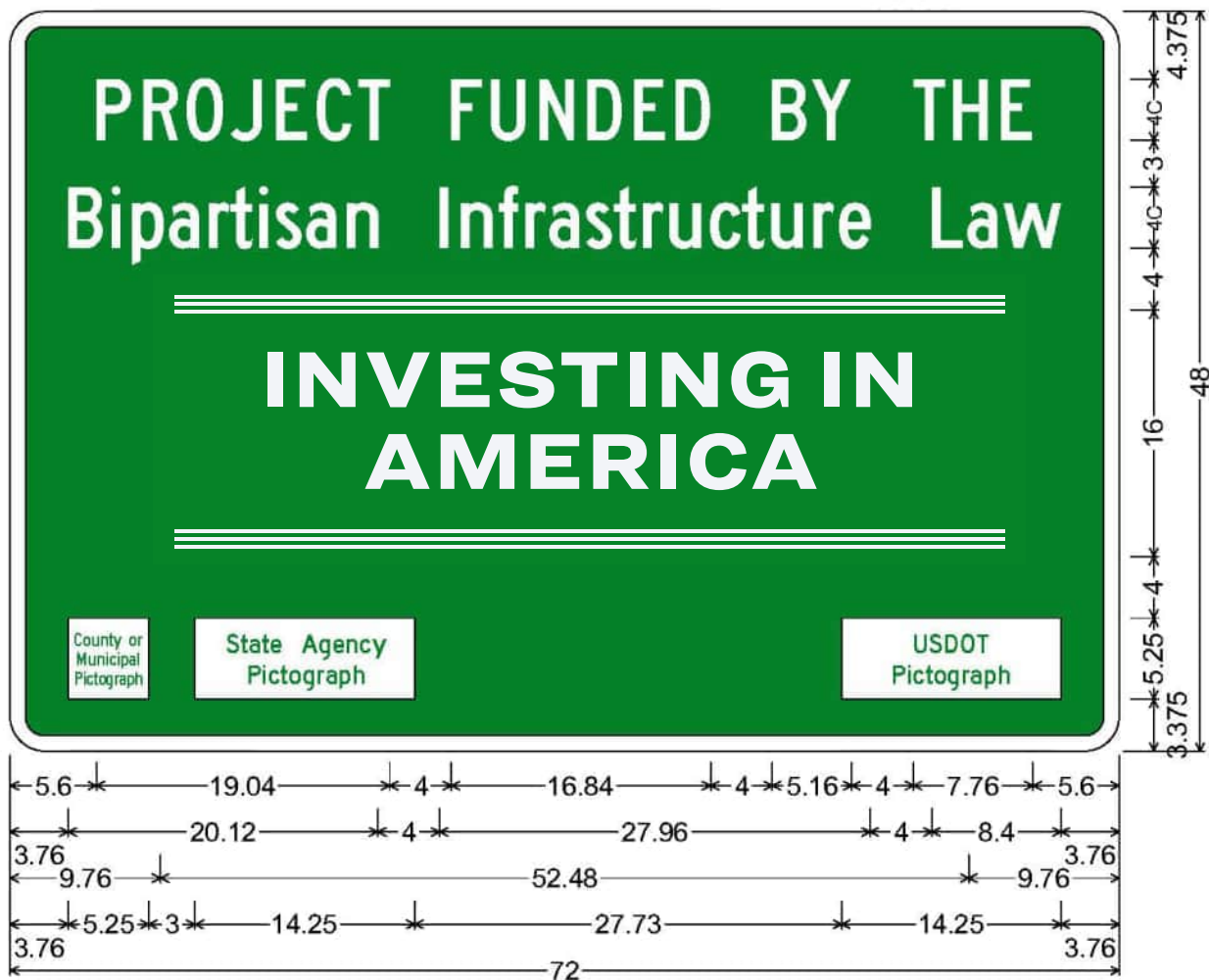


Rectangular State Logo: **not** to exceed 17.5 x 7 in.

Rules for Highway Right of Way Signage 8 Feet



Rules for Highway Right of Way Signage 6 Feet



Technical Specifications

New Water Supply Well No. 3 Wellhouse,
Site Improvements, Treatment and
Watermain Extension

Haring Charter Township, MI

Owner:

Haring Charter Township

515 Bell Ave, Cadillac, MI 49601

Engineer:

Gosling Czubak Engineering Sciences, Inc.

1280 Business Park Drive

Traverse City, Michigan

(231) 946-9191

www.goslingczubak.com

September 2, 2025

Grant NO. #: 24*4066

GCES Project # 240359

CIVIL ENGINEERING

SURVEYING

ENVIRONMENTAL SERVICES

CONSTRUCTION SERVICES

GEOTECHNICAL

DRILLING

LANDSCAPE ARCHITECTURE

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SECTION 01 00 10
SUMMARY OF WORK

PART 1 GENERAL

1.01 WORK COVERED BY CONTRACT DOCUMENTS

Work will include:

- a. Yard piping: 175 LF ~ 8-inch watermain, 218 LF ~ 12-inch watermain, associated valves and fittings, connection to existing water system, one 1-inch water service to well house.
- b. Well house: CMU block structure w/ metal crimp seem roof, concrete floor, concrete apron, and metal security doors, lighting, HVAC, process piping, VFD's, flow meter, pressure gauges, pressure switches, I&C compatible with existing system, chlorine treatment and storage, water sampling and testing, security, paint and coatings, portable eye wash and shower station, signage.
- c. Backup Power –
 - i. Permanent natural gas generator and Automatic Transfer Switch.
- d. Site Improvements: gravel access drive, 6-foot tall chain-link fence, 6-foot tall sliding chain link gate, blow-off pond, and restoration.

1.02 CONTRACTS

All work will be awarded in one contract.

1.03 ALTERNATES

None.

1.04 WORK BY OTHERS

None.

1.05 FUTURE WORK

Well pumping equipment, connection to piping, start up.

1.06 WORK SEQUENCE

Coordinate all work with the OWNER to minimize any inconvenience. Provide construction schedule for review.

1.07 COORDINATION

Coordinate all work with the OWNER to minimize any inconvenience.

1.08 AVAILABILITY OF LANDS

All work will take place on property owned or controlled by the OWNER or within the public right-of-way.

1.09 PRE-ORDERED ITEMS

No items have been pre-ordered for this project.

1.10 OWNER FURNISHED ITEMS

No items are to be Owner furnished for this project.

1.11 PROJECT IDENTIFICATION AND SIGNS

Project identification signs are required.

1.12 AUDIO-VIDEO ROUTE SURVEY

Contractor shall **not** be required to provide an audio-video route survey for prior to start of construction.

PART 2 PRODUCTS - Not Used

PART 3 EXECUTION - Not Used

END OF SECTION

SECTION 01 20 00

PRICE AND PAYMENT PROCEDURE

PART 1 GENERAL

1.01 SUMMARY

- A. Refer to Article 14 of the General Conditions.
- B. Bid price includes all labor, tools, equipment, materials, transportation, and applicable fees, use tax, and sales tax necessary to complete the work in accordance with the Plans and Specifications.
- C. All measurement and payment will be based on completed work, ready for use, performed in strict accordance with the Plans and Specifications.
- D. Bid quantities listed in the Bid Schedule have been estimated and are only for the purpose of comparing, on a uniform basis, the Bids offered for the Work. Completed quantities for payment will be based on field measurements.
- E. Neither the Owner nor his agents shall be held responsible should any of the estimated quantities be found incorrect.
- F. Payment will be made only on items listed in the BID SCHEDULE. All other work not listed in the BID SCHEDULE shall be considered incidental to the performance of the Work.
- G. Owner reserves the right to delete any line item or quantity on the BID SCHEDULE.

1.02 APPLICATION FOR PAYMENT

- A. Pay period: 30 days.
- B. Payment requests shall be submitted on the forms included in the Specifications.

1.03 SUBMITTALS

- A. Submit Conditional Partial Waiver of Lien with each application for payment request, as specified in the General Conditions paragraph 14.2.
- B. Submit a schedule of values in accordance with Section 01 33 23 for all Lump Sum Bids items.
- C. Prior to the first partial payment, submit a construction progress schedule in accordance with Section 2 of the General Conditions.

1.04 ITEMS OF THE BID FORM

Measurement and Payment for the Pay Items listed on the Bid Schedule shall be as follows:

Measurement and Payment for the Pay Items listed on the Bid Schedule shall be as follows:

- A. Item No.- 1 Mobilization
 - 1. Payment for mobilization includes obtaining all necessary bonds, insurance certificates, etc., and all labor and equipment necessary to bring all of the equipment, materials, labor

and supplies to the site, setting up any equipment and removing equipment when work has been completed.

2. Unit of measure: Lump Sum.
- B. Item No. 2 – Traffic Control
1. Payment includes furnishing and operating all necessary traffic control devices, including signs, detours, barricades, and any other devices needed to regulate traffic in accordance with Section 01570.
 2. Unit of measure: Lump sum, payable one time only.
- C. Item No. 3 Soil Erosion and Sedimentation Control
1. Payment includes installation, monitoring, cleaning and replacement as required of inlet filters or approved protection measures at all storm water collection structures throughout the construction area. Other measures as required to prevent sand and sediment from entering open drains, ditches, culverts and discharging to adjacent lakes and all other needed work as stated in Section 31 25 00 or as directed by the engineer.
 2. Unit of Measure: Lump Sum.
- D. Item No. 4 - Site Preparation
1. Payment includes all labor and equipment necessary for the clearing, grubbing, grading, needed to perform the work under this contract.
 2. Unit of measure: Lump Sum, one time for each division of work.
- E. Item No. 5 - Wellhouse
1. Payment for labor, equipment, and materials to construct building in accordance with plans, including foundation, floor slab, walls, roof, floor drain and piping, doors and hardware, concrete stoop, and all other items shown on the plans.
 2. Unit of measure: Lump sum.
- F. Item No. 6 – Wellhouse Piping & Appurtenances
1. Payment for installing, testing, and painting all wellhouse piping shown on plans, including fittings, valves, sample taps and piping, flow meter, pressure gauges, chemical storage spill containment, chemical scale, barrel ramp, portable eye wash and shower station, chemical feed pumps, and appurtenances.
 2. Unit of measure: Lump sum.
- G. Item No. 7 – Blow Off Pond
1. Payment for installing blow off pond including excavation and disposal of excess material, rip rap, and side slow stabilization.
 2. Unit of measure: Lump sum.
- H. Item No. 8 – Wellhouse Electrical
1. Payment for providing and installing all electrical distribution equipment, including pulling all wire, mounting equipment, setting conduit, and wiring all equipment. Also includes providing and installing unit heater, lights, and other electrical devices shown on plans.
 2. Unit of measure: Lump sum.

- I. Item No. 9 - Instrumentation and Controls
 - 1. Payment for providing, installing, starting up, and testing all instrumentation and controls including the transmitter panels and main control panel.
 - 2. Unit of measure: Lump sum.
- J. Item No. 10 - Generator
 - 1. Payment for providing, installing, starting up, and testing natural gas generator including generator set, automatic transfer switch, disconnect switch, concrete slab, gas utility connection from meter to generator, electrical hookup to well house and pumping equipment.
 - 2. Unit of measure: Lump sum.
- K. Item Nos. 11 and 12 – Ductile Iron Restrained Joint Piping
 - 1. Payment includes excavation, dewatering, sand bedding and backfill, installation, piping, fittings, joint restraints, flushing, testing and disinfecting water mains at well site.
 - 2. Unit of measure: Lineal foot installed, measured along center of pipe from center of fitting to center of fitting for each size and material of pipe listed in the Bid Schedule.
- L. Item No. 13 - Gate Valves and Boxes
 - 1. Payment includes installation, valve, valve box with lid, and testing.
 - 2. Unit of measure: Each valve installed for each size listed in the Bid Schedule.
- M. Item No. 14 – Connect to Existing Water Main
 - 1. Payment includes all work necessary for making connections to existing mains, including but not limited to excavation, locating existing water main, coordinating valve shutoff as required, line cutting, cap removal, disinfection, adapters, connecting, and backfill.
 - 2. Unit of measure: Each existing main connection as indicated on plans.
- N. Item No. 15 - New Water Service
 - 1. Payment includes installation excavation, compaction, trimming, corporation stop, piping, fittings, flushing, disinfection, curb stop valve, box, lid, stationary rod, supporting block under the box, adapter if necessary, and connection to existing service line. New service line shall be 1" unless otherwise noted
 - 2. Unit of measure: Each water service installed each size and length listed in the Bid Schedule.
- O. Item No. 16 – 6-Foot Chain Link Fence
 - 1. Payment includes providing and installation of chainlink fencing include wire mesh, posts, footings, corner bracing, tensioning wires, fence post caps and all other materials noted on the plans and specifications.
 - 2. Unit of measure: Linear Foot measured in place.
- P. Item No. 17 – 6-Foot Sliding Gate
 - 1. Payment includes providing and installation of sliding chain link gate unit and supports.
 - 2. Unit of measure: Lump Sum.
- Q. Item No. 18 – Aggregate Surface
 - 1. Payment includes removal of existing soils, preparation of base, aggregate material, compaction, traffic control and testing.

2. Unit of measure: Square yard measured in place.
- R. Item No. 19 –Site Restoration
1. Payment includes placing and grading topsoil, providing seed, fertilizer, and mulch, and restoring all areas disturbed by construction activities to original state and functional intent. This item also covers restoration of any other existing feature not covered by other pay items, including but not limit to existing landscaping, poles, timber walls and curbs, and posts.
 2. Unit of measure: Lump sum.
- S. Item No. 20 – Project Sign
1. Payment includes furnishing and placement of sign, maintaining during construction, and removal following project completion.
 2. Unit of measure: Lump sum

END OF SECTION

SECTION 01 25 13
PRODUCT SUBSTITUTION PROCEDURES

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes substitution of materials, articles, and equipment.
- B. Recommend substitutions in accordance with this section and Section 6.05 of the General Conditions.
- C. Products of equal capacities, quality and function shall be considered.

PART 2 PRODUCTS

2.01 GENERAL

- A. Submit an electronic copy or five hard copies of a complete list of all products proposed for installation within 30 days after date of Contract, unless otherwise indicated in the Contract Documents.
- B. Tabulate the list by each Specification Section.
- C. Include the following for referenced products:
 - 1. Name and address of manufacturer.
 - 2. Trade name.
 - 3. Model or catalog designation.
 - 4. Manufacturer's data including performance and test data, and reference standards.

PART 3 EXECUTION

3.01 CONTRACTOR'S OPTIONS

- A. For products specified by reference, select any product meeting the standards.
- B. Submit a request for substitution for products specified by name.

3.02 GENERAL

- A. Written requests from Bidders will only be considered if received at least ten working days prior to Bid date.
- B. The Engineer will consider formal requests from the Contractor for substitution of specified products within thirty days of Contract unless specified elsewhere in the Contract Documents.
- C. Submit three copies of all substitution requests, plus the number the Contractor would like returned.

- D. Substitutions will not be considered if:
 - 1. Indicated or implied on Shop Drawings or project data submittals without formal request submitted in accordance with this Section and Section 6.05 of the General Conditions.
 - 2. Acceptance will require substantial revision of the Contract Documents.

3.03 SUBMITTALS

- A. Complete data substantiating compliance with the Contract Documents.
- B. For products:
 - 1. Product identification, including manufacturer's name and address.
 - 2. Manufacturer's literature, including product description, performance and test data, and reference standards.
 - 3. Samples.
 - 4. Name and address of similar projects on which the product was used and date of installation.
 - 5. Detailed drawings for modifications to other aspects of the project required for the substitution in accordance with Section 6.05.A.2 of the General Conditions.
- C. For construction methods:
 - 1. Detailed description of the proposed method.
 - 2. Drawings illustrating methods.

3.04 CONTRACTOR'S RESPONSIBILITIES

- A. Investigate the proposed product or method and determine that it is equal or superior in all respects to that which is specified.
- B. Provide the same guarantee for the substitution as for the product or method specified.
- C. Coordinate installation of the accepted substitution into the work, making changes as required for the work to be completed in all respects.
- D. Waive all claims for additional costs related to the substitution.
- E. Include itemized cost estimate in accordance with Section 6.05.A.2 of the General Conditions.

END OF SECTION

SECTION 01 29 76
PROGRESS PAYMENT PROCEDURES

PART 1 GENERAL

1.01 APPLICATION FOR PAYMENT

- A. Preparation:
 - 1. Applications for payment to be submitted in accordance with Article 14 of the General Conditions.
 - 2. Application for payment shall be made on forms provided by or approved by the Engineer.
- B. Schedule of Values:
 - 1. Contractor shall submit a schedule of values for all lump sum items in the Bid Schedule.
 - 2. A preliminary schedule of values shall be submitted to the Engineer for review and approval prior to the preconstruction meeting.
 - 3. Schedule of values will be used only as the basis for the Contractor's application for payment.
- C. Submittals
 - 1. Contractor shall submit an electronic copy or three signed hard copies to the Engineer for review.
 - 2. Application for payment shall be submitted to the Engineer as agreed to at the preconstruction meeting.

PART 2 PRODUCT - Not Used

PART 3 EXECUTION - Not Used

END OF SECTION

SECTION 01 31 19
PROJECT MEETINGS

PART 1 GENERAL

1.01 PRECONSTRUCTION MEETING

- A. Prior to delivery of materials or the start of any construction a preconstruction meeting will be held.
- B. The Engineer will establish the meeting place, time and date, distribute agenda, notify participants, and administer the meeting. Contractor shall notify major subcontractors.
- C. Attendance:
 - 1. OWNER
 - 2. ENGINEER
 - 3. CONTRACTOR
 - 4. Major Subcontractors
 - 5. Utility Companies
 - 6. Safety Representatives
 - 7. Governmental Agencies
- D. Agenda:
 - 1. Distribution by Contractor and discussion of:
 - a. List of names and telephone numbers for superintendent, foreman and other key personnel.
 - b. List of major subcontractors and suppliers.
 - c. Projected Construction Schedules.
 - 2. Critical work sequencing.
 - 3. Major equipment deliveries and priorities.
 - 4. Project coordination
 - 5. Responsibilities of Owner, Engineer, Contractor and other agencies.
 - 6. Utility Discussions
 - a. Critical Utilities
 - 7. Permit Issues
 - 8. Procedures and processing of:
 - a. Field decisions.
 - b. Proposal requests.
 - c. Submittals.
 - d. Change orders.
 - e. Application for payment.
 - 9. Adequacy of distribution of Contract Documents.
 - 10. Procedures for maintaining Record Documents.
 - 11. Use of premises.
 - 12. Construction facilities, controls and construction aids.
 - 13. Temporary utilities.
 - 14. Safety and first aid procedures.
 - 15. Security procedures.
 - 16. Housekeeping procedures.
 - 17. Testing and Staking
 - 18. Record Documents
 - 19. Sign Contracts

- E. The Engineer will prepare minutes and distribute copies to participants within seven (7) days of meeting. Participants shall report corrections and comments within ten (10) days of receipt of minutes.

1.02 PROGRESS MEETINGS

- A. Periodic Progress Meetings will be held as required by the progress of the work.
- B. The Engineer will establish the meeting place, time and date, distribute agenda, notify participants and administer the meeting. Contractor shall notify major subcontractors.
- C. Attendance:
 - 1. OWNER
 - 2. ENGINEER
 - 3. CONTRACTOR
 - 4. Subcontractor as appropriate to the agenda.
 - 5. Suppliers as appropriate to the agenda.
 - 6. Others
- D. Agenda:
 - 1. Review minutes of previous meeting.
 - 2. Review of work progress since previous meeting.
 - 3. Review field observations, problems, and conflicts.
 - 4. Review problems that impede Construction Schedules.
 - 5. Review of shop drawings, off-site fabrication, and delivery schedules.
 - 6. Review corrective measures and procedures to regain projected schedule.
 - 7. Review revisions to Construction Schedules.
 - 8. Review plan progress, schedule, during succeeding work period.
 - 9. Review coordination of schedules.
 - 10. Review submittal schedules; expedite as required.
 - 11. Review maintenance of quality standards.
 - 12. Review proposed changes for:
 - a. Effect on Construction Schedule and on completion date.
 - b. Effect on other Contracts of the Project.
 - 13. Other business.
- E. The Engineer will prepare minutes and distribute copies to participants and Owner within seven (7) days of meeting for review at the next meeting.

PART 2 PRODUCT - Not Used

PART 3 EXECUTION - Not Used

END OF SECTION

SECTION 01 32 16

CONSTRUCTION PROGRESS SCHEDULE

PART 1 GENERAL

1.01 CONSTRUCTION SCHEDULE

- A. Preparation:
 - 1. Prepare in the form of a horizontal bar chart, CPM network, or other form previously approved by the Engineer.
 - 2. Provide a separate horizontal bar column or path for each trade or operation.
 - 3. Prepare the schedule in the chronological order of the beginning of each item of work.
 - 4. Allow space for updating.
 - 5. The schedule sheets shall be 11" x 17" unless otherwise approved by the Engineer.
- B. Content of schedule:
 - 1. Provide a complete sequence of construction by activity.
 - 2. For Shop Drawings, project data, and samples show the following:
 - a. Submittal dates.
 - b. Dates review copies will be required.
 - 3. Show product procurement and delivery dates.
 - 4. Show dates for beginning and completion of each element of construction.
 - 5. Show projected percentage of completion for each item of work as of the first day of each month.
- C. Updating Schedule:
 - 1. Show all changes occurring since previous submission of the updated schedule.
 - 2. Indicate progress of each activity and show completion dates.
 - 3. Other items required in schedule updates are:
 - a. Major changes in scope.
 - b. Activities modified since previous updating.
 - c. Revised projections due to changes
 - d. Other identifiable changes.
- D. Submittals:
 - 1. Submit initial schedule within 15 days after receipt of a Notice to Proceed.
 - 2. Submit updated schedules accurately depicting progress to the first day of each month.
 - 3. Progress schedules shall be included with the Contractor's monthly application for payment

PART 2 PRODUCT - Not Used

PART 3 EXECUTION - Not Used

END OF SECTION

SECTION 31 32 36

VIDEO MONITORING AND DOCUMENTATION

PART 1 GENERAL

1.01 AUDIO-VIDEO ROUTE SURVEY

- A. General:
 - 1. When required in Section 01 11 00 SUMMARY OF WORK, the Contractor shall furnish the engineer with an Audio-Video Route Survey record of the existing conditions.
 - 2. Audio-Video Route Surveys shall:
 - a. Be recorded to a USB portable drive.
 - b. By electronic means, display continuously the date (month, day and year) and time (hours, minutes and seconds).
 - c. Be made on continuously running USB portable drives.
 - d. Be recorded at a rate of speed, equal to a slow walk (2 mph), in the general direction of travel. Panning rates and zoom-in, zoom-out rates shall be controlled sufficiently such that stop action during play-back will produce clarity of detail of the object viewed.
 - e. Be done during times of good visibility. No recording shall be done during periods of visible precipitation, standing water or snow cover unless approved by the Engineer.
- B. Content:
 - 1. Complete coverage including all surface features located within the public right-of-way, easement areas and adjacent private properties up to building line when such properties lie within the zone of influence of construction.
 - 2. Coverage shall include but not limited to:
 - a. Driveways
 - b. Sidewalks
 - c. Curbs
 - d. Ditches
 - e. Roadway
 - f. Landscaping
 - g. Trees
 - h. Culverts, headwalls, and retaining walls
 - i. Buildings located within the zone of influence
 - 3. Houses and buildings shall be identified visually by house number, when visible, in such a manner that structures can be located by reference.
 - 4. All locations shall be identified by audio or visual means at intervals not to exceed 100 linear feet in the general direction of travel.
- C. Submittals:
 - a. One copy of the video shall be submitted to Engineer for review before the preconstruction meeting.
 - b. The Engineer shall review the video within five full working days of receipt.
 - c. Any recorded coverage not acceptable to the Owner shall be redone at no additional charge.
 - d. Contractor shall not place materials or equipment on the construction site prior to review and approval of the audio-video recording.

PART 2 PRODUCT - Not Used

PART 3 EXECUTION - Not Used

END OF SECTION

SECTION 01 33 23

SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES

PART 1 GENERAL

1.01 SHOP DRAWINGS, PRODUCT DATA AND SAMPLES

- A. General:
 - 1. Provide shop drawings in accordance with Article 6 of the General Conditions.
 - 2. Shop Drawings are to be scaled drawings large enough to show all pertinent features of the item and its method of connection to the Work.
 - 3. Literature from manufacturers that includes data not pertinent to this submittal, shall be clearly marked to indicate which portion of the contents is being submitted for the Engineer's review.
 - 4. Samples shall illustrate materials, equipment, or workmanship and establish standards by which completed work is judged.
 - 5. Unless otherwise specifically directed by the Engineer, all samples shall be of the precise article proposed to be furnished.
- B. Submittals:
 - 1. Submit the number of copies that the Contractor requires to be returned, plus three copies that will be retained by the Engineer.
 - 2. All submittals are to be accompanied with a transmittal form that will be provided by or approved by the Engineer.
 - 3. Contractor to thoroughly check Shop Drawings for compliance with the Contract Documents and verify field dimensions and construction criteria:
 - a. Indicate approval by stamping "Approved", with Contractor's signature and date on all copies submitted.
 - b. Shop Drawings submitted without stamped approval of the Contractor will be returned without review.
 - 4. Clearly indicate all deviations in the Shop Drawings from the requirements in the Contract Documents.
 - 5. Make submittals in groups containing all associated items.
 - 6. Provide submittals in advance of scheduled dates of installation to allow time for Engineer review, possible revision, and re-submittal; and for placing orders and securing delivery.
 - 7. Allow 15 working days for Engineer review after receipt of submittal.
 - 8. Cost of delays caused by late submittals shall be the responsibility of the Contractor.
- C. Review of submittals:
 - 1. Submittals will be returned marked with Engineer's review comments.
 - 2. Rejected submittals shall be revised by the Contractor and resubmitted.
 - 3. Engineer's checking of Shop Drawings does not relieve the Contractor of responsibility for errors or omissions.

PART 2 PRODUCT - Not Used

PART 3 EXECUTION - Not Used

END OF SECTION

SECTION 01 41 00

REGULATORY REQUIREMENTS

PART 1 GENERAL

1.01 PERMITS AND FEES

- A. Owners responsibility: The owner will obtain the following permits where applicable.
 - 1. EGLE permit in accordance with Part 41 of Act 451, P.A. 1994 for construction of sanitary sewer facilities.
 - 2. EGLE permit in accordance with Part of Act 399, P.A. 1976.
 - 3. MDOT permit for work within state right-of-way.
 - 4. Soil Erosion and Sedimentation Control Act, Part 91 of Act 451, P.A. 1994.
 - 5. County Road Commission permit for work within county right-of-way.
 - 6. EGLE Wetland permit in accordance with Part 303 of Act 451, P.A. 1994.
 - 7. EGLE Inland Lakes and Streams permit in accordance with Part 301 of Act 451, P.A. 1994.
- B. Contractors responsibility:
 - 1. Meet provisions and requirements of all permits obtained by the Owner.
 - 2. All local or state permits and fees required that are not listed in Section 01 41 00 1.01.A.
 - 3. If applicable, contractor shall get bonding for construction within state highway right-of-way.
- C. All permits obtained to date are attached at the end of the specifications.

1.02 APPLICABLE CODES

- A. All references to codes, specifications, and standards shall refer to the latest edition, amendment, or revision of the reference in effect on the BID due date.
- B. Abbreviations used for codes and references are listed in Section 01 42 13 ABBREVIATIONS AND SYMBOLS.

PART 2 PRODUCT - Not Used

PART 3 EXECUTION - Not Used

END OF SECTION

SECTION 01090

ABBREVIATIONS AND SYMBOLS

PART 1 GENERAL

1.01 DEFINITIONS

- A. Reference to codes, standards, institutions, associations, or government authorities is made in accordance with the following abbreviations:

AASHTO	- American Association of State Highway Officials
ACI	- American Concrete Institute
AISC	- American Institute of Steel Construction
AISI	- American Iron and Steel Institute
ANSI	- American National Standard Institute
ASTM	- American Society of Testing Materials
AWS	- American Welding Society
AWWA	- American Water Works Association
BOCA	- Building Officials Code Association
FAA	- Federal Aviation Association
EGLE	- Michigan Department of Environment Great Lakes and Energy
LTBB	- Little Traverse Bay Bands (of Odawa Indians)
MDOT	- Michigan Department of Transportation
MDNR	- Michigan Department of Natural Resources
MI-OSHA	- Michigan Department of Occupational Safety and Health Association
NEC	- National Electric Code
NEMA	- National Electrical Manufacturers Association
NFPA	- National Fire Protection Association
RECD	- Rural Economic Community Development
USEPA	- United States Environmental Protection Agency
UL	- Underwriter's Laboratories

PART 2 PRODUCT - Not Used

PART 3 EXECUTION - Not Used

END OF SECTION

SECTION 01 42 29
TESTING LABORATORY SERVICES

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes, testing required by the Owner to determine that materials and methods provided for the Work meet the specified requirements. Testing includes, but is not limited to:
 - 1. Bituminous pavement.
 - 2. Concrete.
 - 3. Soil gradation.
 - 4. Welding.
 - 5. Water quality.
 - 6. Density testing.

1.02 UNIT PRICES

- A. The Contractor will be responsible for providing and paying for all testing procedures as described in Article 13 of General Conditions unless specified in this section.
- B. The Contractor will be responsible for selecting proper testing laboratories subject to Engineer's approval.
- C. Inspections and testing performed exclusively for the Contractor's convenience will be paid for by the Contractor.
- D. The Owner will select the testing laboratories and pay for the following tests/inspections:
 - 1. Density testing
 - 2. Density and extraction testing of asphalt
 - 3. Grading of subbase and aggregate base
 - 4. Concrete testing

1.03 QUALITY ASSURANCE

- A. Testing shall be in accordance with all pertinent codes, regulations, procedures, and requirements of the ASTM and other appropriate agencies.

PART 2 PRODUCTS -Not Used

PART 3 EXECUTION

3.01 PROCEDURE

- A. Provide representatives of the testing laboratory with access to the Work at all times.
- B. Coordinate the Work with the testing required. Provide a minimum of 24 hours notice to the testing laboratory prior to the need of testing.
- C. Furnish all material required for sampling. The testing laboratory will obtain all specimens and samples required for testing. The testing laboratory will be responsible for transporting samples to the laboratory.
- D. The testing laboratory will furnish two copies of lab reports to the Engineer and one copy to the Contractor.

END OF SECTION

SECTION 01 56 00

TEMPORARY BARRIERS AND ENCLOSURES

PART 1 GENERAL

1.01 SUMMARY

- A. Provide and maintain adequate facilities for the protection and safety of all persons and property in accordance with Article 6 of General Conditions.

1.02 UNIT PRICES

- A. All work under this Section shall be considered as incidental to construction.

1.03 REFERENCED STANDARDS

- A. Unless otherwise specified, the work for this Section shall conform to all State and National laws, ordinances, rules and regulations pertaining to the kind, including but not limited to the following Standard Specifications:
 - 1. State of Michigan "Occupational Safety and Health Act", Act 154 of the Public Acts of 1974 (MIOSHA) as administered by the Michigan Department of Labor and Public Health.
 - 2. MDOT Michigan Manual of Uniform Traffic Control Devices (MMUTCD)

PART 2 PRODUCTS

2.01 SIGNS AND BARRICADES

- A. Provide in accordance with MDOT Michigan Manual of Uniform Traffic Control Devices - Part 6.

2.02 TEMPORARY FENCING

- A. All fencing shall be strong and durable enough to discourage unauthorized entrance, constructed with the following materials:
 - 1. Posts: Wood or steel
 - 2. Fabric: Snow fence type, wood or plastic, 4 feet high.

PART 3 EXECUTION

3.01 GENERAL

- A. Provide adequate warning signs, barricades, lights, and flagmen as necessary for the protection of the work and safety of the workmen and general public. Control devices shall:
 - 1. Protect workmen and the public from all open trenches and excavations.
 - 2. Provide temporary fencing to discourage unauthorized entrance.
- B. All barricades, signs, lights, and other protective devices shall be installed and maintained in conformance with the transportation authority having jurisdiction.
- C. Designate all streets or roads that are closed with barricades and warning signs. Closing of roads shall be approved by the authority having jurisdiction. Properly notify the local emergency services prior to closing of any road.

- D. Maintain temporary fencing throughout the duration of construction.
- E. Remove temporary fencing at project completion or after permanent fencing is installed.

END OF SECTION

SECTION 01 56 26

TRAFFIC REGULATION

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes:
 - 1. Provide and maintain traffic control equipment and personnel to protect the work and workmen, and to ensure the least possible obstruction to traffic and inconvenience to the general public.
 - 2. Meet all the requirements of the construction permit issued by the right-of-way owner.
- B. Related Sections:
 - Section 01 20 00 - PRICE AND PAYMENT PROCEDURE
 - Section 01 29 76 - PROGRESS PAYMENT PROCEDURES

1.02 UNIT PRICES

All work under this Section shall be considered as incidental to construction, unless specifically indicated on the BID SCHEDULE and referred to in Section 01 20 00 - PRICE AND PAYMENT PROCEDURE

1.03 REFERENCED STANDARDS

MDOT Michigan Manual of Uniform Traffic Control Devices (MMUTCD)

PART 2 PRODUCTS

2.01 GENERAL

All products shall be in accordance with the Michigan Manual of Uniform Traffic Control Devices.

PART 3 EXECUTION

3.01 DETOURS

- A. Contractor shall be solely responsible for acts or omissions resulting in any legal proceedings due to improper or inadequate detour or safety controls.
- B. Submit proposed detour route to the Engineer, the municipality, and all emergency services for approval prior to construction in the detour area.
- C. Keep fire hydrants adjacent to the work accessible to firefighting equipment at all times.
- D. Keep police, fire, and other emergency services informed of the status of road closings.

3.02 PUBLIC ACCESS

- A. Maintain traffic access in accordance with local laws and regulations having jurisdiction.
- B. Minimize the time that vehicular and pedestrian access to any occupied home, or other building is interrupted. Maintain continuous access to businesses.
- C. Maintain temporary driveways, roadways, and crosswalks in good, usable condition until they are fully restored. As a minimum, provide 6 inches of compacted 22-A aggregate at all driveways.

END OF SECTION

SECTION 01 66 00

MATERIALS AND EQUIPMENT

PART 1 GENERAL

1.01 SUMMARY

- A. Furnish all labor, tools, facilities, and materials necessary to properly transport, handle, store and protect all materials and equipment necessary for the performance of the work.
- B. All materials shall be new.
- C. Immediately upon delivery, inspect shipments to assure compliance with requirements of Contract Documents and approved submittals and that products are properly protected and undamaged.

1.02 TRANSPORTATION AND HANDLING

- A. Properly protect all materials and equipment to prevent damage during transportation and handling.
- B. Detailed special handling requirements are specified under the appropriate specification section for the products handled.

1.03 STORAGE AND PROTECTION

- A. Store all materials and equipment to insure the preservation of their quality and fitness for the work.
- B. Store packaged materials in their original containers until ready for use.
- C. Protect all materials and equipment before, during, and after installation.
- D. Provide suitable weather tight storage sheds with raised floors to store and protect materials and equipment that could be damaged by exposure to weather.
- E. Repair or replace all damaged materials and equipment, subject to Engineer approval.
- F. No damaged material shall be used in the work.

PART 2 PRODUCTS - Not Used

PART 3 EXECUTION - Not Used

END OF SECTION

SECTION 01 71 23
FIELD ENGINEERING

PART 1 GENERAL

1.01 STAKEOUT AND SURVEYING

- A. Owners responsibility: Provide staking in accordance with Supplementary Conditions SC-4.05.A.
- B. Contractors responsibility:
 - 1. Obtain field measurements, line and grade control, and facility locations based on guideline staking provided by the Owner.
 - 2. Preserve and protect all field staking provided by the Owner.
 - 3. Compensate the Owner for all costs of replacement of staking damaged by the Contractor.

1.02 SOIL BORINGS

- A. Soil borings were conducted at the site. Boring logs are shown on the plans and included in the Appendix.

1.03 EXISTING UTILITIES

- A. Existing utilities are shown on the Plans in their approximate location, based on the available data.
- B. The Owner will not be responsible for omissions or variations from the locations shown.
- C. Contact Miss Dig (1-800-482-7171) 72 hours prior to any excavation to locate existing buried utilities.
- D. Preserve and protect existing utilities from damage. Repair all damage to existing utilities at no cost to the Owner. Work stoppages resulting from damaged utilities will not entitle the Contractor to additional payment.

PART 2 PRODUCTS - Not Used

PART 3 EXECUTION - Not Used

END OF SECTION

SECTION 01 75 16
START-UP SERVICES

PART 1 GENERAL

1.01 TEST OPERATION AND RUN-IN:

- A. Notify the Engineer and test operate the equipment to the Engineer's satisfaction.
- B. Test operate all equipment including controls and associated items, after completion of the electrical and mechanical work.
- C. Run-in and make ready for operation all equipment after test operations.
- D. "Run-in" shall mean sufficient operation to wear in gears, motors, bearings, and any other items in accordance with the manufacturer's recommendations.
- E. "Ready for operation" shall mean fully aligned, tested under full load, adjusted, cleaned, and ready for use.
- F. "Completely installed" shall mean that the installation is complete and ready for final payment.

1.02 FIELD SERVICES:

- A. Secure the services of a qualified equipment manufacturer representative to assist in erection, inspection, make necessary adjustments, initiate the start-up and resolve start-up problems.
- B. Provide a qualified equipment manufacturer's representative for instruction of Owner's personnel in the proper operation and maintenance of the equipment.
- C. Coordinate the training of personnel through the Engineer after "test operation" and "run-in."
- D. Furnish written reports from the equipment manufacturer for each visit. The report shall contain the findings, recommendations, and any pertinent comments, with a signature and title of the representative. At least three (3) copies of the report shall be furnished to the Engineer.

PART 2 PRODUCT - Not Used

PART 3 EXECUTION - Not Used

END OF SECTION

SECTION 01 78 00
CONTRACT CLOSEOUT SUBMITTAL

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes contract close-out requirements.
- B. Contract close-out shall be done in accordance with the Contract Documents before final payment will be released.

1.02 CLEANING

- A. Clean the site in accordance with Section 6.11 of the General Conditions.

1.03 PROJECT RECORD DOCUMENTS

- A. Provide one set of record documents in accordance with Section 6.12 of General Conditions.
- B. Provide materials certifications as specified by the Engineer.
- C. Submittal of the Record Documents shall be made with a transmittal letter containing:
 - 1. Date
 - 2. Project title and number
 - 3. Contractor's name and address
 - 4. Title and number of each Record Document

1.04 GUARANTEES

- A. Provide in accordance with Section 6.19 of the General Conditions.
- B. Manufacturer's Guarantee:
 - 1. For each item of equipment, furnish the guarantee of the manufacturer.
 - 2. Guarantee that the equipment will perform its intended service and that any defective design or workmanship shall be corrected or replaced at no expense to the OWNER.
 - 3. The guarantee period of the manufacturer's guarantee shall be one year from the date of final payment of the project by the Owner, unless specified otherwise.

1.05 SUBSTANTIAL COMPLETION

- A. Certification that the work is substantially complete shall be in accordance with Section 14.04 of the General Conditions.

1.06 FINAL INSPECTION AND PAYMENT

- A. The final inspection, final application for payment and acceptance shall be in accordance with Section 14.06 through 14.09 of the General Conditions.

PART 2 PRODUCTS - Not Used

PART 3 EXECUTION - Not Used

END OF SECTION

SECTION 01 78 23

OPERATION AND MAINTENANCE DATA

PART 1 GENERAL

1.01 OPERATION AND MAINTENANCE MANUALS

A. General:

1. Manuals shall be in durable plastic binders approximately 8½ " x 11" in size with at least the following:
 - a. Identification on, or readable through, the front cover stating general nature of the manual;
 - b. Neatly typewritten index near the front of the manual;
 - c. Complete instructions regarding operation and maintenance of all equipment involved;
 - d. Complete nomenclature of all replaceable parts, their part numbers, and name and address of nearest vendor of parts;
 - e. Copies of all guarantees and warranties issued;
 - f. Copy of the approved Shop Drawing and all data concerning all changes made during construction.
2. Manuals that include manufacturer's catalog pages shall, clearly indicate the precise items included in this installation and delete or otherwise clearly indicate all manufacturers' data with which this installation is not concerned.

B. Submittals:

1. Provide 3 copies of the manual to the Engineer unless indicated otherwise in pertinent Sections.
2. Submit operation and maintenance manuals prior to initial equipment startup.

PART 2 PRODUCT - Not Used

PART 3 EXECUTION - Not Used

END OF SECTION

MISCELLANEOUS CAST IN PLACE CONCRETE

SECTION 03 30 53

MISCELLANEOUS CAST IN PLACE CONCRETE

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Section Includes:
Furnish, place and finish all cast-in-place concrete and accessories.
- B. Related Sections:
 - 1. Section 01 20 00 - PRICE AND PAYMENT PROCEDURE
 - 2. Section 01 33 23 - SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES
 - 3. Section 01 45 29 - TESTING LABORATORY SERVICES

1.02 QUALITY ASSURANCE

- A. Codes and standards:
 - 1. ACI 301 - "Specifications for Structural Concrete for Buildings"
 - 2. ACI 350R - "Concrete Sanitary Engineering Structures"
 - 3. ASTM C 94 - "Standard Specifications for Ready-Mixed Concrete"
 - 4. ACI 318 - "Building Code Requirements for Reinforced Concrete"
- B. Tests:
 - 1. Performed in accordance with Section 01 45 29 - TESTING LABORATORY SERVICES and this Section.
 - 2. Slump tests
 - a. Comply with ASTM C 143 and C 172
 - b. Frequency: Once per truck
 - 3. Compression cylinder tests
 - a. Make and cure specimens conforming to ASTM C 31 requirements
 - b. Four specimens per test
 - c. Frequency: Once per day or every 50 cubic yards for each strength or type
 - 4. Air-entraining test
 - a. In accordance with ASTM C 231
 - b. Frequency: Each truckload
 - 5. Acceptance and evaluation
 - a. Based on ACI 301 "Specifications for Structural Concrete for Buildings"
 - b. Hardened Concrete Testing
 - i. May be required by Owner or Engineer
 - ii. Comply with ASTM C 42
 - iii. In accordance with the ACI "Building Code for Reinforced Concrete" (ACI -318), Section 4.7.

1.03 SUBMITTALS

- A. General
Make submittals in accordance with Section 01 33 23 - SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Mix designs:
 - 1. ACI 211.1 - "Recommended Practice for Selecting Proportions for Normal and Heavyweight Concrete"
 - 2. Furnish mix design(s) with test report(s) by an independent testing laboratory for each mix.

MISCELLANEOUS CAST IN PLACE CONCRETE

3. Furnish the following material content per cubic yard of each class of concrete furnished:
 - a. Dry weight of cement.
 - b. Saturated surface and dried weights of fine and coarse aggregates.
 - c. Quantities, type and name of admixtures.
 - d. Weight of water.
 4. Provide product information on all components of mix design
- C. Test reports:
1. Provide at 7 days and 28 days test reports in accordance with Section 01 45 29 - TESTING LABORATORY SERVICES.
 2. Immediately notify the Engineer if any test specimen fails to meet the required specification tolerances.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Cement:
1. Portland cement
 2. ASTM, C150
 3. Type I or IA
- B. High early cement:
1. Portland cement
 2. ASTM C150
 3. Type III or IIIA
- C. Aggregates:
1. Fine and coarse aggregates
 - a. Conform to ASTM C 33.
 2. Coarse aggregate
 - a. 1 inch maximum.
 3. Limit coarse aggregate as follows:
 - a. Soft particles: 2.0%.
 - b. Chert as a soft impurity (defined in Table 3 of ASTM C 33): 1.0%;
 - c. Total of soft particles and chert as a soft impurity: 2.0%;
 - d. Flat and elongated particles, long dimension more than five times short dimension: 15.0%.
- D. Flyash: ASTM C 618
- E. Water: Potable
- F. Admixtures:
1. Air entrainment: ASTM C260
 2. Water reducing agents: ASTM C 494
 3. Retarding agent at Contractor's option: ASTM C 494
 4. Accelerating agent at Contractor's option: ASTM C 494
 5. No admixture shall contain calcium chloride.
- G. Membrane curing compounds:
1. Moisture retention properties: ASTM C 309.
 2. Material compatible with application of other surface materials.
- H. Base plate and equipment grout:

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1. ASTM C 1107, "Specification for Packaged Dry, Hydraulic Cement Grout (Nonshrink)".
2. CRD-C 621, "Corps of Engineers Specification for Nonshrink Grout."

- I. Epoxy bonding agent:
Concressive 1001-LPL, Adhesive Engineering Company; or equal.
- J. Skid resistant topping:
 1. Furnish where called for on the plans
 2. Install in accordance with manufacturer's recommendation
 3. Euclid Chemical Company, Cleveland, OH; Sonneborn Building Products, Minneapolis; or equal

2.02 CONCRETE MIX

- A. Proportioning:
 1. In accordance with ACI 211.1 - "Standard Practice for Selecting Proportions for Normal, Heavy Weight and Mass Concrete"
 2. Selected and documented in accordance with ACI-318 - "Building Code Requirements for Reinforced Concrete"
 3. Provide mix design, test records, calculations and other documentation to Engineer in accordance with Section 01 33 23 - SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Specified compressive strength (f'c): 4000 psi.
- C. Maximum water-cement ratio by weight:
 1. 0.45 without superplasticizers
 2. 0.40 with superplasticizers
- D. Cement factor
Based upon required strength with W/C ratio per ACI 211.1
- E. Air entrained concrete
 1. Total air content:
 - a. 6% ± 1% for all concrete exposed to freezing and thawing, including all wastewater and potable water containment vessels
 2. Total air content:
 - a. 3% ± 1% for all other concrete
- F. Slump limits

	<u>Max.</u>	<u>Min.</u>
1. Reinforced foundation walls and footings	3"	1"
2. Unreinforced footings, caissons and substructure walls	3"	1"
3. Reinforced slabs, beams and walls	4"	1"
4. Building columns	4"	1"
5. Pavements	3"	1"
6. Sidewalks, driveways and slabs on ground	4"	2"

2.03 PRODUCTION AND MIXING

- A. Production:
 1. Ready mixed concrete
Batched, mixed, and transported in accordance with ASTM C 94.
 2. Use only transit mixed concrete from NRCA certified mixing plants or plant approved by the Engineer.
 3. Ready-mix delivery tickets: Furnish with each batch of concrete before unloading at the

MISCELLANEOUS CAST IN PLACE CONCRETE

site with the following information:

- a. Name of ready-mix batch plant
- b. Serial number of ticket
- c. Date and truck number
- d. Name of Contractor
- e. Job name and location
- f. Specific class or designation of concrete
- g. Amount of concrete (cubic yards)
- h. Time loaded or of first mixing of cement and aggregates
- i. Type, name and amount of admixture
- j. Type, brand and amount of cement
- k. Total water content by producer (or W/C ratio)
- l. Maximum size of aggregate
- m. Weights of fine and coarse aggregates

B. Mixing:

1. Add water at the job site only if the total amount of water is equal to or less than that specified by the concrete mix design and slump remains within allowable limits.
2. Mix 30 additional revolutions of the drum if water is added to mixed concrete at the job site.
3. Completely discharge the concrete within 1½ hours after introduction of mixing water to the cement or 1 hour after arriving at the site, whichever is sooner.
4. If the ambient air temperature exceeds 85°F, the time may be reduced by the Engineer as required.
5. Do not retemper concrete that has partially set.

C. Adjustments for weather conditions:

1. Cold weather:

Minimum Ambient Air Temperature (°F)	Minimum Concrete Temperature (°F)
30 to 45	60
15 to 30	65
below 15	no concrete placement permitted

Do not mix cement with water or aggregates above 100°F.

2. Hot weather (ambient temperature 90°F. or above)
 - a. Conform to "Recommended Practice for Hot Weather Concreting" ACI 305R.
 - b. An approved set retarder will be permitted under hot weather conditions

PART 3 - EXECUTION

3.01 PLACING

A. Pre-placement inspection:

1. Inspect and complete:
 - a. Formwork installation
 - b. Reinforcing Steel
 - c. Embedded or cast-in items
2. Notify and cooperate with other Contractors and trades
3. Notify Engineer at least 24 hours in advance of pouring
4. Thoroughly wet wood forms immediately before placing concrete as required where form coating is not used.

MISCELLANEOUS CAST IN PLACE CONCRETE

5. Clean all mixing and transporting equipment
 6. Remove all debris, water and ice before placing concrete.
- B. Handling:
Prevent separation or loss of ingredients while transporting concrete.
- C. Method and rate:
1. Place all concrete in accordance with:
 - a. ACI 304R - "Recommended Practice for Measuring, Mixing, Transporting and Placing Concrete"
 - b. CI 304.2R - "Placing Concrete by Pumping Method"
 2. Place in a manner to avoid segregation.
 3. Place concrete continuously until the panel or section is complete.
 4. Do not deposit fresh concrete on hardened concrete, without a properly prepared cold joint.
 5. Place horizontal layers with a maximum thickness of 18 inches.
 6. Place concrete in columns, deep beams and walls with an elephant trunk or tremie to avoid segregation for vertical drops exceeding 3 feet.
 7. Placing floors and slabs: Place evenly over the entire area.
 8. Protect new concrete from rain until it has hardened sufficiently to prevent damage.
- D. Compaction:
1. Mechanically vibrate as concrete is placed for a sufficient duration to accomplish thorough compaction and complete embedment of reinforcement and fixtures.
 2. Do not vibrate long enough to cause segregation of mix.
 3. Vibrators: Comply with ACI 309 - "Standard Practice for Consolidation of Concrete"
 4. Do not use vibrators to transport concrete inside of forms.
 5. Insert and withdraw vibrators vertically at uniformly spaced locations not farther than the visible effectiveness of the machine.
 6. Do not insert vibrators into lower layers of concrete that have begun to set.
 7. Make at least two vibrators, all in good working condition, available for use during all pouring operations.
 8. For large pours in excess of 50 cubic yards, three vibrators shall be available.

3.02 PROTECTION AND CURING

- A. General:
1. Prevent the concrete surface temperature from falling below 50°F
 2. Prevent loss of moisture from the surface:
 - a. Normal Portland Cement : 7 days.
 - b. High-early-strength Portland Cement: 3 days.
- B. Curing:
1. Treat all beams, columns, slabs and walls with a liquid membrane-forming curing compound as specified in 2.01 immediately after finishing or removing forms.
 2. Apply in strict compliance with manufacturer's instructions.
 3. Use alternate methods of curing such as ponding, continuous sprinkling, etc only with the prior approval of the Engineer.
- C. Protection:
1. Protect all freshly placed concrete from damage due to low temperatures when the mean daily temperature is below 40°F (4.5°C) in accordance with ACI 306R.

MISCELLANEOUS CAST IN PLACE CONCRETE

3.03 JOINTS AND EMBEDDED ITEMS

- A. Construction joints:
 - 1. Joints not shown in the Contract Documents must be approved by the Engineer.
 - 2. Continue all reinforcement across joints.
 - 3. Provide longitudinal keys at least 1½ inches deep:
 - a. In all joints in walls
 - b. Between walls and slabs or footings
 - 4. Before placing adjoining concrete:
 - a. Thoroughly clean the joint surface
 - b. Remove all laitance
 - 5. Roughen the concrete surface in an approved manner to obtain bond
 - 6. Refer to standard structural details for construction joint details.
- B. Control joints:

Construct control joints as outlined in Section 3.03A and as detailed on plans.
- C. Expansion joints:
 - 1. Do not extend reinforcement or other embedded metal items bonded to the concrete (except dowels in floors, bonded on only one side of joints) continuously through any expansion joint.
 - 2. Premolded expansion joint filler
 - a. Intersections of walls and slabs on grade unless otherwise shown
 - i. "Specification for Preformed Expansion Joint Filler for Concrete (Bituminous Type)" (ASTM D 994)
 - b. Slabs on grade where slab to slab is jointed.
 - i. "Specification for Preformed Expansion Joint Fillers for Concrete Paving and Structural Construction (Non-extruding and Resilient Bituminous Types)" (ASTM D 1751)
- D. Waterstops:
 - 1. At joints as called for on the construction plans.
 - 2. See Section 03251, 2.01A.
- E. Other embedded items:
 - 1. Placement of all embedded pipe, conduit and other fixtures is the responsibility of the Contractor.
 - 2. Conform to ACI 318, Section 6.3
 - 3. Place all sleeves, inserts, anchors, and embedded items required for adjoining work or for its support prior to concreting.
 - 4. Position and support expansion joint material, waterstops, and other embedded items against displacement.
 - 5. Prevent the entry of concrete into sleeves, inserts, and anchor slots.

3.04 SURFACE TREATMENT

- A. Patching:
 - 1. Patch all poor joints, voids, honeycomb, defective areas and tie holes immediately after stripping forms.
 - 2. Remove all laitance and foreign materials from areas to be patched by means of sandblasting.
 - 3. Patch material
 - 4. Mortar with the same proportions as the concrete to be patched
 - 5. Omit coarse aggregate.
 - a. Bond patch material to concrete with a two-component liquid epoxy bonding agent in

MISCELLANEOUS CAST IN PLACE CONCRETE

- accordance with manufacturer's instructions and recommendations.
 - b. Use an epoxy adhesive for bonding plastic concrete to hardened concrete in conformance with "Standard Specification for Bonding Plastic Concrete to Hardened Concrete with a Multi-Component Epoxy Adhesive" - ACI 503.2, except as modified by the requirements of this project specification.
- B. Wall finishes:
- 1. Remove all fins.
 - 2. Repair all damaged areas, including those discolored, spalled, cracked or non-uniform in texture to the satisfaction of the Engineer.
 - 3. Concrete surfaces exposed to view
 - a. Finish exterior walls down to a point one foot below finished grade
 - b. Finish interior surfaces of tanks to a point one foot below the water line
 - 4. After repairing defects, apply an Engineer approved waterproof coating in accordance with manufacturer's recommendations.
- C. Troweling floors:
- 1. Trowel finish all floors.
 - 2. After screeding and as soon as concrete has set sufficiently:
 - a. Float surface
 - b. Steel trowel surface
 - c. Provide smooth, hard, dense finish free from trowel marks, blemishes, and irregularities.
 - 3. Finish platforms, walks, drives, and steps to a broom surface.
 - 4. Leave a 2 inch border around panels in sidewalks and platforms.
 - 5. Power float slab areas which receive a topping or grout base and tile.
- D. Membrane curing and sealer compounds:
- 1. Apply curing compounds immediately after stripping forms.
 - 2. Apply compound per manufacturer's recommendations and in accordance with ASTM C 309.
- E. Skid resistant topping:
- Apply in accordance with manufacturer's recommendations.

3.05 SPECIFIC ITEMS OF CONSTRUCTION

- A. Liquid containing concrete tank and channel walls:
- 1. Install waterstops in all joints below maximum water level.
 - 2. Immediately remove All seepage through cracks in walls by epoxy injection.
- B. Expansion strips:
- 1. Where indicated on the Drawings
 - 2. At intersections of building floor slabs and vertical surfaces
 - 3. Around columns
- C. Slab Toppings:
- 1. Toppings are required where indicated on the Drawings.
 - 2. Immediately before pouring topping, wet down surface of rough slab.
 - 3. Where topping is poured over precast-prestressed concrete members, set screeds to give indicated slab thickness at center of span.
- D. Stairs and platforms:

MISCELLANEOUS CAST IN PLACE CONCRETE

Place abrasive nosings on all concrete stairs.

- E. Base plate and equipment grouting:
 - 1. Add only water and use mechanical mixer for minimum of three minutes.
 - 2. Protect from freezing.
 - 3. Cure in accordance with manufacturer's recommendation.
- F. Miscellaneous items:
 - 1. Perform all concrete work for mechanical and electrical trades including but not limited to vaults, valve and meter pits, light pole bases, and machine bases.
 - 2. Accessories such as manhole rings, ladder rings, pulling eyes, anchor bolts, etc., may be furnished by other trade but installed by the Contractor.
- G. Chamfer:

Chamfer all exposed concrete edges 1" x 1" unless otherwise indicated on the Drawings.
- H. Grout:

"Grout" as called for on the Drawings and used as a topping slab or shaped fill for water flow shall be a 3000 psi or greater concrete mix. Sections requiring less than 2" thick shall have a maximum aggregate size of $\frac{3}{8}$ inch.

3.06 HYDROSTATIC LEAK TESTS FOR CAST-IN-PLACE CONCRETE TANKS

- A. General:

Cast-in-place concrete structures which are designed to normally be filled with liquid will be subjected to a hydrostatic leak test.
- B. Test procedure:
 - 1. conduct the test before the tank is backfilled to allow visual observation of the floor slab - outer wall construction joint.
 - 2. Fill each tank to its design liquid depth for a minimum period of 24 hours.
 - 3. No visible leakage shall be allowed.
 - 4. Any measurable loss of water over the 24 hour period shall be grounds for rejecting the test as unsatisfactory.
 - 5. Empty, repair and retest the tank if the test fails.
 - 6. All labor, equipment, and water required for testing each tank are the responsibility of the Contractor.

END OF SECTION

SECTION 04 22 00

UNIT MASONRY

Standards: Comply with recommendations of Brick Institute of America (BIA), and National Concrete Masonry Assoc. (NCMA).

Submittals: Submit product data for masonry units, cementitious products for mortar and grout, coloring pigments, and masonry accessories. Submit samples of exposed masonry units and colored pigmented mortar.

Cavity Insulation: See Section 07 21 00.

Concrete Masonry Units (CMU): ASTM C 90, Grand N-I.

Provide "normal weight" units (min. 125 pcf) "single core's" except where "lightweight" units (max. 105 pcf) are indicated, in general:

Interior and Exterior Walls Below Grade:

Stand CMU - normal weight.

Interior Walls Above Grade:

Standard CMU - lightweight, earth blend or approved equal.

Provide "bullnose" CMU at all exterior corners of interior walls.

Exterior Walls Above Grade:

Grade to 7'-4" A.F.F. (11 courses) single scored, earth blend, normal weight.

7'-4" to 8'-8" A.F.F. (2 courses) triple scored, earth blend split face, normal weight.

Above 8'-8" (5 courses, single scored), earth blend, normal weight.

All exterior concrete block, both decorative and regular including precast lintels and/or sills, shall contain the recommended amount of integral water-repellent known as the "DRY BLOCK SYSTEM. Block Admix" as manufactured by Forrer Chemical Company, Milwaukee, Wisconsin

Mortar Materials and Mixes: Provide mortar complying with ASTM C 270, Proportion Specification, for materials and mortar typed of composition indicated below:

Cementitious Material: Portland cement, Type 1, no air entertainment, white or natural color as required to produce mortar color indicated, combined with hydrated lime, Type S, ASTM C 207.

Aggregate: Natural or manufactured sand, ASTM C144.

Colored Mortar Pigments: Natural and synthetic iron oxides and chromium oxides compounded for mortar.

Color to be selected by Architect.

Additive: All exterior block walls shall be laid with mortar containing the DRY BLOCK SYSTEM integral mortar admix as per label instructions, including attention NCMA TEK 53 for joint and crack

control and NCMA TEL 13 TEK 126 for proper flashing.

Masonry Mortar Exterior and Bearing Walls: ASTM C 270, Type S; approximately 3 : 1 : 11 portland cement, lime, sand. Mortar to be colored.

Masonry Grout, Reinforced CMU: ASTM C476, use type PL mortar proportioned by volume; one part Portland cement, 2-1/4 to 3 parts sand.

Masonry Mortar, Interior: ASTM C 270, Type N; approximately 3 : 2 : 14 portland cement, lime, sand.

Setting Bed Mortar: ASTM C 270, Type M; approximately 6 : 1 : 18 portland cement, lime sand.

Do not add admixtures unless otherwise indicated.

Select and proportion pigments with other ingredient to produce mortar color indicated; do not exceed pigment-to-cement ratio of 1- to 10, by weight.

Machine mix to match color selected by Architect.

Joint Reinforcement, Ties and Anchoring Devices: Comply with requirements indicated below for basic materials and with those indicated under each item.

Zinc-Coated Wire: ASTM A 82 for uncoated wire, ASTM A 641, Class 3 for zinc coating.

Joint Reinforcement: Welded-wire units prefabricated with deformed continuous side rods and plain cross rods into straight lengths of not less than 10' and of widths to fit wall thicknesses indicated, with prefabricated corner and tee units, and as follows:

Continuous Masonry Wire Reinforcing: Truss or ladder design, minimum 9 gauge welded steel wire, 0.8oz. hot-dip coating (after fabrication) for exterior walls, mill-galvanized wire for interior walls, width 1-1/2 to 2" less than wall thickness.

Miscellaneous Masonry Anchors: Fabricated from 16 gage steel sheet or 3/8" steel rod, 1.5 oz. hot-dip zinc coating after fabrication.

Concealed Flashing Materials: Provide materials as follows:

Vinyl Masonry Flashing: PVC with plasticizers and modifiers, formed into a 20-mil flexible sheet.

Weepholes: Polyethylene plastic tubing, 1/4" x 4".

Insulation:

Loose Granular Perlite Insulation: See Section 07 21 00 - Thermal Insulation.

Install masonry units in running bond. Scored lines to match up. Horizontal joint between single and triple scored units to be raked joint, all others tooled.

Copper Asphalt Masonry Flashing: 3-oz. copper sheet with flexible fibrated asphalt coating on both faces.

Cut exposed masonry units, where necessary, with a power saw.

Avoid the use (by proper layout) of less-than-half-size units.

Bond intersecting walls with masonry units or provide anchors spaced 2'-0".

Hold uniform joint sizes as indicated, or if not indicated, hold joint sizes to suit modular size of masonry units.

Cut joints flush and tool slightly concave, unless otherwise indicated.

Reinforce horizontal joints with continuous masonry joint reinforcement, spaced 24" vertically; and except spaced 8" in parapet walls, and immediately above and below openings, for a distance of 2' beyond jambs of opening. Do not bridge control and expansion joints in the wall system.

Anchor ends of walls to structure with anchors spaced 2'-0", except as otherwise shown.

Provide control and expansion joints at locations shown, and keep clean of mortar droppings.

Provide concealed flashing in exterior masonry work as indicated.

Except as otherwise shown, provide flashing under copings and sills, through wall at counterflashing locations, and above elements of structural support for masonry.

Build other work into the masonry work as shown, fitting masonry units around other work, and grouting for secure anchorage.

Protect newly laid masonry from exposure to precipitation, excessive drying, freezing, soiling, backfill and other harmful elements.

Dry-brush masonry work at end of each day's work.

Final Cleaning: After mortar is thoroughly set and cured, clean masonry as follows:

Remove large mortar particles by hand with wooden paddles and non-metallic scrape hoes or chisels.

Test cleaning methods on sample panels before proceeding with cleaning of entire masonry work.

Clean concrete unit masonry to comply with masonry manufacturer's directions and applicable NCMA "Tek" bulletins.

END OF SECTION

SECTION 06 11 00

General Carpentry Materials:

Lumber Standard: Am. Softwood Lumber Std. PS 20 (U.S. Dep. Comm.), S4S, 19% moisture at time of dressing, except as otherwise indicated.

Light Framing (4 x 4 Max.): "Standard" grade any species.

Structural Framing 2 x 6 to 4 x 14): "No. 2" grade, Fir or Hem-Fir.

Stress Grade: 1200 psi minimum, factor marked.

Exposed board Lumber: Select clear redwood of sizes noted on Drawings.

Concealed Board Lumber: Southern Pine "No. 3" (SPIB), any species "No. 4" (WCLIB) or any species "Standard" (WWPA).

Plywood Standard: Softwood plywood - Construction and Industrial PS 1 (U.S. Dep. Comm.), type and grade as indicated.

Provide plywood bearing DFPA grade - trade marks.

Plywood Sheathing: C/D,INT-APA, exterior glue or OSB (Oriented Slant Board).

Preservative pressure treated lumber and plywood with water-borne preservatives to comply with AWPAC2 and C9, respectively, and with requirements indicated below:

Kiln-dry to 15% moisture content after treatment, except for wood in contact with ground.

Wood for Above-Ground Use: AWPB LP-2.

Treat cants, nailers, blocking, furring, stripping and similar items in conjunction with roofing, flashing, vapor barriers, and waterproofing.

Treat sills, sleepers, blocking, furring, stripping and similar items in direct contact with masonry or concrete.

Treat ground-contact and water-immersed wood items in accordance with standard for ground contact.

Fire-Retardant Treated Wood: Where wood is indicated for fire-retardant treatment comply with AWPAC20 (lumber) and AWPAC27 (plywood). Provide UL label in each piece treated. Re-dry treated lumber.

Installation:

Install rough carpentry work to comply with "Manual of House Framing" by National Forest Products Assoc. (N.F.P.A.) and with recommendations of American Plywood Association (APA), unless otherwise indicated. For Sheathing, underlayment and other products not covered in above standards, comply with recommendations of manufacturer of product involved for use intended. Set carpentry work to required levels and lines, with members plumb and true and cut to fit.

Install finish carpentry work plumb, level, true and straight with no distortions. Shim as required using concealed shims. Scribe and cut finish carpentry items to fit adjoining work. Anchor

finish carpentry work securely to supports and substrates, using concealed fasteners and blind nailing except as indicated, countersunk and filled flush with finished surface.

Trussed Rafters: Comply with "Light Metal Connected Wood Trusses" by Truss Plate Institute., and with "Nat. Design Specs. for Stress Graded Lumber and Its Fasteners" by NDMA.

Submit manufacturer's Shop Drawings for approval with an engineers seal.

Glued Laminated Structural Units Standard: Comply with PS 56 "Structural Glued Laminated Timber" k min. bending stress (FC) = 2400 psi; grade industrial.

Nail plywood or oriented strand board sheathing 6" o.c. at edges of panels, and 12" o.c. at intermediate supports. Leave space between panels as recommended by APA.

Standing and Running Trim: Install with minimum number of joints possible, using full-length pieces from maximum length of lumber available. Cope at returns, miter at corners to produce tight fitting joints. Use scarf joints for end-to-end joints.

Securely attach carpentry work to substrates and supporting members using fastener of size that will not penetrate members where opposite side will be exposed to view or receive finish materials. Install fasteners without splitting wood; fasten panel products to allow for expansion at joints unless otherwise indicated.

END OF SECTION

SECTION 06 17 00
PREFABRICATED WOOD TRUSSES

General:

Standards: Comply with N.F.P.A. National Design Specification and with TPI standards including "Quality Standard for Metal Plate Connected Wood Trusses", "Commentary and Recommendations for Handling and Erecting Wood Trusses", Commentary and Recommendations for bracing Wood Trusses" and the following:

"Design Specification for Metal Plate Connected Wood Trusses".

Submittals: In addition to product data for truss components submit the following:

Shop drawings showing sizes, design values, materials, and dimensional relationships of components as well as bearing and anchorage details.

To extent engineering design considerations are fabricator's responsibility, submit design analysis and test reports indicating truss performance characteristics and compliance with requirements.

Provide shop drawings which have been signed and stamped by a structural engineer licensed to practice in jurisdiction where trusses will be installed.

Certification, signed by officer of fabricating firm, indicating trusses comply with project requirements.

Handle and store trusses with care and to comply with TPI recommendations to avoid damage from bending, overturning or other cause.

Products:

Lumber: Provide lumber S4S, S-Dry unless otherwise indicated grade marked, complying with PS 20 and requirements indicated.

Lumber Species: Any softwood, at Contractor's option, graded under WWPA, WCLB, SPIB or NLGA rules, which complies with other requirements.

Lumber Grade: Any grade fulfilling requirements indicated.

Stress Rating: Provide lumber which has been graded or tested and certified to comply with stress ratings indicated.

Metal Connector Plates: Metals and thickness as indicated, but not less than thickness indicated below:

Hot-Dip Galvanized Sheet Steel: ASTM A 446, Grade A, G60, 0.036" thick.

Fasteners and Anchorages: Of size, type, material and finish suited to application shown.

Fabrication: Fabricate and assemble trusses to provide units of configuration indicated, with closely fitted joints and connector plates securely fastened to wood members.

Installation:

Install trusses to comply with TPI referenced standards and other indicated requirements.

END OF SECTION

SECTION 06 83 16
FIBERGLASS REINFORCED PANELING

- 1 PART 1 GENERAL
 - 1.01 SUMMARY
 - A. This section covers the materials to be provided and the methods to be used for interior paneling.
 - 1.02 UNIT PRICES
 - A. Refer to Section 01 20 00 PRICE AND PAYMENT PROCEDURE
 - 1.03 REFERENCES
 - A. American Plywood Association (APA)
 - B. West Coast Lumber Inspection Bureau (WCLIB)
 - C. American Wood Preservers Association (AWAPA)
 - D. Uniform Building Code (UBC)
 - 1.04 SUBMITTALS
 - A. Laminated Fiberglass Panels, Fasteners, Trim, and Adhesive
- 2 PART 2 PRODUCTS
 - 2.01 LAMINATED FIBERGLASS PANELS (Milk House Parlor Board or Sanitary Liner)
 - A. Fiberglass laminated to 3/8" CDX plywood as shown on plans.
 - B. Fiberglass thickness: 0.05".
 - C. Color: White.
 - D. As supplied by Kinetics, Inc.; Madison, Wisconsin
- 3 PART 3 – EXECUTION
 - 3.01 WALLS AND CEILINGS
 - A. Install 2" by 2" treated wood furring strips at 16" o.c. and at the bottom and top of the interior block walls.
 - B. Install laminated fiberglass panels to walls and ceilings with custom fasteners and construction adhesives as shown on the plans.
 - C. Seal all seams with flexible caulk and white vinyl trim.
 - D. Provide nailers/blocking and custom trim for panel edges, wall ceiling joint, and other unfinished edges.
 - E. Install vinyl baseboard at floor/wall.
 - F. Install 8-inch MCU interior wall as shown on plans.
 - 1. Install 36" x 36" window in interior wall in location shown on plan.
 - 2. Seal all penetrations of wall against air exchange.
 - 3. Install a wall collar where 6-inch piping penetrates wall.
 - 4. Interior wall does not require insulation.

END OF SECTION

SECTION 07 11 00
DAMP PROOFING

GENERAL

Description of Work

Extent of each type of fluid applied waterproofing work is shown on drawings. Fluid applied waterproofing is hereby defined to exclude similar membranes used as exposed finish for roofing, flooring, or special coatings.

Types of fluid applied waterproofing required for project include the following:

Single-component, bitumen-modified, moisture curing polyurethane.

QUALITY ASSURANCE

Manufacturer: Obtain primary waterproofing materials of each type required from single manufacturer with not less than three years of successful experience in supplying principal materials for FA-WP work. Provide secondary materials only as recommended by manufacturer of primary materials.

Installer: A firm which has specialized in installation of types of waterproofing required for project for not less than three years and which is not unacceptable to manufacturer(s) of primary materials.

As applicable, assign work closely associated with waterproofing, including (but not limited to) waterproofing accessories, flashings in connection with waterproofing expansion joints in membrane, and protection course on membrane, to installer of waterproofing, for undivided responsibility.

SUBMITTALS:

Product Data: Submit manufacturer's specifications, installation instructions, and general recommendations for each waterproofing material required. Include data substantiating that materials comply with requirements.

JOB CONDITIONS:

Substrate: Proceed with work of this section only after substrate construction and penetrating work have been completed.

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.

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.

PRODUCTS

MATERIALS:

General Compatibility: Provide products which are recommended by manufacturer to be fully compatible with indicated substrates, including modification by bituminous additives (Asphalt or coal tar as needed) and similar proven compounding provisions.

Single-Component, Bitumen-Modified, Polyurethane: Polyurethane rubber based liquid membrane material, self-bonding to normal substrates, compounded specifically for application method to be used and for slope of substrate, not less than 97% solids and 6-month shelf life in uncured state.

Products/Manufacturers: Provide one of the following:

Mameco 101
Sonoborn HLM
Tremco 60

Miscellaneous Materials:

Primer/Filler/Sealer: As recommended by manufacturer of FA-WP liquid compound and as indicated.

Flashing, Cant Strips, and Accessories: As recommended by manufacturer of FA-WP liquid compound and as indicated.

Protection Course (PRT CRS): Rigid asphalt/asbestos composition board, 1/8" thick, formed under heat and pressure, standard sizes.

EXECUTION

INSPECTION

Installer must examine substrate and conditions under which waterproofing work is to be performed and must notify Contractor in writing of unsatisfactory conditions, do not proceed with work until unsatisfactory conditions have been corrected in manner acceptable to Installer.

PREPARATION OF SUBSTRATE:

Clean substrate of projections and substances detrimental to work; comply with instructions of prime materials manufacturer.

Install cant strips and similar accessories as shown and as recommended by prime materials manufacturer even though not shown, which particular attention at construction joints. Fill voids, seal joints, and apply bond breakers as recommended by prime materials manufacturer.

Prime substrate as recommended (and Only if recommended) by prime materials manufacturer.

Mask off adjoining surfaces not to receive FA-WP, to effectively prevent spillage or over-spray of liquid materials outside membrane area.

INSTALLATION:

General: 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 endure satisfactory performance of work.

Apply uniform coating of FA-WP to substrate and adjoining surfaces indicated to receive membrane.

Apply coating complying with manufacturer's recommendations regarding horizontal and vertical surfaces.

Provide 60-mil (average) coating, with no variations below 50-mil thickness.

Install sheet-type flashings and joint covers as recommended by prime materials manufacturer. Except as otherwise shown, extended flashings to not less than 4" beyond finished surface to be applied over waterproofing.

Permit membrane to cure under conditions which will not contaminate or deteriorate FA-WP material.
Block off traffic and protect membrane from physical damage.

Protection Course:

Install protection course (PRT CRS) on cured membrane (after testing, if required) without delay, so that period of exposure will be minimized.

On vertical surfaces comply with FA-WP manufacturer's recommendations for adhesion of protection course to membrane.

END OF SECTION

SECTION 07 21 00
THERMAL INSULATION

General:

Provide insulation thickness indicated, or provide combination of thickness and K-value required to yield the "R" value indicated.

Perimeter and Under Slab Insulation:

Extruded Polystyrene Insulation Board: FS HH-I-524C, Type IV, Class B, self-skinned, K-value of 0.20.

Provide:

"Dow Styrofoam" by Dow Chemical U.S.A.
"Formula R 250" by UC Industries

Vertical Application: Set in mastic adhesive as recommended by manufacturer.

Ceiling Insulation:

Faced Mineral Fiber Blanket/Batt Insulations: ASTM C 665 for Type III, Class A (blankets with reflective vapor-retarder membrane facing with flame spread of 25 or less; foil-scrim-kraft vapor-retarder membrane on one face, respectively; and as follows;

Mineral Fiber Type: Fibers manufactured from glass or slag.

Loose Organic Fiber Insulation: Cellulosic fibers (reprocessed newsprint or other) process with fire-retardant, vermin-resistant and neutralizing chemicals for blowing or pouring in place, complying with FS HH-I-515, Class 25, 2 lb. minimum in-place density, k-value of 0.28; tested and labeled by UL for critical radiant flux of 12 W per q cm (CPSC 16CF-1209), 15% smoldering combustion, "Acceptable" for corrosiveness, moisture absorption, odor emission, fungal growth and permanence of flame-resistance, and "Negative" on starch content.

Loose Granular Masonry Cavity Insulation:

Granular Perlite Insulation: FS HH-I-574 or ASTM C 549, k-value of 0.33, silicone treated where used in exterior walls.

The insulation shall be installed in the cores of all exterior hollow masonry unit walls.

The insulation shall be poured directly into the wall at any convenient interval. Wall sections under doors and windows shall be filled before sills are placed.

All holes and openings in the wall through which insulation can escape shall be permanently sealed or caulked prior to installation of the insulation. Cooper, galvanized steel, or fiberglass screening shall be used in all weep holes.

Stud Partitions Interior and Exterior Walls:

Glass Fiber Blanket/Batt Insulation: Inorganic nonasbestos fibers formed with binders into resilient blankets or batts complying with HH-I-521, semi-rigid type where required for self support. (3-1/2 / 5-1/2 as indicated).

Installation, General:

Comply with insulation manufacturer's printed instructions and recommendations for the installation for each type of thermal insulation. Provide adequate anchorage or support for each unit. Insulate at all wood-on block plates, all possible openings in walls and ceilings (i.e., window and door frames, headers), around all inside plumbing lines and between plumbing lines and outside walls.

END OF SECTION

SECTION 07 25 00
VAPOR BARRIERS

General:

For use below all slabs and gypsum ceilings.

Elastic Sheet Vapor Barriers VB:

Polyethylene Vapor Barrier VB: 6-mil carbonated polyethylene film, rated 0.1 perms for less.

Installation:

Seal VB at seams, perimeter, obstruction and penetrations, with adhesive, sealant or tape recommended by manufacturer.

Anchorage: Install vapor barriers with adhesive or fasteners as appropriate for supporting substrate, and of type recommended by vapor barrier manufacturer.

Provide lapped seams and lap vapor barriers onto other work at edges of coverages and at penetrations of barriers by other work.

Seal lapped seams and laps onto other work with adhesive or self-adhesive tape of type recommended by vapor barrier manufacturer. Before covering over vapor barriers with other (concealing) work, patch punctures and tears with adhesively applied barrier material or tape with perm rating equal to barrier rating.

END OF SECTION

SECTION 07 41 00

METAL ROOFING

PART 1-GENERAL

1.01 DESCRIPTION

A. General

1. Furnish all labor, material, tools, equipment and services for all preformed roofing as indicated, in accord with the provisions of the Contract Documents. The Metal Roofing Manufacturer will provide all components required for a complete metal roofing system to include panels, panel clips, trim/flashing, fascias, ridge, closures, sealants, fillers and any other required items.
2. Completely coordinate with work of all other trades.

1.02 QUALITY ASSURANCE

A. Applicable standards

1. AISC 360, *Specification for Structural Steel Buildings*, American Institute of Steel Construction, Chicago, IL, 2010.
2. AISI D111, *Design Guide for Cold-Formed Steel Purlin Roof Framing Systems*, American Iron and Steel Institute, Washington, D.C., 2009.
3. AISI S100, *North American Specification for the Design of Cold-Formed Steel Structural Members*, Washington, D.C., 2007, with Supplement 1, dated 2010.
4. ADM1, *Aluminum Design Manual*, Aluminum Association, Arlington, VA, 2010.
5. ASTM A653, *Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process*, American Society for Testing and Materials, West Conshohocken, PA, 2008.
6. ASTM A792, *Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process*, American Society for Testing and Materials, West Conshohocken, PA, 2008.
7. ASTM E1514, *Standard Specification for Structural Standing Seam Steel Roof Panel Systems*, American Society for Testing and Materials, West Conshohocken, PA, 1998(2003).
8. ASTM E1592, *Standard Test Method for Structural Performance of Sheet Metal Roof and Siding Systems by Uniform Static Air Pressure Difference*, American Society for Testing and Materials, West Conshohocken, PA, 2005.
9. ASTM E 1646, *Standard Test Method for Water Penetration of Exterior Metal Roof Panel Systems by Uniform Static Air Pressure Difference*, American Society for Testing and Materials, West Conshohocken, PA, 1995(2003).
10. ASTM E1680, *Standard Test Method for Rate of Air Leakage through Exterior Metal Roof Panel Systems*, American Society for Testing and Materials, West Conshohocken, PA, 1995(2003).
11. MBMA, *Metal Building Systems Manual*, Metal Building Manufacturers Association, Inc., Cleveland, OH, 2006 with 2010 Supplement (updated expected in 2012).
12. MBMA, *Metal Roofing Systems Design Manual*, Metal Building Manufacturers Association, Inc., Cleveland, OH, 2000 (update expected in 2012).
13. SJI K-1.0, *Standard Specification for Open Web Steel Joists, K-series*, Steel Joist Institute, Forest, VA, 2010.
14. UL 580, *Tests for Uplift Resistance of Roof Assemblies*, Underwriters Laboratories, Inc., Northbrook, IL, 2006, with Revisions through July, 2009.

B. Manufacturer's qualifications

1. Manufacturer shall have a minimum of three years experience in manufacturing metal roofing systems [and shall be accredited under the International Accreditation Service, "Accreditation Criteria for Inspection Programs for Manufacturers of Cold-Formed Steel Structural and Nonstructural Components Not Requiring Welding (AC473)" or "Accreditation Criteria for Inspection Programs for Manufacturers of Metal Building Systems (AC472)"]. Panels specified in this section shall be produced in a permanent factory environment with fixed-base roll-forming equipment. A letter from the manufacturer certifying the manufacturer's qualifications shall accompany the product material submittals.

- C. The Installer shall meet the following minimum criteria
- Maintain a minimum \$250,000 general liability coverage for each loss.
 - Maintain worker's compensation coverage, as mandated by law.
 - Have no viable claims pending regarding negligent acts or defective workmanship on previously or current projects.
 - Have not filed for protection from creditors under any state or federal insolvency or debtor relief statutes or codes.
 - Have received specific training in the proper installation of the specified system and will be present to supervise whenever material is being installed.
 - Have installed five projects of similar scope and magnitude that have been in service for a minimum of two years with satisfactory performance of the roof system.

1.03 SYSTEM PERFORMANCE REQUIREMENTS

- A. Performance Testing
- Metal roofing systems shall be tested in accordance with UL580, Class 90 rating
 - Metal roof panel systems shall be tested in accordance with ASTM E1592 for negative loading. Capacity for gauge, span or loading other than those tested is permitted to be determined by interpolating between test values only.
 - Metal roof panel systems shall have a maximum air infiltration rate of 0.007 cfm/ft² at a pressure differential of 6.24 psf. when tested in accordance with ASTM E1680.
 - Metal roof panel systems shall have no water leakage at a pressure differential of 6.24 psf when tested in accordance with ASTM E1646.
 - The panels and concealed anchor clips shall be capable of supporting a 300-pound temporary concentrated load at the panel mid-span in the installed condition. The load shall be applied over the entire panel width. The panels shall support this concentrated load without displaying permanent distortions that would affect the weather tightness of the SSSRS.

1.04 DESIGN REQUIREMENTS

- A. General
- The SSSRS shall be designed by the Manufacturer as a complete system. Members and connections not indicated on the drawings shall be the responsibility of the Contractor. All components of the system shall be supplied or specified by the same manufacturer.
- B. Design Loads
- Design load application shall be in accordance with 2015 Michigan Building Code.
 - Dead Loads
 - The dead load shall be the weight of the SSSRS. Collateral Loads shall be as shown on the contract drawings. Collateral Loads shall not be applied to the roof panels.
 - Live Loads
 - The panels and concealed anchor clips shall be capable of supporting a minimum uniform live load of 20 psf.
 - Snow Loads
 - The design ground snow loads shall be as defined on the contract drawings.
 - Wind Loads
 - The design wind speed for the metal roofing system shall be as defined on the contract documents.
 - Thermal Effects
 - Roof panels shall be free to move in response to the expansion and contraction forces resulting from temperature variation, as specified in the MBMA *Metal Roofing Systems Design Manual*.
 - Rainfall Intensity
 - All exterior gutters and downspouts shall be designed for rainfall intensity based upon a 5-year recurrence interval for a five-minute duration. All interior gutters, valleys and downspouts

shall be designed for rainfall intensity based upon a 25-year recurrence interval based on a five-minute duration.

C. Framing Members Supporting the SSSRS

1. Any additions/revisions to framing members supporting the SSSRS to accommodate the manufacturer/fabricator's design shall be the Contractor's responsibility, and shall be submitted for review and approval by the Engineer of Record. New or revised framing members and their connections shall be designed in accordance with [AISC 360] [AISI S100] [SJI K1.1] design specifications. Deflection requirements shall be in accordance with the applicable building code, or as a minimum, the provisions of the AISC Steel Guide Series 3 – *Serviceability Design Considerations for Steel Buildings, 2nd Edition*.

D. Roof Panels

1. Steel panels shall be designed in accordance with the AISI S100.
2. Aluminum panels shall be designed in accordance with the *Aluminum Design Manual*.
3. Deflection requirements shall be in accordance with the applicable building code, or as a minimum, L/180 for roof snow load (but not less than 20 psf).

E. Accessories and Their Fasteners

1. Accessories and their fasteners shall be capable of resisting the specified design wind uplift forces and shall allow for thermal movement of the roof panel system. Exposed fasteners shall not restrict free movement of the roof panel system resulting from thermal forces, except at designed points of roof panel fixity.

1.05 SUBMITTALS

A. Installation Drawings

1. Submit completed installation drawings and installation details by the manufacturer, to the architect (owner) for review. Do not proceed with manufacture prior to review and architectural approval of installation drawings. Do not use drawings prepared by the architect (owner) for installation drawings.
2. Installation drawings shall show methods of installation, elevations and plans of roof and wall panels, sections and details, specified loads, flashings, roof curbs, vents, sealants, interfaces with all materials not supplied by the metal roofing system manufacturer, and proposed identification of component parts and their finishes.

B. Calculations (All calculations noted below shall be reviewed and sealed by a Licensed Professional Engineer.)

1. Submit engineering calculations defining cladding loads for all roof areas based on specified building codes, allowable clip loads, and required number of fasteners to secure the panel clips to the designated substructure.
2. Compute uplift loads on clip fasteners with full recognition of prying forces and eccentric clip loading.
3. Calculate holding strength of fasteners in accordance with submitted test data provided by Fastener Manufacturer based on length of embedment and properties of materials.
4. Submit drainage calculations for valley, gutter, and downspout design.
5. Submit thermal calculations and details of floating clip, flashing attachments, and accessories, indicating the free movement in response to the expansion/contraction effects.

C. Physical Samples

1. Submit samples and color chips for all proposed finishes.
 - a. Submit one 12-inch long sample of panel, including clips.
 - b. Submit two 3-inch x 5-inch color chip samples in color selected by the architect .

D. Test Reports

1. Submit test report showing that metal panels have been tested in accordance with ASTM E1592.
2. Submit test report showing that metal panels meet the water penetration requirements of ASTM E1646.
3. Submit test report showing that metal panels meet the air infiltration requirements of ASTM E1680.

E. Metal Roofing System Fabrication Certification

1. Submit a letter from the SSSRS manufacturer verifying that the SSSRS has been produced in a

plant that is accredited under the IAS AC472 or AC473 program.

F. Installation contractor's qualifications

1. Submit a letter from the manufacturer identifying the installer of the metal roofing system as an authorized installer, approved by the manufacturer prior to the start of the installation of the metal roofing system.

G. Metal roofing system installation inspection reports

1. Submit written and photographic SSSRS installation inspection reports from the general contractor's third party metal roof consultant appraising the installation of the metal roofing system. The written and photographic inspection reports shall be submitted to the architect (owner), metal roofing system installation contractor and general contractor.

2. A separate report shall be submitted for each of the following stages of the metal roofing system installation

a. Prior to the installation of the metal roofing panels to verify the proper installation of the substrate. The roof consultant shall be only responsible for assuring that the substrate is in suitable condition for the installation of the SSSRS.

b. At final completion of all metal roofing system work.

1.06 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Delivery

Deliver metal roofing system to job site properly packaged to provide protection against transportation damage.

B. Handling

Exercise care in unloading, storing and installing metal roofing system to prevent bending, warping, twisting and surface damage.

C. Storage

Store all material and accessories above ground on well supported platforms. Store under waterproof covering. Provide proper ventilation of metal roofing system to prevent condensation build-up between each panel or trim/flashing component.

PART 2 – PRODUCTS

(Vertical Rib Structural Standing Seam, trapezoidal Rib Structural Standing Seam, Panel rib height not less than 2 inches)

2.01 MATERIALS

A. Metal roof panel

1. Profile: 1¾ inch high rib x 12 inch wide panel

2. Seam Type: [Interlocking / Snap Connection] [Mechanically Seamed]

3. Minimum Thickness: Panel to meet all specified design loads, but not less than 0.023 inches (24 Gauge).

4. Panel Base Material

a. Galvanized steel sheet, G90, conforming to ASTM A653

b. Galvalume® steel sheet, AZ50, conforming to ASTM A792 for painted and unpainted panels.

c. Galvalume® steel sheet, AZ55, conforming to ASTM A792 for unpainted panels.

5. Texture

a. Smooth.

6. Finish

a. Selected from manufacturer's standard offering.

b. Factory Color Finish.

Clear acrylic-coated Galvalume.

B. Concealed Anchor Clips

Concealed anchor clips shall be the same as those used during the testing of the roof system. Clip bases shall have factory punched or drilled holes for attachment. Clips shall be made from multiple pieces with the allowance for the total thermal movement required within the clip. Fixed clips are permitted when the manufacturer can substantiate that the system can accommodate the thermal cyclic movement under sustained live or snow loads.

2.02 Miscellaneous Materials

A. Fasteners

Fasteners for steel roof panels shall be zinc-coated steel, aluminum, corrosion resisting steel, or nylon-capped steel, type and size specified below, or as otherwise, approved for the applicable requirements. Fasteners for aluminum roof panels shall be aluminum or corrosion resisting steel. Fasteners for structural connections shall provide both tensile and shear ultimate strengths of not less than 750 pounds per fastener. Fasteners for accessories shall be the manufacturer's standard. Exposed roof fasteners shall be sealed or have sealed washers on the exterior side of the covering to waterproof the fastener penetration. Washer material shall be compatible with the screw head; have a minimum diameter of 3/8-inch for structural connections; and gasket portion of fasteners or washers shall be neoprene or other equally durable elastomeric material.]

B. Components

Components shall be compatible with the roof panel furnished. Flashing, trim, metal closure strips, caps, gutters, downspouts, roof curbs, and similar metal components shall not be less than the minimum thickness specified by the SSSRS Manufacturer. Exposed metal components shall be finished to match the panels or trim, as furnished. Molded closure strips shall be closed-cell or solid-cell synthetic rubber or neoprene, or polyvinyl chloride pre-molded to match configuration of the covering and shall not absorb or retain water. Thermal spacer blocks and other thermal barriers at concealed clip fasteners shall be as recommended by the SSSRS Manufacturer.

C. Sealants

All tape sealant shall be a pressure sensitive, 100 percent solid, sealing tape with a release paper backing. Provide permanently elastic, non-sagging, non-toxic, non-staining tape sealant approved by the SSSRS Manufacturer.

2. The SSSRS Manufacturer shall approve all joint sealant that will come into contact with the SSSRS.

2.03 FABRICATION

A. Panels shall be produced by a SSSRS Manufacturer meeting the requirements of section 1.02B.

B. Fabricate trim, flashing and accessories to Manufacturer's specified profiles.

2.04 PREFABRICATED CURBS AND EQUIPMENT SUPPORTS

A. General: Provide the SSSRS Manufacturer with the dimensions, weights and model number of the units to be supported by the curb(s).

B. Fabricate curbs of structural quality aluminum, Galvalume®, or hot-dipped galvanized sheet. Curbs shall have welded joints unless a two-piece curb is required. Provide integral base plates and water diverters/crickets. Front base plate shall be extended up-slope from the beginning of the water diverter. Curbs shall be designed for a compatible installation with the panel system.

C. Curbs shall be constructed to match the roof slope and provide a mounting surface as required by the rooftop unit manufacturer.

D. Submit roof curb manufacturer's shop drawings to SSSRS Manufacturer for approval before fabrication of curbs.

E. Any curb structural support system shall allow thermal movement of the curb with the roofing system.

2.05 PREFABRICATED PIPE FLASHINGS

A. Pipe flashings shall provide a weathertight joint at projections through the roof, taking into account the thermal movement of the roof and the service temperature of the projection. Pipe flashings shall have an aluminum-flanged base ring.

PART 3 – EXECUTION

3.01 SURFACE CONDITIONS

A. Examination

1. The Contractor shall verify installed work of other trades that such work is complete to a point where the roofing system installation may commence.
2. Verify that the substructure installation is in accordance with the approved shop drawings and SSSRS Manufacturer's requirements. This specifically includes verifying that secondary structural members and/or decking are installed to meet performance requirements. Coordinate with SSSRS Manufacturer to ensure that the substructure is installed to accommodate the appropriate clip spacing.

B. Discrepancies

1. In event of discrepancy, notify the architect (owner).
2. Do not proceed with installation until discrepancies have been resolved.

3.02 INSTALLATION

A. Install the SSSRS in accordance with manufacturer's instructions and approved installation drawings.

B. Install the SSSRS so that it is weathertight and allows for thermal movements.

C. Locate and space all exposed fasteners in accordance with the SSSRS Manufacturer's recommendations. Use torque settings to obtain controlled uniform compression for a positive seal without rupturing the neoprene washer.

D. Avoid placing pipe penetrations through the panel seams.

E. Do not allow panels or trim to come into contact with dissimilar materials (i.e. copper, lead, graphite, treated lumber, mortar, etc.). Water run-off from these materials is also prohibited.

F. Comply with SSSRS Manufacturer's approved installation drawings, instructions and recommendations for installation of roof curbs. Refer to SSSRS Manufacturer's standard installation details. Anchor curbs securely in place with provisions for thermal and structural movement.

3.03 CLEANING, PROTECTION

A. Dispose of excess roofing materials and remove debris from site.

B. Clean work in accordance with manufacturer's recommendations.

C. Protect work against damage until final acceptance. Replace or repair to the satisfaction of the architect (owner), any work that becomes damaged prior to final acceptance.

D. Touch up minor scratches and abrasions per the SSSRS Manufacturer's recommendations.

END OF SECTION

SECTION 07 46 00
PREFORMED SIDING

Performance Requirements: Provide preformed panel systems which comply with performance requirements indicated.

Submittals: Submit manufacturer's product data describing preformed siding panels and structural support system.

Submit samples of each exposed finish material.

Submit certification by manufacturer that products have been pretested and comply with performance requirements indicated.

Manufacturers: Provided the following or product meeting equal or better specifications.

Mastic Corp., T.Lok Vinyl Siding, Quad 2 1/2" and vented soffit.

Metal siding: 29 gauge wall panels, 26 gauge ceiling panels. Panels to be by Quality Edge or approved equal.

Color: Color to be selected. Submit standard samples to architect for approval.

Finish: Manufacturers standard.

Warranty: Manufacturers standard 50 year limited warranty.

Accessories: Provide manufacturer's standard and accessories as required for a complete installation including trim, flashing, corner units, clips, seam closures, battens, sealants, and similar items.

Comply with panel mfr.'s. instructions for anchorage, joint sealers, flashing and trim for the proper and permanent installation of panels, with provisions for thermal expansion, erected in panel pattern indicated.

Conceal fasteners by use of laps and joint clips.

END OF SECTION

SECTION 07 65 00
FLASHING AND SHEET METAL

General:

Conform to profiles and sizes shown on drawings, and comply with "Architectural Sheet Metal Manual" by SMACNA, for each general category of work required. Material provided under this section must be compatible with Flexible Sheet Roofing material and be installed by Roofing Installer. If the Roofing Material Manufacturer provides materials compatible with roofing to allow homogenous bonding of associated materials, those materials may supersede the requirements of this section.

Metal flashing and counter flashing.
Metal wall flashing and expansion joints.
Exposed metal trim.
Sheet metal expansion joints.
Elastic sheet flashing.
Miscellaneous sheet metal accessories.

Products:

Aluminum Sheet: ASTM B 209, alloy 3003-H-14; 0.032 inch (20 gage); brown finish.

Fabricate sheet metal with flat-lock seams, except seal aluminum seams with epoxy metal seam cement and, where required for strength, rivet seams and joints.

Coat back-side of fabricated sheet metal with 15-mil sulfur-free bituminous coating, SSPC-Paint 12, where required to separate metals from corrosive substrates, including cementitious materials, wood or other absorbent materials; or provide other permanent separation.

Provide for thermal expansion of running sheet metal work by overlaps of expansion joints in fabricated work. Where required for water-tight construction, provide hooked flanges filled with polyisobutylene mastic for 1-inch embedment of flanges. Space joints at intervals of not more than 30 feet for zinc alloy or aluminum. Conceal expansion provisions where possible.

Extruded Aluminum Trim and Flashing: Provide standard products conforming to the profiles and sizes indicated, alloy 6063-T52, 0.08 inch minimum thickness' complete with welded corner units, flashings and accessories.

Finish: AA C22A41 clear anodized.

Separate aluminum from contact with cementitious and absorptive surfaces, and from dissimilar metals, by a 15-mil coating of bituminous mastic (SSPC - Paint 12) or other permanent separation.

Bed base units in roofing cement. FS-SS-C-153/

Elastic Sheet Flashing/Membrane: Manufacturer's standard flexible, elastic, black, non-reinforced, flashing sheet of 50 to 60 mils thickness, 50 to 70 Shore A hardness, 1200 psi tensile strength, minus 30 deg F (minus 35 deg C) brittleness.

Elastic Sheet: EPDM synthetic rubber.

Execution:

Anchor work in place with noncorrosive fasteners, adhesives, setting compounds, tapes and other

materials
and devices as recommended by manufacturer of each material or system. Provide for thermal expansion and building movements. Comply with recommendations of "Architectural Sheet Metal Manual" by SMACNA.

Seal moving joints in metal work with elastomeric joint sealants, complying with FS SS-T-00227, 00230, or 001543.

Clean metal surfaces of soldering flux and other substances which could cause corrosion.

Composition Stripping: Cover flanges (edges) of work set on bituminous substrate with 2 courses of glass fiber fabric (ASTM D-1668) set in and covered with asphaltic roofing cement, FS-SS-C-153.

Performance: Water-tight and weatherproof performance of flashing sheet metal work is required.

END OF SECTION

SECTION 07 90 00
JOINT SEALERS

Materials, General:

Color: Manufacturer's standard highest-performance color, as selected by architect.

Compatibility: Provide materials selected for compatibility with each other and with substrates in each joint system; confirm with manufacturer.

General Characteristics: Provide type, grade, class, hardness and similar characteristics for material as indicated or, where not indicated, to comply with manufacturer's recommendations relative to exposures, traffic, weather conditions and other factors of the joint system for best possible overall performance. Except as otherwise indicated, joint sealers are required to permanently maintain airtight and waterproof seals, without failures in joint movement accommodation cohesion, adhesion (where applicable), migration, staining, and other performances as specified.

Elastomeric Sealants:

General: Provide sealant for all exterior location where sealants are required, but not called out or specified as to type.

Multi-Component Polyurethane Sealant: FS TT-S-00230C Class A; self-; leveling, except non-sag where joints are not horizontal.

Provide sealant in all exterior joints and joints between dissimilar materials where called for, and including:

Control and expansion joints (interior and exterior on exterior walls).
Joints between dissimilar materials (interior and exterior for doors, windows, etc.).
Perimeter joints of exterior openings.
Under metal thresholds.

Non-Elastomeric Sealants and Caulking Compounds:

One-Component Acrylic Sealant: ASTM C920 Type S, Class 12.5 Grade NS, or FS tt-S-00230 Class B, non-say: solvent based, solids 95% acrylic.

Provide sealant in all interior joints and joints between dissimilar materials where called for and including:

Control and expansion joints.
Joints between dissimilar materials (door frames/masonry).
Vertical control joints at exposed surfaces of interior unit masonry.

Joint Fillers and Sealant Backers:

Expanded Polyethylene Joint Filler : Flexible, close-cell, 10 psi compression for 25% deflection, except higher if required for installation forces, 0.1 lbs. per. sq. ft. surface water absorption.

Sealant Backer Rod: Non-absorptive close-cell (or jacketed open-cell) compressible/flexible plastic or rubber rod stock neoprene, polyurethane, PVC.

Installation:

Clean joint surfaces and prime or seal as recommended by sealant manufacturer.

Support sealants from back with construction as shown, or with joint filler or backer rod.

Install sealants to size and shape shown or, if not shown, with "hour glass" section profile and as follows:

Elastomeric Sealants, Non-Traffic Joints: Depth equal to 50% of normal joint width, but not more than 1/2" and not less than 1/4".

Non-Elastomeric Sealants, Non-Traffic Joints: Depth in range of 75% to 125% of normal joint width.

END OF SECTION

SECTION 08 11 00
STEEL DOORS, FRAMES, AND WINDOWS

Standards: In addition to other specified requirements, comply with Steel Door Institute "Recommended Specifications for Standard Steel Doors and Frames" (SDI-100), for the following classifications:

Submittals: With manufacturer's standard details and specifications for steel doors and frames, submit shop drawings showing application to project, as required.

For door and frame assemblies required to be fire rated and exceeding sizes of tested assemblies, submit manufacturer's certification that each assembly has been constructed to conform to design, materials and construction equivalent to labeled construction requirements.

Manufacturer: One of the following:

Ceco Corp.
Curries Mfg., Inc
Steelcraft/Div American Standard Co.
Republic Builders Products Corp./Subs. Republic Steel.

Materials: Steel doors, frames and windows; hot-rolled, pickled and oiled per ASTM A 569 and A 568; cold-rolled per ASTM A 366 and A 568.

Anchors and Accessories: Manufacturer's standard units. Use galvanized items for units built into exterior walls, complying with ASTM A 153.

Fabrication: Fabricate units to be rigid, neat in appearance, and free from defects, warp, or buckle. Weld exposed joints continuously, grind, dress, and make smooth, flush and invisible.

Prepare Steel Doors and Frames to receive mortised and concealed finish hardware, including cutouts, reinforcing, drilling, and tapping, complying with ANSI A 115 "Specifications for Door and Frame Preparation for Hardware". Reinforce units to receive surface-applied finish hardware to be field applied.

Locate finish hardware as indicated or, if not indicated, per DHI "Recommended Locations for Builder's Hardware".

Shop Paint exposed surfaces of doors and frame units, including galvanized surfaces, using manufacturer's standard baked-on rust inhibitive primer.

Doors: Comply with SDI-100, of the types and styles indicated, for materials quality, metal gages, and construction details.

Exterior and Interior Doors: Grade II, heavy duty, Model 4, minimum 18 gauge faces.
(exterior door to have steel top cap)

Thermal Rated (Insulating) Doors: Provide thermal insulating doors for all exterior steel doors.
Doors

shall be fabricated with a maximum apparent U factor of 0.24
BTU/hr (ft²) degrees F as tested in accordance with ASTM
C236.

Frames: Comply with SDI-100, of the types and standards indicated, for materials quality, metal gages, and construction details.

Fabricate all frames from 16 gauge steel.

Provide standard hollow metal frames for doors, transoms, sidelights, borrowed lights, and other openings as indicated.

Prepare frames to receive 3 silencers on strike jambs of single-swing frames and on heads of double-swing frames. (Stick on silencers are not acceptable in lieu of drilled type.)

Provide 26-gage steel plaster guards on mortar boxes, welded to frame, at back of hardware cutouts where installed in concrete, masonry or plaster opening.

Protect inside faces of frames in plaster or masonry wall construction which are placed with anti-freeze additives, using high-built fibered asphalt emulsion coating.

Installation: Install hollow-metal units in accordance with manufacturer's instructions and final shop drawing (if any).

Fit doors to frames and floors with clearances specified in SDI-100.

Finish hardware is specified in another Section 8700.

Glass and Glazing:

Polished Wire Glass: Quality q11; clear, square mesh; 1/4" thick' UL labeled "fire resistant".

END OF SECTION

SECTION 08 15 00
FIBERGLASS REINFORCED PLASTIC DOORS AND FRAMES

GENERAL

DESCRIPTION

Work Includes: Fiberglass reinforced plastic doors and frames.

Related Work:

General Conditions, Supplementary Conditions and Division 1 Sections apply to this work.
Section 04200 - Unit Masonry
Section 08110 - Hollow Metal
Section 08710 - Glass and Glazing

SUBMITTALS: Submit shop drawings and product data under provisions of Section 01300. Indicate frame configuration, anchor types and spacing, location of cutouts for hardware, reinforcement and finish. Indicate door elevations and internal reinforcement. Submit manufacturer's product literature, fabrication descriptions and installation instructions under provisions of Section 01300.

DELIVERY, STORAGE AND PROTECTION: Deliver, handle and store doors and frames at the job site in such a manner as to prevent damage. Doors shall not be received before the building is enclosed. Only remove cartons upon arrival of doors at job site if cartons are wet or damaged. Doors shall be stored out of weather and/or extreme temperatures. The doors shall be stored in a vertical position on blocking, clear of the floor and with blocking between the doors to permit air circulation between the doors. All damaged or otherwise unsuitable doors and frames, when so ascertained, shall be immediately removed from the job site.

REGULATORY REQUIREMENTS: Fire-rated door and panel construction conforms to products tested under ASTM E152, UL10B & NFPA 252. Install door and panel assembly conforming to NFPA for fire-rated class, ANSI A117.1 specifications for handicap accessibility, ADA requirements, ANSI A151.1 Mod. Swing cycle test in excess of 1,000,000 cycles. Flame Spread: All FRP component parts, including the gelcoat finish, shall have a flame spread classification of 25 or less per ASTM E84 and shall be self extinguishing per ASTM D635 unless operating conditions dictate otherwise. Resins: Resins to meet with USDA and FDA standards for incidental food contact, if applicable to this project.

PRODUCTS

ACCEPTABLE MANUFACTURERS: Products manufactured by the following companies complying with these specifications will be acceptable: CORRIM Company, Oshkosh, Wisconsin 54901. Telephone (920) 231-2000, Fax (920) 231-2238. Products manufactured that have successfully completed ANSI A151.1 Mod. Swing Cycle test in excess of 1,000,000 cycles, with no failure of any design features of the door.

DOORS: Door Fabrication FRP (Fiberglass Reinforced Plastic) Face Sheets:

Standard face sheets shall be manufactured using a corrosion resistant resin system with light stabilizing additives. The resin shall be reinforced with fiberglass, 40% by weight. Face sheets shall be 0.070" to 0.125" in thickness. Standard being 0.120". Total door thickness to be a nominal 1 3/4".

Finish: Standard gelcoat color to be gray or white. Special gelcoat color to be selected by the architect. 15 Mils thick coverage, ± 3 mils. Smooth, seamless finish

Internal Construction:

Core

Option B: Polyurethane Foam Core a 1 1/2" thick rigid block of polyurethane shall be laminated to the exterior panels. The "R" factor shall be 11-12.

Stiles and Rails:

Stiles and rails shall be 1 ½" square pultruded fiberglass tubes. A polyester-based resin filled with ¼" chopped glass strands and aerosol shall be used for reinforcements and corner blocks, etc. The bottom rail shall allow 1 ¼" of height alterability without loss of the panel's integrity. No metal or wood lumber reinforcements will be allowed.

Fire-rated openings to be the "Polyfire Series" furnished in strict compliance with UL testing, and in accordance with ASTM-E152/UL 10B.

Hardware Preparations:

Reinforcement Blocking: Lockset - non-swelling polymer blocking; Surface mounted hardware - non-swelling polymer blocker; Thru-bolted hardware - non-swelling polymer blocking

Mortise Hardware: Full mortise hinges - non-swelling polymer blocking; Mortise locksets - to suit template provided; Exit devices - to suit template provided. All doors shall be mortised and reinforced to allow application of hinges and locks, in accordance with hardware schedule and manufacturer's templates. The hinges shall be attached by using stainless steel wood screws. Pilot holes shall be in strict accordance to manufacturer's recommendations.

Astragals: Astragals for pairs of doors to be fabricated of stainless steel material of manufacturer's standard flat design, by finish hardware supplier.

FRAMES

Frame Fabrication FRP (Fiberglass Reinforced Plastic)

Jamb Depth: 5 ¾" standard. Refer to frame schedule for exact sizes.

Face Dimension: 2" standard. Headers available in 2" and 4".

Return: 1/2"

Stop: 5/8"

Rabbet: 1 15/16"

Corner Miter: Head and Jamb members shall be standard 45° miter, providing a neatly mitered corner connection, fabricated for Knocked Down (KD) field assembly.

Pultrusion: In compliance with pultrusion industry standards

Reinforcements and Braces/Supports: Corner Reinforcement: 4" x 4" x 5 3/8" x ¼" thick pultruded fiberglass angel. Attached to head bar at factory using stainless steel screws or suitable polymer rivets. Mortise Hinge Reinforcement: 1 ½" x 7 x ¼" thick polymer. Attached to frame by means of bonding and stainless steel countersunk screws. Closer Reinforcement: Same as mortise hinge reinforcement, less screws. Strike Reinforcement: 1 ½" x 9 x ¾" thick polymer material. Attached to frame by means of bonding and stainless steel countersunk screws or suitable polymer rivets.

Anchoring Systems

"T"-Strap or Wire Anchor for masonry construction
Concealed existing wall anchor if necessary

Finish

Gelcoat: 15 mils thick, ± 3 mils on all exposed surfaces. Color to match door unless otherwise indicated.

FABRICATION

Fabricate FRP doors and frames as shown on the drawings and in accordance with best shop practices. Frames shall be rigid, neat in appearance and free from defects. Field measurements shall be taken as required for coordination with adjoining work.

Form exposed surfaces free from warp, wave and buckle, with all corners square, unless otherwise shown. Set each member in proper alignment and relationship to other members with all surfaces

straight and in a true plane.

Reinforce members and joints with plates, tubes or angels for rigidity and strength.

Doors and frames shall be mortised and reinforced for hardware in accordance with the hardware manufacturer's instructions and templates. The reinforcing shall be designed to receive hinges, locks, strikes, closures, etc.

Furnish at least three (3) metal anchors or polymer spacers in each jamb of frames up to 84" high and one (1) additional anchor for each 24" in height above 84", in shapes, sizes and spacing shown or required for anchorage into adjoining wall construction. Fabricate joint anchor of stainless steel.

Terminate bottom of frames at the indicated finished floor level.

Provide clearance for doors of 1/8" at jambs and heads; 1/4" clearance above threshold.

INSPECTION

Installer shall examine the substrate and conditions under which fiberglass reinforced plastic work is to be installed and notify the General Contractor in writing of any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected in a manner acceptable to the installer.

INSTALLATION

General: Install FRP doors, frames and accessories in accordance with final shop drawings, NFPA 80 standards at fire-rated openings, and as herein specified. Installation to be similar to that of hollow metal doors and frames, and in accordance with FRP manufacturer's written instructions

Frame Installation: Place frames prior to construction of enclosing walls and ceilings. Set frames accurately in position, plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is completed, remove temporary braces and spreaders leaving surfaces smooth and undamaged. Frame must not be drilled for brace supports as finish may be damaged. In masonry construction, locate three (3) wall anchors per jamb at hinge and strike levels. Frames may be grouted full of mortar at jambs and anchors shall be built into the joints as walls are laid up. A continuous bead of silicone sealant is to be applied between the head and jamb at the miter joint.

Door Installation: Fit FRP doors accurately in frames, within clearances specified in Paragraph 2.04H of this section.

TOLERANCES

Maximum Diagonal Distortion: 1/8" measured with a straight edge, corner to corner.

Maximum measurable plane is 4' 0" x 7' 0".

ADJUSTING

At substantial completion, adjust all operable components to ensure proper installation and that they function smooth and freely.

CLEANING

Remove dirt and excess sealant from exposed surfaces. Follow the manufacturer's recommended cleaning techniques and procedures for cleaning all surfaces. Use only cleaning products that will not scratch or damage the surfaces, and are recommended by the manufacture. Remove debris from project site.

WARRANTY

To include one (1) year free from defects in materials and workmanship from date of shipment, and thirty (30) years from degradation or failure due to corrosion from date of shipment, provided that the structural integrity of the doors and frames have not been violated or compromised. (No unauthorized cuts, bores, or other structural alterations affecting the core of the door, or the structure of the frame.) Normal wear and tear, or physical abuse of a specific installation is not part of this warranty.

END OF SECTION

SECTION 08 30 00
ACCESS DOORS

Submittals: Manufacturer's standard details and specifications.

Manufacturers: the following (or equal):

Cesco Products

Frames: 12 ga. steel, factory primed.

Fabricate frame with exposed flange approximately 1" wide for access doors located in the following construction:

Style MS-W (medium security) for masonry wall.

Flush Panel Door: Factory primed 10 gauge galvanized steel or heavier with manufacturer's standard hinges, provide lock (to be keyed by hardware supplier).

Installation: Coordinate installation with work of other trades and located accurately. Comply with manufacturer's instructions for secure attachment, proper relation to adjacent finished surfaces and proper operation.

END OF SECTION

SECTION 08 56 00
FIBERGLASS WINDOWS

GENERAL

RELATED DOCUMENTS

Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 specification Sections, apply to this section.

SUMMARY

This Section includes the following window types:

Sliding Window Units.

Performance Grade Classification: Provide wood windows that comply with requirements of NWWDA I.S. 2 for performance grade 40. Glass to be bronze, low E unit.

Performance Requirements (Grande 40 Windows): Each required window unit shall comply with the following performance requirements:

Air Infiltration: Not more than 0.25 cfm. per sq. ft. of overall frame area at an inward test pressure of 1.57 lbf per sq. ft.

Water Penetration: No water penetration as defined in the test method at an inward test pressure of 4.43 lbf per sq. ft.

Structural Performance: No glass breakage, damage to hardware, or permanent deformation that would impair operation of the unit, or residual deflection greater than 0.4 percent of the span at a positive (inward) and negative (outward) test pressure of 40 lbf per sq. ft.

Product certificates signed by the window manufacturer certifying that window units comply with specified performance requirements.

Safety Glass Standard: Where safety glass is indicated or required by authorities having jurisdiction, provide the type of products indicated which comply with ANSI Z97.1 and testing requirements of 16 CFR Part 1201 for category II materials.

Single Source Responsibility: Provide fiberglass windows produced by a single fabricator who is capable of indicating prior successful production of units similar to those required.

Design Criteria: Drawings indicate window sizes, profiles, and dimensional requirements. Window units having minor deviations from indicated dimensions and profiles may be accepted, subject to the Architect's approval, provided such deviations do not materially detract from the design concept or intended performance.

Warranty

Submit a written warranty signed by the Manufacturer, agreeing to repair or replace fiberglass window units that fail in materials or workmanship with the specified warranty period.

Fiberglass Window Units:
Pella or approved equal.

MATERIALS

General: Comply with requirements of NWWDA I.S. 2.

Insect Screens: Provide removable insect screen panel for each movable glazed sash. Comply with requirements of SMA 2005.

INSTALLATION

Comply with manufacturer's instructions and recommendations for installation of window units, hardware, operators, accessories, and other window components.

Set units plum, level, true to line, without warp or rack of frames or sash. Provide proper support and anchor securely in place.

Set sill members in a bed of compound or with joint fillers or gaskets as indicated, to provide weathertight construction. Refer to Division 7 sections for joint fillers and sealants required to be installed concurrently with window units. Coordinate window installation with wall flashings and other built-in components.

ADJUSTING

Adjust operating sash and hardware to provide a tight fit at contact points and weather-stripping, and to provide smooth operation and a weathertight closure. Lubricate hardware and moving parts.

CLEANING

Clean interior and exterior surfaces promptly after installation of windows. Take care to avoid damage to protective coatings and finishes. Remove excess glazing and sealants, dirt, and other substances.

Clean glass of pre-glazed window units promptly after installation. Wash and polish glass on both faces not more than 4 days prior to date scheduled for final inspection. Comply with manufacturer's recommendations for final cleaning and maintenance.

Remove and replace glass that is broken, chipped, cracked, abraded or damaged in other ways during construction period, including natural causes, accidents, and vandalism.

PROTECTION

Institute and maintain protection and other precautions required through remainder of construction period to ensure that, except for normal weathering, window units will be without damage or deterioration at the time of substantial completion.

END OF SECTION

SECTION 08 70 00
BUILDERS HARDWARE

Description of work:

The extent of builders hardware is shown on the Drawing in schedules. Builders hardware is hereby defined to include all items known commercially as builders hardware, as required for swing and sliding doors, except special typed of unique and non-matching hardware specified in the same section as the door and door frame.

Steel Doors and Frames are specified in Section 08 150.

Quality Assurance

Acceptable Hardware Manufacturers:

General:

Listed herein are acceptable manufacturers for the primary items of builders hardware. Listed manufacturer's products which comply with the indicated requirements are acceptable for other items.

An asterisk (*) indicates which manufacturer's product numbers have been used in schedules and elsewhere to establish minimum requirements.

Obtain each kind of hardware (latch and lock sets, hinges, closures, etc.) from only one manufacturer, even though several may be indicated as acceptable manufacturers.

Listing of Acceptable Manufacturers:

- A. Hinges.....McKinney, *Hager, *Stanley
- B. Locksets & Latchsets.....Yale, Schlage, Sargent, *Cal Royal
- C. Door Closures.....*LCN, *Norton, Sargent, Yale, Rixon
- D. Pulls.....*Rockwood, Trimco, Ives, Hiawatha
- E. Stops.....*Rockwood, Ives, Quality
- F. Thresholds.....*National Guard, Pemko, Reese
- G. Weatherstrip & Sweeps.....*National Guard, Pemko, Reese

Any substitute of a product not listed, without prior written approval, will be rejected.

Supplier:

A recognized builders hardware supplier who has been furnishing hardware in the same area of the project for a period of time of not less than two years, and who is, or has in employment, an experienced hardware consultant who is available at reasonable times during the course of work for project hardware consultation to the Owner, Architect and Contractor.

Installer:

Assign installation of hardware to experienced tradesmen, either at the door and frame fabrication plant or at the project site.

Departures from Scheduled Designations:

Except as otherwise indicated, the use of one manufacturer's numeric designation system in schedules does not imply that other listed acceptable manufacturer's products will not be

acceptable, unless they are not acceptable in design, or not equal in size, weight, finish, function, or other quality of significance. Do not change the selection after Architect's acceptance of hardware supplier's completed hardware schedule.

Submittal

Manufacturer's Data

Submit manufacturer's product data for each item of hardware. Include whatever information may be necessary to show compliance with requirements, and include instructions for installation and for maintenance of operating parts and exposed finishes. Whenever needed, furnish templates to fabricators of other work which is to receive finish hardware.

Samples:

Prior to submittal of the final hardware schedule and prior to delivery of hardware, submit one sample each exposed hardware unit, finished as required and tagged with full description for coordination with schedule. Sample will be reviewed by Architect for design, color, and texture only. Compliance with other requirements is the exclusive responsibility of the Contractor. Samples will be returned to supplier. Units which are acceptable and remain undamaged through submittal, review and operation, may be use in work, within limitations of keying coordination requirements.

HARDWARE SCHEDULE:

General:

Submit six (6) copies of the hardware schedule in the manner and format specified. Hardware schedules are intended for coordination of the work. Review and acceptance by the Architect or Owner does not relieve the Contractor of his exclusive responsibility to fulfill the requirements as shown and specified.

Include a separate key schedule, showing clearly how the Owner's final instruction on keying of locks have been fulfilled. Coordinate with existing keying system.

Hardware Schedule Format:

Submit hardware schedule in the same format (sets) as set forth in the specifications. Add additional information, such as door numbers, total quantities of each hardware item, etc., as may be deemed necessary for the Builder's hardware supplier.

Submit two (2) copies of catalog cuts of all hardware items proposed by listed acceptable manufacturers to be used in the project in lieu of each scheduled hardware item, including catalog cuts of the scheduled hardware item it is proposed to be substituted for. Mark-up choices and options in data on both proposed and scheduled hardware catalog cut sheets, as necessary to indicate characteristic of the actual product being provided for the project.

JOB CONDITIONS

Coordinate hardware with other work. Tag each item or package separately, with identification related to the final hardware schedule, and include basic installation instructions in the package. Furnish hardware items of proper design for use on doors and frames of the thicknesses, profile, swing, security and similar requirements indicated, as necessary for proper installation and function. Deliver individually packaged hardware items at the proper times to the proper locations (shop or project site) for installation.

Keying:

All locks and cylinders shall be keyed alike in sets and master keyed at the direction of the Owner.

Furnish six (6) master keys and two (2) keys each lock, unless otherwise noted.

Miscellaneous Items:

Door Stripping:

Provide type indicated or, if not indicated, type recommended by manufacturer for condition of exposure, with easily replaceable resilient stripping elements.

On fire-rated doors provide type approved for use with rating.

Provide weatherstripping at jambs and head of each exterior door.

Provide weatherstripping at sill of each exterior door, threshold-contact type except as otherwise indicated.

All weatherstripping and sweep strips to be supplied with self-drilling "tek" screws for installation on hollow metal doors and frames.

EXECUTION

INSTALLATION

General:

Install each hardware item in compliance with manufacturers' instructions and recommendations.

Wherever cutting and fitting is required to install hardware onto or into surfaces which are later to be painted or finished in another way, coordinated removal, storage, and reinstallation or application of surface projections with finishing work specified in Section 09 90 00. Do not install surface-mounted items, including silencers, until finishes have been completed on the substrate.

Set units level, plumb, and true to line and location. Adjust and reinforce attachment substrate as necessary for proper installation and operation.

Drill and countersink units which are not factory-prepared for anchorage fasteners. Space fasteners. Space fasteners and anchors in accordance with industry standards.

Mounting heights:

Mount hardware units at heights indicated in "Recommended Locations for Builders Hardware" by the Door and Hardware Institute (DHI), except as otherwise specifically indicated or required to comply with governing regulations.

Thresholds and Floor Covers:

Cut and fit to profile of door frames, with mitered corners and hairline joints.

Screw to substrate with No. 10 or larger screws, of the proper type for permanent anchorage and of bronze, stainless steel, or other materials which will not corrode in contact with the

threshold metal.

At exterior doors, and elsewhere as indicated, set each edge of threshold in a seal strip of sealant.
Remove excess sealant. See section 07 90 00 for type sealants required.

ADJUST AND CLEAN

General:

Hardware supplier shall, at completion of hardware installation, visit jobsite and adjust and check each operating item of hardware and each door to ensure proper operation or function of every unit. Lubricate moving parts with type lubricant recommended by builders hardware manufacturer. Replace units which cannot be adjusted or lubricated to operate freely and smoothly as intended for the application made. Adjust door control devices to compensate for final operation of heating ventilating equipment. Hardware supplier shall notify Architect, in writing, as to any major hardware misinstallations and that adjustments have been made.

END OF SECTION

SECTION 09 91 00

PAINTING

PART 1 GENERAL

1.01 WORK INCLUDED:

- A. Work includes painting of all ferrous metals, including but not necessarily limited to the following items. In general, all ferrous metal (including galvanized) will be painted unless it is buried pipe.
 - 1. All pipe and fittings
 - 2. Miscellaneous metal hangers, supports, etc.
- B. Specifically excluded from these painting requirements are the pumps and piping provided by the factory built pump station manufacturer. The painting requirements for this equipment are specified in Section 33 32 13.

PART 2 PRODUCTS

2.01 MATERIALS:

- A. All materials specified herein are manufactured by the Tnemec Company, Inc., North Kansas City, Missouri and are approved for use of this project.
- B. Equivalent materials of other manufacturers may be substituted for approval of the Owner. Requests for substitution shall include manufacturer's literature for each product giving the name, generic type, descriptive information, solids by volume, recommended dry film thickness and a list of 10 projects where each product has been used and rendered satisfactory service for at least 3 years. No request for substitution shall be considered that would decrease film thickness and/or number of coats or offers a change in the general type of coating specified.
- C. Colors shall be as determined by the Owner, or as specified.
- 1. Piping Color Requirements:
 - a. Raw Water: Olive Green
 - b. Potable: Dark Blue
- D. Painting schedule:
(all thicknesses for dry film)
 - 1. Steel - structural, pipes, equipment, etc.
 - a. Exterior, non-immersion; factory-primed:
Epoxy/Polyurethane System:
 - Field coats:

Intermediate:	66-1211 Hi-Build Epoxyline	(2.0 to 3.0 mils)
Final:	73-color Endura-Shield III	<u>(2.0 to 3.0 mils)</u>
Total		(4.0 to 6.0 mils DFT)
 - b. Exterior, non-immersion; not factory primed:
Epoxy/Polyurethane System:
 - Surface preparation: SSPC-SP6
 - Field coats:

Primer:	66-1211 Hi-Build Epoxyline	(3.0 to 5.0 mils)
Final:	73-color Endura-Shield III	<u>(3.0 to 5.0 mils)</u>
Total		(6.0 to 10.0 mils DFT)
 - c. Interior, non-immersion; factory primed:

- Epoxy System:
- Field coats:

1st coat:	66-1211 Hi-Build Epoxyline	(2.0 to 3.0 mils)
2nd coat:	66-color Hi-Build Epoxyline	<u>(4.0 to 6.0 mils)</u>
Total		(6.0 to 9.0 mils DFT)
- d. Interior, non-immersion; not factory-primed:
- Epoxy System:
- Surface preparation: SSPC-SP6
 - Field coats:

Primer:	66-1211 Hi-Build Epoxyline	(3.0 to 5.0 mils)
Final:	66 color Hi-Build Epoxoline	<u>(4.0 to 6.0 mils)</u>
Total		(7.0 to 11.0 mils)
- e. Exterior, immersion or intermittent immersion:
- Coal Tar Epoxy System:
- Surface preparation: SSPC-SP10 or manufacturer's recommendations for various surfaces.

1st coat:	66-1211 Hi-Build Epoxyline	(3.0 to 5.0 mils)
2nd coat:	46H-413 Hi-Build Tneme-Tar	<u>(14.0 to 20.0 mils)</u>
Total		(17.0 to 25.0 mils)
2. Steel - Galvanized Pipe
- a. Exterior, non-immersion:
- Epoxy/Polyurethane System:
- Surface preparation: see manufacturer's recommendations
 - Field coats:

Primer:	66-1211 Hi-Build Epoxyline	(2.0 to 3.0 mils)
Final:	73-color Endura-Shield III	<u>(2.0 to 3.0 mils)</u>
Total		(4.0 to 6.0 mils DFT)
- b. Interior, non-immersion:
- Epoxy System:
- Surface preparation: see manufacturer's recommendations
 - Field coats:

Primer:	66 color Hi-build Epoxoline	(2.0 to 3.0 mils)
Final:	66 color Hi-build Epoxoline	<u>(2.0 to 3.0 mils)</u>
Total		(4.0 to 6.0 mils DFT)
- c. Immersion:
- Epoxy System:
- Surface preparation: SSPC-SP1, followed by Brush-off Blast
 - Field coats:

Primer:	66 color Hi-build Epoxoline	(3.0 to 5.0 mils)
Final:	66 color Hi-build Epoxoline	<u>(4.0 to 6.0 mils)</u>
Total		(7.0 to 11.0 mils DFT)
- d. Immersion, severe:
3. Ductile Iron Pipe - Above Ground Only
- a. Exterior Exposed Pipe:
- Epoxy/Polyurethane System:
- Surface preparation: Abrasive Blast Cleaning equivalent to SSPC-SP7 (Bluish Gray), by pipe manufacturer.
 - Factory prime coat: 163-1211 Varacure (3.0 to 5.0 mils)
 - Field coats:

Intermediate:	66 color Hi-build Epoxoline	(4.0 to 6.0 mils)
Final:	73-color Endura-Shield III	<u>(2.0 to 3.0 mils)</u>
Total		(9.0 to 14.0 mils DFT)
- b. Interior Exposed Pipe:
- Epoxy System:
- Surface preparation: Abrasive Blast Cleaning equivalent to SSPC-SP7 (Bluish

- Gray), by pipe manufacturer.
- Factory prime coat: 163-1211 Varacure (3.0 to 5.0 mils)
- Field coats:
 - Final: 66 color Hi-build Epoxoline (4.0 to 6.0 mils)
 - Total (7.0 to 11.0 mils DFT)
- c. Exterior; immersion or intermittent immersion
Coal Tar Epoxy System:
 - Surface preparation: see manufacturer's recommendation for various surfaces
 - Factory prime coat: 163-1211 Varacure (3.0 to 5.0 mils)
 - Field coats:
 - Final: 46H-413 Coal tar-epoxy (14.0 to 20.0 mils)
 - Total (17.0 to 25.0 mils)

PART 3 - EXECUTION

3.01 COORDINATION

Provide finish coats which are compatible with prime paints used. Provide barrier coats over incompatible primers where required.

3.02 SURFACE PREPARATION

- A. Perform preparation and cleaning procedure in accordance with coating manufacturer's instructions for each substrate condition.
- B. Remove hardware, accessories, machined surfaces, plates, lighting fixtures and similar items in place and not to be finish painted or provide surface applied protection. Reinstall removed items after final paint coat has cured.

3.03 APPLICATION

- A. Materials shall be mixed, thinned and applied according to the manufacturer's printed instructions. Use applicators and techniques best suited for the material and surfaces to which applied.
- B. Apply additional coats when undercoats, stains, or other conditions show through the final coat until paint film is of uniform finish, color and appearance.
- C. Finish doors on top, bottom, and edges same as exterior faces.
- D. Sand lightly behind succeeding enamel or varnish coats.
- E. Omit first coat (primer) on metal surfaces which have been shop primed and touch up painted, unless otherwise specified.
- F. Apply prime coat to material which is required to be painted or finished, which has not been prime coated by others.
- G. Apply each material at not less than the manufacturer's recommended spreading rate, to provide a total dry film thickness of not less than 4.0 mils for the entire coating system of prime and finish coats for 3 coat work.
- H. Allow each coat to dry thoroughly before applying the next coat.
- I. Completed work shall match approved samples for color, texture, and coverage. Remove,

refinish or repaint work not in compliance with specified requirements.

3.04 ACCEPTANCE OF WORK

- A. Request acceptance of each coat before applying to next coat.
- B. Correct work that is not acceptable and request reinspection.

END OF SECTION

SECTION 09 97 00

SPECIAL COATINGS

PART 1 GENERAL

1.01 WORK INCLUDED:

- A. Work includes painting of all ferrous metals, including but not necessarily limited to the following items. In general, all ferrous metal (including galvanized) will be painted unless it is buried pipe.
 - 1. All pipe and fittings
 - 2. Miscellaneous metal hangers, supports, etc.
- B. Specifically excluded from these painting requirements are the pumps and piping provided by the factory built pump station manufacturer. The painting requirements for this equipment are specified in Section 33 32 13.

PART 2 PRODUCTS

2.01 MATERIALS:

- A. All materials specified herein are manufactured by the Tnemec Company, Inc., North Kansas City, Missouri and are approved for use of this project.
- B. Equivalent materials of other manufacturers may be substituted for approval of the Owner. Requests for substitution shall include manufacturer's literature for each product giving the name, generic type, descriptive information, solids by volume, recommended dry film thickness and a list of 10 projects where each product has been used and rendered satisfactory service for at least 3 years. No request for substitution shall be considered that would decrease film thickness and/or number of coats or offers a change in the general type of coating specified.
- C. Colors shall be as determined by the Owner, or as specified.
 - 1. Piping Color Requirements:
 - a. Raw Water: Olive Green
 - b. Potable: Dark Blue
- D. Painting schedule:
(all thicknesses for dry film)
 - 1. Steel - structural, pipes, equipment, etc.
 - a. Exterior, non-immersion; factory-primed:
Epoxy/Polyurethane System:
 - Field coats:

Intermediate:	66-1211 Hi-Build Epoxyline	(2.0 to 3.0 mils)
Final:	73-color Endura-Shield III	<u>(2.0 to 3.0 mils)</u>
Total		(4.0 to 6.0 mils DFT)
 - b. Exterior, non-immersion; not factory primed:
Epoxy/Polyurethane System:
 - Surface preparation: SSPC-SP6
 - Field coats:

Primer:	66-1211 Hi-Build Epoxyline	(3.0 to 5.0 mils)
Final:	73-color Endura-Shield III	<u>(3.0 to 5.0 mils)</u>
Total		(6.0 to 10.0 mils DFT)
 - c. Interior, non-immersion; factory primed:

- Epoxy System:
- Field coats:

1st coat:	66-1211 Hi-Build Epoxyline	(2.0 to 3.0 mils)
2nd coat:	66-color Hi-Build Epoxyline	<u>(4.0 to 6.0 mils)</u>
Total		(6.0 to 9.0 mils DFT)
- d. Interior, non-immersion; not factory-primed:
- Epoxy System:
- Surface preparation: SSPC-SP6
 - Field coats:

Primer:	66-1211 Hi-Build Epoxyline	(3.0 to 5.0 mils)
Final:	66 color Hi-Build Epoxoline	<u>(4.0 to 6.0 mils)</u>
Total		(7.0 to 11.0 mils)
- e. Exterior, immersion or intermittent immersion:
- Coal Tar Epoxy System:
- Surface preparation: SSPC-SP10 or manufacturer's recommendations for various surfaces.

1st coat:	66-1211 Hi-Build Epoxyline	(3.0 to 5.0 mils)
2nd coat:	46H-413 Hi-Build Tneme-Tar	<u>(14.0 to 20.0 mils)</u>
Total		(17.0 to 25.0 mils)
2. Steel - Galvanized Pipe
- a. Exterior, non-immersion:
- Epoxy/Polyurethane System:
- Surface preparation: see manufacturer's recommendations
 - Field coats:

Primer:	66-1211 Hi-Build Epoxyline	(2.0 to 3.0 mils)
Final:	73-color Endura-Shield III	<u>(2.0 to 3.0 mils)</u>
Total		(4.0 to 6.0 mils DFT)
- b. Interior, non-immersion:
- Epoxy System:
- Surface preparation: see manufacturer's recommendations
 - Field coats:

Primer:	66 color Hi-build Epoxoline	(2.0 to 3.0 mils)
Final:	66 color Hi-build Epoxoline	<u>(2.0 to 3.0 mils)</u>
Total		(4.0 to 6.0 mils DFT)
- c. Immersion:
- Epoxy System:
- Surface preparation: SSPC-SP1, followed by Brush-off Blast
 - Field coats:

Primer:	66 color Hi-build Epoxoline	(3.0 to 5.0 mils)
Final:	66 color Hi-build Epoxoline	<u>(4.0 to 6.0 mils)</u>
Total		(7.0 to 11.0 mils DFT)
- d. Immersion, severe:
3. Ductile Iron Pipe - Above Ground Only
- a. Exterior Exposed Pipe:
- Epoxy/Polyurethane System:
- Surface preparation: Abrasive Blast Cleaning equivalent to SSPC-SP7 (Bluish Gray), by pipe manufacturer.
 - Factory prime coat: 66 color Hi-build Epoxoline (3.0 to 5.0 mils)
 - Field coats:

Intermediate:	66 color Hi-build Epoxoline	(4.0 to 6.0 mils)
Final:	73-color Endura-Shield III	<u>(2.0 to 3.0 mils)</u>
Total		(9.0 to 14.0 mils DFT)
- b. Interior Exposed Pipe:
- Epoxy System:
- Surface preparation: Abrasive Blast Cleaning equivalent to SSPC-SP7 (Bluish

- Gray), by pipe manufacturer.
- Factory prime coat: 66 color Hi-build Epoxoline (3.0 to 5.0 mils)
- Field coats:
 - Final: 66 color Hi-build Epoxoline (4.0 to 6.0 mils)
 - Total (7.0 to 11.0 mils DFT)
- c. Exterior; immersion or intermittent immersion
Coal Tar Epoxy System:
 - Surface preparation: see manufacturer's recommendation for various surfaces
 - Factory prime coat: 66 color Hi-build Epoxoline (3.0 to 5.0 mils)
 - Field coats:
 - Final: 46H-413 Coal tar-epoxy (14.0 to 20.0 mils)
 - Total (17.0 to 25.0 mils)

PART 3 - EXECUTION

3.01 COORDINATION

Provide finish coats which are compatible with prime paints used. Provide barrier coats over incompatible primers where required.

3.02 SURFACE PREPARATION

- A. Perform preparation and cleaning procedure in accordance with coating manufacturer's instructions for each substrate condition.
- B. Remove hardware, accessories, machined surfaces, plates, lighting fixtures and similar items in place and not to be finish painted or provide surface applied protection. Reinstall removed items after final paint coat has cured.

3.03 APPLICATION

- A. Materials shall be mixed, thinned and applied according to the manufacturer's printed instructions. Use applicators and techniques best suited for the material and surfaces to which applied.
- B. Apply additional coats when undercoats, stains, or other conditions show through the final coat until paint film is of uniform finish, color and appearance.
- C. Finish doors on top, bottom, and edges same as exterior faces.
- D. Sand lightly behind succeeding enamel or varnish coats.
- E. Omit first coat (primer) on metal surfaces which have been shop primed and touch up painted, unless otherwise specified.
- F. Apply prime coat to material which is required to be painted or finished, which has not been prime coated by others.
- G. Apply each material at not less than the manufacturer's recommended spreading rate, to provide a total dry film thickness of not less than 4.0 mils for the entire coating system of prime and finish coats for 3 coat work.
- H. Allow each coat to dry thoroughly before applying the next coat.
- I. Completed work shall match approved samples for color, texture, and coverage. Remove,

refinish or repaint work not in compliance with specified requirements.

3.04 ACCEPTANCE OF WORK

- A. Request acceptance of each coat before applying to next coat.
- B. Correct work that is not acceptable and request reinspection.

END OF SECTION

COLOR GUIDE

FOR WATER AND WASTEWATER PIPES















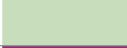





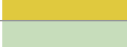





WATER	TNEMEC COLOR	BANDS
Finished or Potable Water	11SF True Blue/Safety	-- --
Nonpotable Water	11SF True Blue/Safety	35GR Black
Raw Water	110GN Clover	-- --
Settled or Clarified Water	10GN Aqua Sky	-- --









WASTEWATER	TNEMEC COLOR	BANDS
Backwash Waste	68BR Twine	-- --
Grit	33GR Gray	-- --
Raw Sludge	15SF Safety Brown	35GR Black
Reclaimed Water*	16SF Rec Water Purple	-- --
Scum	33GR Gray	-- --
Sewage	33GR Gray	-- --
Sewage Effluent*	07RD Terra Cotta	-- --
Sewer (Sanitary or Other)	34GR Deep Space	-- --
Sludge	84BR Weathered Bark	-- --
Sludge Draw Off	15SF Safety Brown	04SF Tangerine Orange/Safety
Sludge Gas	05SF International Orange	-- --
Sludge Recirculation	15SF Safety Brown	02SF Lemon Yellow/Safety
Sludge Recirculation Discharge	15SF Safety Brown	-- --

NOTE: Colors based on "10 States Standards" unless otherwise marked. Standards may vary by region or municipality. Colors represented are digital reproductions of actual standards and will vary in appearance due to differences in monitor and video card output. These digital representations should not be used to finalize color selection(s). Please contact your local Tnemec representative for color-accurate samples or for assistance with suitable primer and finish coat selections and color matching.

*Existing Standard **ANSI/ASME A13.1-2007

Continued on back.

CHEMICAL	TNEMEC COLOR	BANDS	
Alum or Primary Coagulant	04SF Tangerine Orange/Safety		-- --
Ammonia	00WH White		-- --
Carbon Slurry	35GR Black		-- --
Caustic	02SF Lemon Yellow/Safety		-- --
Chlorine	02SF Lemon Yellow/Safety		-- --
Chlorine (Gas and Solution)	02SF Lemon Yellow/Safety		-- --
Compressed Air	91GN Balsam		-- --
Compressed Air**	11SF True Blue/Safety		-- --
Fluoride	25BL Fountainbleu		-- --
Lime Slurry	37GN Irish Spring		-- --
Natural Gas	05SF International Orange		35GR Black 
Ozone	02SF Lemon Yellow/Safety		-- --
Phosphate Compounds	37GN Irish Spring		-- --
Polymer (Wastewater)	14SF Purple Rain/Safety		-- --
Polymers or Coagulant Aids (Water)	04SF Tangerine Orange/Safety		09SF Spearmint Green/Safety 
Potassium Permanganate	14SF Purple Rain/Safety		-- --
Soda Ash	37GN Irish Spring		-- --
Sulfur Dioxide (Wastewater)	02SF Lemon Yellow/Safety		06SF Candy Apple Red/Safety 
Sulfur Dioxide (Water)	37GN Irish Spring		02SF Lemon Yellow/Safety 
Sulfuric Acid	02SF Lemon Yellow/Safety		-- --

OTHER	TNEMEC COLOR	BANDS	
Fire Protection	06SF Candy Apple Red/Safety		-- --
Fuel Oil/Diesel	06SF Candy Apple Red/Safety		-- --
Fuel Oil/Diesel**	02SF Lemon Yellow/Safety		-- --
Gas	28RD Monterrey Tile		-- --
Hoists/Trolleys*	02SF Lemon Yellow/Safety		-- --
Other Lines	32GR Light Gray		-- --
Plumbing Drains/Vents	35GR Black		-- --
Steam*	04SF Tangerine Orange/Safety		-- --

NOTE: Colors based on “10 States Standards” unless otherwise marked. Standards may vary by region or municipality. Colors represented are digital reproductions of actual standards and will vary in appearance due to differences in monitor and video card output. These digital representations should not be used to finalize color selection(s). Please contact your local Tnemec representative for color-accurate samples or for assistance with suitable primer and finish coat selections and color matching.

***Existing Standard **ANSI/ASME A13.1-2007**

SECTION 10 00 00
PORTABLE FIRE EXTINGUISHER

Extinguisher Manufacturers: Provide products by the following:

Kidde Belleville, Div. of Walter Kidde & Comp. Inc.

Fire Extinguisher Standard: Provide units which comply with applicable UL standard and are labeled by UL.

Submittals: Submit product data and installation instructions.

Fire Extinguisher (FE): provide fire extinguisher unit of types indicate for locations indicated.

Multi-Purpose Dry Chemical Type (2A-10BC-FE): UL-rated 2-A, 10-BC, 5lb. nominal capacity, in enameled steel container.

Mounting Brackets: Manufacturer's standard, of proper size for type and capacity of extinguisher indicated. Provide brackets for extinguisher.

Installation: In accordance with manufacturer's directions for type of mounting required at height and locations indicated, or if not indicated, to comply with applicable regulations governing authorities.

Identify bracket-mounted extinguisher with red letter decals spelling "FIRE EXTINGUISHER" applied to wall surface. Letter size, style and location selected by Architect.

END OF SECTION

**SECTION 22 00 10
PLUMBING EQUIPMENT AND MATERIALS**

PART 1 GENERAL

1.01 INSTRUCTION:

- A. The Plumbing Contractor is to either copy or remove this specification section from the spec book and complete as follows:
 - 1. Indicate the specific manufacturer on which the bidder's base bid price is based in the blank space provided.
 - 2. All equipment is to be bid as specified. Material or equipment from another manufacturer may be bid as a Voluntary Alternate, but the dollar amount must be shown as an "Add" or "Deduct" to the base bid. Provide the name of the alternate manufacturer in the space provided.
 - 3. Insert the name(s) of each subcontractor used in your bid in the space provided in Part 3.
 - 4. This form shall be submitted with the bid.

1.02 RELATED DOCUMENTS:

- A. The other Contract Documents complement the requirements of this Section. The General Requirements apply to the work of this section.

1.03 DEVIATIONS FROM SPECIFIED MATERIAL:

- A. See SECTION 22 00 00, Part 2, Paragraph 2.02 - Substitutions and Changes. Base bid shall be based on manufacturers listed in this specification or on the drawings.

PART 2 PRODUCTS

2.01 THE FOLLOWING IS A LIST OF APPROVED MANUFACTURERS, GROUPED ACCORDING TO TYPES OF MATERIALS OR EQUIPMENT.

- A. Service Sink(s):
 - 1. Bradley, FIAT Products, Florestone, and Zurn
 - a. Voluntary Alternate _____
 - b. Add \$ Deduct \$ _____
- B. Hose Bibb(s):
 - 1. Acorn, Prier, and Woodford
 - a. Voluntary Alternate _____
 - b. Add \$ Deduct \$ _____
- C. Drain(s):
 - 1. JR Smith, Sioux Chief, and Zurn
 - a. Voluntary Alternate _____
 - b. Add \$ Deduct \$ _____
- D. Domestic Hot Water Heater(s):
 - 1. AO Smith, Bradford White, Lochinvar, and Rheem
 - a. Voluntary alternate _____
 - b. Add \$ Deduct \$ _____

PART 3 SUB-CONTRACTORS

3.01 INSERT THE NAME OF EACH SUB-CONTRACTOR AND WORK TO BE PERFORMED BELOW:

- A. Subcontractor Work Performed _____
- B. Subcontractor Work Performed _____
- C. Subcontractor Work Performed _____

END OF SECTION

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SECTION 22 07 19
PLUMBING PIPING INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Piping insulation.

1.02 REFERENCE STANDARDS

- A. ASTM C177 - Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus; 2013.
- B. ASTM C534/C534M - Standard Specification for Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form; 2014.
- C. ASTM C547 - Standard Specification for Mineral Fiber Pipe Insulation; 2015.
- D. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2015a.
- E. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials; 2014.
- F. NFPA 255 - Standard Method of Test of Surface Burning Characteristics of Building Materials; National Fire Protection Association; 2006.
- G. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.

PART 2 PRODUCTS

2.01 REGULATORY REQUIREMENTS

- A. Surface Burning Characteristics: Flame spread index/Smoke developed index of 25/50, maximum, when tested in accordance with UL 723, NFPA 255, or UL 723.

2.02 GLASS FIBER

- A. Insulation: ASTM C547; rigid molded, noncombustible.
 - 1. K (KSI) Value: ASTM C177, 0.24 at 75 degrees F (0.035 at 24 degrees C).
 - 2. Maximum Service Temperature: 850 degrees F (454 degrees C).
 - 3. Maximum Moisture Absorption: 0.2 percent by volume.
- B. Vapor Barrier Jacket: White Kraft paper with glass fiber yarn, bonded to aluminized film; moisture vapor transmission when tested in accordance with ASTM E96/E96M of 0.02 perm-inches (0.029 ng/Pa s m).

2.03 FLEXIBLE ELASTOMERIC CELLULAR INSULATION

- A. Insulation: Preformed flexible elastomeric cellular rubber insulation complying with ASTM C534/C534M Grade 1; use molded tubular material wherever possible.
 - 1. Minimum Service Temperature: Minus 40 degrees F (Minus 40 degrees C).
 - 2. Maximum Service Temperature: 220 degrees F (104 degrees C).
 - 3. Connection: Waterproof vapor barrier adhesive.
- B. Elastomeric Foam Adhesive: Air dried, contact adhesive, compatible with insulation.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that piping has been tested before applying insulation materials.
- B. Verify that surfaces are clean and dry, with foreign material removed.

3.02 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install in accordance with North American Insulation Manufacturers Association (NAIMA) National Insulation Standards.

- C. Exposed Piping: Locate insulation and cover seams in least visible locations.

3.03 SCHEDULES

- A. Plumbing Systems:
 - 1. Domestic Hot and Cold Water Supply:
 - a. Insulation:
 - 1) Pipe Size Range: All sizes.
 - 2) Thickness: 1/2 inch.

END OF SECTION

SECTION 22 10 05
PLUMBING PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Pipe, pipe fittings, specialties, and connections for piping systems.
 - 1. Sanitary sewer.
 - 2. Domestic water.

1.02 REFERENCE STANDARDS

- A. ANSI Z21.22 - American National Standard for Relief Valves and Automatic Gas Shutoff Devices for Hot Water Supply Systems; 2015.
- B. ASME B16.3 - Malleable Iron Threaded Fittings: Classes 150 and 300; 2011.
- C. ASME B16.22 - Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings; 2013.
- D. ASME B31.1 - Power Piping; 2014.
- E. ASME B31.9 - Building Services Piping; 2014.
- F. ASME BPVC-IV - Boiler and Pressure Vessel Code, Section IV - Rules for Construction of Heating Boilers; 2015.
- G. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2012.
- H. ASTM A74 - Standard Specification for Cast Iron Soil Pipe and Fittings; 2015.
- I. ASTM B32 - Standard Specification for Solder Metal; 2008 (Reapproved 2014).
- J. ASTM B88 - Standard Specification for Seamless Copper Water Tube; 2014.
- K. ASTM B88M - Standard Specification for Seamless Copper Water Tube (Metric); 2013.
- L. ASTM D2239 - Standard Specification for Polyethylene (PE) Plastic Pipe (SDR-PR) Based on Controlled Inside Diameter; 2012.
- M. ASTM D2447 - Standard Specification for Polyethylene (PE) Plastic Pipe, Schedules 40 and 80, Based on Outside Diameter; 2003.
- N. ASTM D2466 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40; 2013.
- O. ASTM D2564 - Standard Specification for Solvent Cements for Poly(Vinyl Chloride) (PVC) Plastic Piping Systems; 2012.
- P. ASTM D2609 - Standard Specification for Plastic Insert Fittings for Polyethylene (PE) Plastic Pipe; 2002 (Reapproved 2009).
- Q. ASTM D2665 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Drain, Waste, and Vent Pipe and Fittings; 2014.
- R. ASTM D2855 - Standard Practice for Making Solvent-Cemented Joints with Poly(Vinyl Chloride) (PVC) Pipe and Fittings; 1996 (Reapproved 2010).
- S. ASTM D3034 - Standard Specification for Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings; 2015.
- T. ASTM F876 - Standard Specification for Crosslinked Polyethylene (PEX) Tubing; 2013a.
- U. ASTM F877 - Standard Specification for Crosslinked Polyethylene (PEX) Plastic Hot- and Cold-Water Distribution Systems; 2011.
- V. ASTM F1281 - Standard Specification for Crosslinked Polyethylene/Aluminum/Crosslinked Polyethylene (PEX-AL-PEX) Pressure Pipe; 2011.
- W. AWWA C651 - Disinfecting Water Mains; 2005.
- X. MSS SP-80 - Bronze Gate, Globe, Angle and Check Valves; 2013.

- Y. MSS SP-85 - Cast Iron Globe & Angle Valves, Flanged and Threaded Ends; 2011.
- Z. MSS SP-110 - Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends; 2010.
- AA. NFPA 54 - National Fuel Gas Code; National Fire Protection Association; 2012.
- AB. NSF 61 - Drinking Water System Components - Health Effects; 2014 (Errata 2015).
- AC. NSF 372 - Drinking Water System Components - Lead Content; 2011.

1.03 REGULATORY REQUIREMENTS

- A. Perform Work in accordance with State of Michigan plumbing code.
- B. Conform to applicable code for installation of backflow prevention devices.
- C. Provide certificate of compliance from authority having jurisdiction indicating approval of installation of backflow prevention devices.

1.04 DELIVERY, STORAGE, AND HANDLING

- A. Accept valves on site in shipping containers with labeling in place. Inspect for damage.
- B. Provide temporary protective coating on cast iron and steel valves.
- C. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.
- D. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

- A. Potable Water Supply Systems: Provide piping, pipe fittings, and solder and flux (if used), that comply with NSF 61 and NSF 372 for maximum lead content; label pipe and fittings.

2.02 SANITARY SEWER PIPING, BURIED WITHIN 5 FEET (1500 MM) OF BUILDING

- A. PVC Pipe: ASTM D2665 or ASTM D3034.
 - 1. Fittings: PVC.
 - 2. Joints: Solvent welded, with ASTM D2564 solvent cement.

2.03 SANITARY SEWER PIPING, ABOVE GRADE

- A. PVC Pipe: ASTM D2665.
 - 1. Fittings: PVC.
 - 2. Joints: Solvent welded, with ASTM D2564 solvent cement.

2.04 DOMESTIC WATER PIPING, ABOVE GRADE

- A. Copper Tube: ASTM B88 (ASTM B88M), Type L (B), Drawn (H).

2.05 BALL VALVES

- A. Construction, 4 Inches (100 mm) and Smaller: MSS SP-110, Class 150, 400 psi (2760 kPa) CWP, bronze or ductile iron body, 304 stainless steel or chrome plated brass ball, regular port, teflon seats and stuffing box ring, blow-out proof stem, lever handle with balancing stops, threaded or grooved ends with union.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that excavations are to required grade, dry, and not over-excavated.

3.02 PREPARATION

- A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.
- B. Remove scale and dirt, on inside and outside, before assembly.
- C. Prepare piping connections to equipment with flanges or unions.

3.03 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Provide non-conducting dielectric connections wherever jointing dissimilar metals.
- C. Route piping in orderly manner and maintain gradient. Route parallel and perpendicular to walls.
- D. Install piping to maintain headroom, conserve space, and not interfere with use of space.
- E. Group piping whenever practical at common elevations.
- F. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment. Refer to Section 22 05 16.
- G. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings.
- H. Install valves with stems upright or horizontal, not inverted. Refer to Section 22 05 23.
- I. Install water piping to ASME B31.9.
- J. PVC Pipe: Make solvent-welded joints in accordance with ASTM D2855.
- K. Sleeve pipes passing through partitions, walls and floors.
- L. Pipe Hangers and Supports:
 - 1. Install in accordance with ASME B31.9.
 - 2. Support horizontal piping as indicated.
 - 3. Install hangers to provide minimum 1/2 inch (15 mm) space between finished covering and adjacent work.
 - 4. Place hangers within 12 inches (300 mm) of each horizontal elbow.

3.04 APPLICATION

- A. Install unions downstream of valves and at equipment or apparatus connections.
- B. Install ball valves for shut-off and to isolate equipment, part of systems, or vertical risers.

3.05 DISINFECTION OF DOMESTIC WATER PIPING SYSTEM

- A. Disinfect water distribution system in accordance with Section 33 01 10.58.
- B. Prior to starting work, verify system is complete, flushed and clean.
- C. Ensure acidity (pH) of water to be treated is between 7.4 and 7.6 by adding alkali (caustic soda or soda ash) or acid (hydrochloric).
- D. Inject disinfectant, free chlorine in liquid, powder, tablet or gas form, throughout system to obtain 50 to 80 mg/L residual.
- E. Bleed water from outlets to ensure distribution and test for disinfectant residual at minimum 15 percent of outlets.
- F. Maintain disinfectant in system for 24 hours.
- G. If final disinfectant residual tests less than 25 mg/L, repeat treatment.
- H. Flush disinfectant from system until residual equal to that of incoming water or 1.0 mg/L.
- I. Take samples no sooner than 24 hours after flushing, from 10 percent of outlets and from water entry, and analyze in accordance with AWWA C651.

3.06 SCHEDULES

- A. Metal Pipe Hanger Spacing:
 - 1. Pipe Size: 1/2 inches (15 mm) to 1-1/4 inches (32 mm):
 - a. Maximum Hanger Spacing: 6.5 ft (2 m).
 - 2. Pipe Size: 1-1/2 inches (40 mm) to 2 inches (50 mm):
 - a. Maximum Hanger Spacing: 10 ft (3 m).

END OF SECTION

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SECTION 23 00 00
MECHANICAL GENERAL PROVISIONS

PART 1 GENERAL

1.01 DESCRIPTION OF WORK

- A. This Division includes all materials, labor, equipment, tools, supervision, permits, and incidentals necessary to complete installation and successfully test, start-up, and operate, in a practical and efficient manner, all mechanical systems indicated on the Mechanical Drawings and described in this Division. The work shall also include any items which, while not specifically included in the Contract Documents, are reasonable and are accepted trade practices or necessary for the proper completion of the systems.
- B. Mechanical systems in the contract shall include the following:
 - 1. Plumbing systems including:
 - a. Domestic potable hot water, cold water, and sanitary drain systems.
 - b. Plumbing fixtures, piping, and insulation indicated in the Drawings and Specifications.
 - 2. Heating, ventilation, and air-conditioning (HVAC) systems including all equipment ductwork, piping, insulation, and temperature control systems indicated in the Drawings and the Specifications.
- C. The General Provisions of this Contract, including General and Supplementary Conditions and other General Requirements specified in the Architectural, Electrical, Structural, and Fire Protection Specifications apply to the work specified in this Section.
- D. This section is not intended to supersede, but to clarify the definitions in Division 01, General Requirements.

1.02 DRAWINGS AND SPECIFICATIONS

- A. Drawings are diagrammatic and are intended to convey a general arrangement and scope of the work included in the contract. Should drawings contradict themselves or the Specifications, the better quality or greater quantity of work shall be included.
- B. The Mechanical Contractor shall be familiar with all Architectural, Structural, Fire Protection, and Electrical Drawings and Specification Sections, and shall follow any special requirements or directions included in these areas.
- C. Drawings and Specifications are intended to include all work and materials necessary for completion of the work. Any incidental item of material, labor or detail required for the proper execution and completion of the work and omitted from either the drawings and specifications or both, but required by governing codes local regulations, trade practices, operational functions, and good workmanship, shall be provided as part of the Contract Work without extra charge, even though not specifically detailed or specified.
- D. Should there be any question as to the scope of work for which the Mechanical Contractor is responsible, they should request an interpretation before submitting their bid. After contracts are awarded, the Owner shall not be responsible for claims for extras for work that was not included because the Mechanical Contractor was unsure if they should include given work in their bid.

1.03 SITE AND PROJECT DOCUMENT EXAMINATION

- A. Submission of a bid proposal is considered evidence that the Mechanical Contractor has completed the following:
 - 1. Visited the site.
 - 2. Informed themselves of the site conditions.
 - 3. Examined Drawings and Specifications of all trades including Architectural, Structural and Electrical, and is proficient, experienced and knowledgeable of all standards, codes, ordinances, permits and regulations which affect his respective trade, and that all costs are included in his proposal.

- B. The Mechanical Contractor and/or Sub-Contractor shall insure all required permits, and assessments have been obtained prior to any work beginning. Contractor shall verify requirement to include privilege fees, plan review fees, and permits as part of his formal bid.
- C. Field Changes:
 - 1. This Mechanical Contractor shall not make any field changes that affect the system design, equipment manufacturer, timing, costs, or performance without written approval from the Mechanical and Plumbing Engineer. Approval shall be in the form of a written Field Change Request or Change Order, or supplemental memorandum addressed to the Engineer. All Change Orders shall be directed through the General Contractor and Architect.
 - 2. The Contractor assumes liability for any additional costs for changes requested. Should any unauthorized change be determined by the Engineer and Architect as lessening the value of the project, a credit will be request, and shall be issued as a change to the contract.

1.04 STANDARDS, CODES, AND PERMITS

- A. Refer to Division 01, General Requirements and Supplementary Conditions.
- B. All work shall comply with the latest edition of applicable standards and codes of following:
 - 1. ASA - American Standards Association
 - 2. ASME - American Society of Mechanical Engineers
 - 3. ASTM - American Society of Testing Materials
 - 4. ANSI - American National Standards Institute
 - 5. AGA - American Gas Association
 - 6. ASHRAE - American Society of Heating, Refrigerating, and Air Conditioning Engineers
 - 7. AWWA - American Water Works Association
 - 8. NFPA - National Fire Protection Association
 - 9. IBR - Institute of Boiler and Radiator Manufacturers
 - 10. AWS - American Welding Society
 - 11. UL - Underwriter's Laboratories
 - 12. NEMA - National Electric Manufacturers Association
 - 13. NEC - National Electric Code
 - 14. ARA - American Refrigeration Association
 - 15. OSHA - Occupational Safety and Health Act
 - 16. ABMA - American Boiler Manufacturers Association
 - 17. International Mechanical Code 2015
 - 18. International Plumbing Code 2015 (with Michigan Amendments)
 - 19. Michigan Mechanical Code 2015
- C. All work shall be provided and tested in accordance with all applicable local county, state laws, ordinances, codes, rules and regulations.
- D. No work shall be covered or enclosed by walls, ceilings, or other, until the work is tested in accordance with applicable codes and regulations, and successful tests witnessed and approved by authorized inspection authority. Written approvals shall be secured by the Mechanical Contractor and submitted to Engineer before final acceptance of work will be granted.

1.05 SUBMITTALS

- A. Proposal Supplement:
 - 1. Contractor to submit ONE (1) copy of Proposal Supplement - SECTION 23 00 10 - MECHANICAL EQUIPMENT AND MATERIALS, at the time of Bid opening, listing the manufacturers upon which his bid was based, including all items being provided by Sub-Contractors.
 - 2. After Proposal Supplement and Sub-Contractors are approved, no deviation shall be permitted without written approval of Engineer.

- B. Shop Drawings:
 - 1. Submit a minimum of EIGHT (8) copies of shop drawings on all equipment and materials indicated on the Drawings for approval, prior to placing delivery orders (also refer to Architectural Specifications for shop drawing requirements).
 - 2. At the time of submittal for review by the Engineer, shop drawings shall include signatures or stamps indicating that the Contractor and/or the Sub-Contractor has reviewed the submittals and has coordinated the required space, quantities required, services and work of other trades for the equipment or system being submitted.
 - 3. Submittals shall be in the form of bound folders with the name of the Project, Architect, Engineer and the submitting Contractor indicated on the cover. Submittals requiring drawings too large to be bound into the folder shall be folded and inserted in pockets bound into the folder.
 - 4. Provide shop drawings of all manufactured equipment and materials except pipe, pipe fittings and galvanized ductwork. Drawings shall include equipment capacities, weights, dimensions, construction details, installation, controls, wiring diagrams, and motor data.
 - 5. Engineer's approval of shop drawings is for general application only and is a service only and not considered as a guarantee of total compliance with or as relieving the Mechanical Contractor of basic responsibilities under all contract documents, and does not approve changes in time or cost.
 - 6. After approval, the Mechanical Contractor and its subcontractors are responsible to provide information to all other trades involved in, or affected by, the installation of the Mechanical and Plumbing equipment.
- C. Record (As-Built) Drawings:
 - 1. At substantial completion of construction, furnish record (as-built) plans to the Engineer for approval. As part of the Final Punch List/Close-out, approved as-built plans shall be provided to the Owner.
 - 2. Record drawings shall include, at the minimum:
 - a. The location and performance data on each piece of equipment.
 - b. The general configuration of duct and pipe distribution systems, including sizes.
 - c. The terminal air or water design flow rates.
- D. Operating and Maintenance Manuals:
 - 1. The Mechanical Contractor and subcontractors shall provide TWO (2) bound and indexed (with tabs for each section) sets of operating and maintenance instructions to the Engineer for review as part of the Final Punch List/Close-out. The Engineer will provide approved manuals to the Owner.
 - 2. These manuals shall be in accordance with industry-accepted standards and shall include, at the minimum:
 - a. Submittal data stating equipment size and selected options for each piece of equipment requiring maintenance.
 - b. Operation and Maintenance manuals for each piece of equipment requiring maintenance. Required routine maintenance actions shall be clearly identified.
 - c. Names and addresses of at least one (1) service agency.
 - d. HVAC controls system maintenance and calibration information, including:
 - 1) Wiring diagrams
 - 2) Control schematics
 - 3) Control sequence of operation descriptions
 - e. HVAC control drawings with desired or field-determined set points permanently recorded and indicated.

1.06 MECHANICAL UTILITY SERVICE REQUIREMENTS

- A. Exterior plumbing services including sanitary drain and storm drain systems beyond 5 feet from the building are covered within the scope of the Civil Engineer on this project.

PART II PRODUCTS

2.01 STANDARDS

- A. All products shall be furnished by established manufacturers regularly engaged in making the type of materials to be provided and complete with all parts, accessories, connections, etc. as specified or as recommended and/or required by the manufacturer.
- B. All material where applicable shall be labeled or listed by Underwriters Laboratories, Inc.
- C. All materials and equipment shall be installed in strict compliance with manufacturer's installation instructions. Where special installations or deviations are required, written approval from the manufacturer is required, and shall not void the manufacturer warranty.

2.02 SUBSTITUTIONS AND CHANGES

- A. The Contractor and/or Equipment Supplier may propose alternate equipment or materials of EQUAL or better quality, function, performance, durability and appearance. This information is to be submitted to the Engineer's Office TEN (10) working days prior to bid due date to allow for proper review time and to issue an addendum incorporating the acceptable substitution(s). It is the submitter's responsibility to provide sufficient material for review as required by Engineer's Office. Acceptance and approval is the responsibility of the Engineer.
- B. The Contractor and/or Equipment Supplier is liable for any added costs to himself or others and is responsible for verifying dimensions, clearance and roughing-in requirements, when product not named as the basis of design are used and is responsible for advising other Contractors of variations and submit revised drawing layout for approval of Engineer.
- C. See SECTION 23 00 10 for voluntary alternates.
 - 1. No substitutions will be accepted after bids are received.
 - 2. When only one manufacturer is listed within the description of the mechanical equipment, the design engineering or project requirements will not allow substitution of other manufacturers.
 - 3. Contractor will be responsible for ALL costs (engineering time, manufacturer's costs, distributor costs, etc.) incurred to replace equipment not approved if substitutions are made by the distributor, manufacturer's rep., contractor or subcontractor.
- D. Equipment not listed in the Mechanical Schedules or this Division 23, or not approved in writing by the Engineer, shall be separated from the Base Bid and shall be listed as a Voluntary Alternate only. Before acceptance, all Voluntary Alternates must be approved by the Engineer and Architect, and must be approved for use by any special Specifications related to the job.
- E. The Mechanical Contractor is responsible and liable for any added costs to themselves or others that may be a result from use of Approved Alternates or Voluntary Alternates.
- F. The Mechanical Contractor is responsible for bidding the Mechanical and Plumbing materials such as pipe and ductwork materials as listed on the Mechanical Drawings and this Division 23 Specification. Alternate materials or value engineering must be pre-approved by the Engineer, prior to bid submittal. Approval of alternate materials must be shared with the Architect, Owner, and other bidders.

2.03 ELECTRICAL REQUIREMENTS AND CONNECTIONS

- A. General:
 - 1. When the Mechanical equipment not named as the basis of design is approved for use, the Mechanical Contractor is responsible for any costs incurred by other trades, including revisions to the Electrical requirements such as conduit, wire, starters, heaters, fused switches, disconnects, or circuit breakers.
 - 2. Electrical items furnished shall bear the Underwriter's Laboratories label and the installation shall comply with requirements of the National Electric Code, ANSI, IPCEA, IRI, and local codes, ordinances and regulations.
- B. Motor Starters and Controls:
 - 1. The Electrical Contractor shall provide all manual or magnetic motor starters as required for all motors as indicated on all Electrical Drawings.

2. The Mechanical Contractor shall provide factory installed motor starters integral with packaged equipment containing thermal overcurrent protection in all underground conductors with heater coils selected for specific motor usage for all motors.
- C. Electrical Wiring and Controls:
 1. The Mechanical Contractor shall furnish and install all motors, drives, controllers integral to equipment and factory mounted controls for all mechanical equipment.
 2. The Mechanical Contractor or Temperature Control Contractor shall furnish and install all electrical devices requiring mechanical connections, and/or electrical connections, such as thermostats, UL rated temperature control cabinets, etc., as listed in the Division 23 Contract Documents.
 3. The Temperature Control Contractor or Mechanical Contractor shall furnish and install all power and Class 2 and 3 wiring (low voltage), conduit, and electrical boxes associated with the Temperature Control System. Verify with Mechanical and Electrical Engineer whether plenum-rated, low voltage wiring is required.
 4. The Electrical Contractor shall install all Class 1 (120 volt and greater) power wiring, conduit to motors and/or factory mounted control panels as indicated on Electrical Drawings or as indicated in Specifications.
 5. All electrical wiring work by the Mechanical Contractor and Temperature Control Contractor shall be in accordance with Division 26 requirements.

PART III EXECUTION

3.01 COORDINATION OF MECHANICAL WORK

- A. Responsibility:
 1. The Mechanical Contractor shall be responsible for all Sub-Contractors and Suppliers, and include in his bid all materials, labor and equipment involved in accordance with all local regulations, jurisdictional awards, decisions, and secure compliance of all parts of the Specifications and Drawings regardless of sectional inclusion in these Specifications.
 2. The Mechanical Contractor and Sub-Contractors shall be responsible for all parts applicable to the job in accordance with the Specifications and Drawings, and shall be responsible for coordinating locations and arrangements of all Mechanical and Plumbing work with all other relevant Architectural, Structural, Electrical, and fire protection Mechanical Drawings, shop drawings, and Specifications.
- B. Submission of a bid proposal is considered evidence that the Mechanical Contractor and its Sub-Contractors are fully capable of providing the following and have included the following in their bid proposal:
 1. Fully proficient and experienced to do the work described in the contract documents.
 2. Knowledgeable of all federal, state, and local standards, codes, ordinances, permits, and regulations that pertain to the work described in the contract documents.
 3. Have properly estimated the time and workforce, including subcontractors, needed to complete the job by the due date.
 4. Have included all material, equipment, and labor costs for completion of the job, including all subcontractors' costs.
 5. Have all the equipment, tools, supplies, vehicles, and trailers to complete the job.
 6. Have included all travel, food and lodging expenses.
- C. Installation of Mechanical Systems:
 1. Install all Mechanical equipment as shown on the Mechanical Drawings. Deviations of the Mechanical systems and/or installation locations shall be approved by the Engineer.
 2. Changes or deviations of the Mechanical systems design and/or installation locations may require redrawing and resubmittal of the Mechanical Drawings to the state or local Mechanical or building inspector.
 3. Any costs associated with re-drawing and resubmittal of the Mechanical and Plumbing Drawings that did not have pre-approval from the Mechanical Engineer, may be charged to the Mechanical Contractor or Mechanical subcontractors. All costs shall be based on a time and materials basis.

4. Minor deviations from the original design will be accepted, but a written request or courtesy call to the Engineer is required. The Engineer may request a written report of the situation and a written request for record.

3.02 EQUIPMENT CLEARANCE

- A. The Mechanical Contractor shall coordinate with the Electrical Contractor's equipment location to ensure adequate clearance is maintained as required by the National Electrical Code and applicable state and local codes, as well as accessibility for future maintenance and operation.
- B. Mechanical work shall be arranged with building construction to provide minimum 6'-8" overhead clearance where possible.
- C. Install equipment in a neat and workmanlike manner. Install, align, and level all Mechanical equipment so that it may be easily accessed, adjusted, serviced, and balanced.
- D. Install equipment so that filters, valves, and controls may be easily accessed.
- E. Install equipment so that it does not block or limit access to other equipment, access panels, etc.
- F. Install equipment so that it may be easily inspected.

3.03 GENERAL SUPPORTS

- A. Mechanical Contractor shall provide all necessary channel, angle, brackets, vibration isolators, or supplementary steel as required for adequate support for all piping, specialties, ductwork, and equipment which is hung from the ceiling or roof, or mounted to the floor or roof. For equipment requiring welding or bolting to steel framing, or anchoring to concrete structures, the Mechanical Contractor shall require written approval from the Architect and General Contractor.
- B. Where piping or equipment is suspended from concrete construction, coordinate with the General Contractor to set approved concrete inserts that shall receive hanger rods such as UniStrut in the concrete form-work. In metal decks, coordinate with General Contractor to use Ramset or welds as required.

3.04 WALL, FLOOR, CEILING, AND ROOF OPENINGS

- A. Locate all openings and advise the General Contractor of details and templates of all openings necessary for inspection of Mechanical work.
- B. All openings including saw cuts, cores, and required lintels shall be provided by the General Contractor and shall be approved by the Architect and Structural Engineer. Size and location are the responsibility of the Mechanical Contractor. Cracks and rough edges left following installation of equipment shall be caulked, fire-caulked if required, or filled by the Mechanical Contractor.
- C. Perform or pay for all cutting, fitting, repairing, patching and finishing of work of other sections where it is necessary to disturb such work to permit installation of mechanical work.
- D. All roof openings including saw cuts and cores through the roof deck shall be provided by the General Contractor and shall be approved by the Architect and Structural Engineer. Size and location of the openings are the responsibility of the Mechanical Contractor.
- E. All roof curbs, Pate Curbs, or other specialty curbs shall be the responsibility of the Mechanical Contractor. Specialty roof curb flashings or curb-membranes shall be included.
- F. All roofing materials including standard flashing, and the installation of roofing systems around the Mechanical equipment shall be the responsibility of the General Contractor.
- G. All roof deck supporting materials including angles, joists, etc., shall be the responsibility of the General Contractor, and shall be approved by the Architect and Structural Engineer.

3.05 FIELD CHANGES

- A. The Mechanical Contractor shall not make any field changes that affect the system design, equipment manufacturer, timing, costs, or performance without written approval from the Mechanical and Plumbing Engineer. Approval shall be in the form of a written Field Change

Request or Change Order, or Supplemental Instruction. All Change Orders shall be directed through the General Contractor and Architect.

- B. The Contractor assumes liability for any additional costs for changes requested. Should any unauthorized change be determined by the Engineer and Architect as lessening the value of the project, a credit will be request, and shall be issued as a change to the contract.

3.06 PROJECT CLOSE-OUT

- A. Final Acceptance and payment will only be made after final Punch-List completion and receipt at the Engineer's Office of:
 - 1. Approved Operating and Maintenance Instruction Manuals
 - 2. Approved Record Drawings (As Built)
 - 3. All Guarantees/Warranties
 - 4. Certificates of Inspection
 - 5. Written and signed verification that Owner's Training has taken place
 - 6. Final Test and Balance Report (reference SECTION 23 05 93 for Report requirements)
 - 7. All extra materials specified to be provided within the Contract Documents

3.07 CERTIFICATES OF INSPECTION

- A. Submit to the Engineer's Office evidence that installation has been inspected and approved by local or state mechanical inspector and/or the authority having jurisdiction.

3.08 GUARANTEES AND WARRANTIES

- A. All labor, materials and equipment shall be guaranteed by Contractor and/or warranted by Manufacturer for ONE (1) year after acceptance date except where specified longer for special equipment. Contractor shall secure such warranty from all Suppliers (not one year from shipment date) or Contractor to assume warranty.
- B. Acceptance date of substantial completion shall be Owner occupancy as determined by Architect/Engineer.
- C. Contractor shall make all necessary alterations, repairs, adjustments, and replacements during guarantee periods as directed by Architect/Engineer to comply with Drawings and Specifications at no cost to Owner.
- D. Repair or replacements made under guarantee bear further ONE (1) year guarantee from date of acceptance of repair or replacement.
- E. At the end of a one-year period of continuous operation, make a complete inspection of all systems, fixtures, equipment, safety devices and controls to insure equipment is operating properly, and report to Engineer in writing.

3.09 PLACING EQUIPMENT INTO OPERATION

- A. Mechanical Contractor shall be responsible for all startup procedures, system checks and balancing associated with his equipment.
- B. All equipment shall be installed, tested and operated in accordance with manufacturer's recommendations at normal operating conditions.
- C. All permanent mechanical equipment operated during construction periods shall be cleaned and damaged equipment replaced.

3.10 OWNER'S TRAINING

- A. The option of videotaping any and all training sessions shall be given to the Owner at no additional cost, with the Contractor conducting the videotaping and with TWO (2) copies of all tapes being turned over to the Owner for future use.
- B. The Mechanical Contractor shall conduct TWO (2) - 2-hour training session(s) on the operation and maintenance of all mechanical equipment. Schedule training with Owner at least 72 hours prior to session(s).

END OF SECTION

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**SECTION 23 00 10
MECHANICAL EQUIPMENT AND MATERIALS**

PART 1 GENERAL

1.01 INSTRUCTION:

- A. The Mechanical Contractor is to either copy or remove this specification section from the Project Specification book and complete as follows:
 - 1. Indicate the specific manufacturer on which the bidder's base bid price is based in the blank space provided.
 - 2. All equipment is to be bid as specified. Material or equipment from another manufacturer may be bid as a Voluntary Alternate, but the dollar amount must be shown as an "Add" or "Deduct" to the base bid. Provide the name of the alternate manufacturer in the space provided.
 - 3. Insert the name(s) of each subcontractor used in your bid in the space provided in Part 3.
 - 4. This form shall be submitted with the bid.

1.02 RELATED DOCUMENTS:

- A. The other Contract Documents complement the requirements of this Section. The General Requirements apply to the work of this section.

1.03 DEVIATIONS FROM SPECIFIED MATERIAL:

- A. See SECTION 23 00 00, Part 2, Paragraph 2.02 - Substitutions and Changes. Base bid shall be based on manufacturers listed in this specification or on the drawings.

PART 2 PRODUCTS

2.01 THE FOLLOWING IS A LIST OF APPROVED MANUFACTURERS, GROUPED ACCORDING TO TYPES OF MATERIALS OR EQUIPMENT.

- A. Domestic Hot Water Heater(s):
 - 1. Lochinvar, Rheem, A.O. Smith, and Bradford White
- B. Electric Heater(s):
 - 1. Berko, QMark, Marley, and Redd-I or pre-approved equal
- C. Exhaust/Supply Fan(s):
 - 1. Greenheck, Cook, Acme, and Fantech

PART 3 SUB-CONTRACTORS

3.01 INSERT THE NAME OF EACH SUB-CONTRACTOR AND WORK TO BE PERFORMED BELOW:

- A. Subcontractor _____
Work Performed _____
- B. Subcontractor _____
Work Performed _____

END OF SECTION

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SECTION 23 05 53
MECHANICAL IDENTIFICATION FOR PIPING AND EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Nameplates.
- B. Tags.
- C. Pipe markers.

1.02 REFERENCE STANDARDS

- A. ASME A13.1 - Scheme for the Identification of Piping Systems; 2007.
- B. ASTM D709 - Standard Specification for Laminated Thermosetting Materials; 2013.

PART 2 PRODUCTS

2.01 IDENTIFICATION APPLICATIONS

- A. Control Panels: Nameplates.
- B. Small-sized Equipment: Nameplates.
- C. Thermostats: Nameplates.

2.02 NAMEPLATES

- A. Manufacturers:
 - 1. Advanced Graphic Engraving, LLC; _____: www.advancedgraphicengraving.com/#sle.
 - 2. Kolbi Pipe Marker Co; _____: www.kolbipipemarkers.com/#sle.
 - 3. Seton Identification Products, a Tricor Direct Company; _____: www.seton.com/#sle.
- B. Letter Color: White.
- C. Letter Height: 1/2 inch (13 mm).
- D. Background Color: Black.
- E. Plastic: Comply with ASTM D709.

2.03 TAGS

- A. Manufacturers:
 - 1. Advanced Graphic Engraving; _____: www.advancedgraphicengraving.com/#sle.
 - 2. Brady Corporation; _____: www.bradycorp.com/#sle.
 - 3. Kolbi Pipe Marker Co; _____: www.kolbipipemarkers.com/#sle.
 - 4. Seton Identification Products, a Tricor Company; _____: www.seton.com/#sle.
- B. Plastic Tags: Laminated three-layer plastic with engraved black letters on light contrasting background color. Tag size minimum 1-1/2 inch (40 mm) diameter.
- C. Metal Tags: Brass with stamped letters; tag size minimum 1-1/2 inch (40 mm) diameter with smooth edges.

2.04 CEILING TACKS

- A. Manufacturers:
 - 1. Craftmark Pipe Markers; _____: www.craftmarkid.com/#sle.
- B. Description: Steel with 3/4 inch (20 mm) diameter color coded head.
- C. Color code as follows:
 - 1. HVAC Equipment: Yellow.
 - 2. Fire Dampers and Smoke Dampers: Red.
 - 3. Heating/Cooling Valves: Blue.

PART 3 EXECUTION

3.01 PREPARATION

- A. Degrease and clean surfaces to receive adhesive for identification materials.

3.02 INSTALLATION

- A. Install nameplates with corrosive-resistant mechanical fasteners, or adhesive. Apply with sufficient adhesive to ensure permanent adhesion and seal with clear lacquer.
- B. Install tags with corrosion resistant chain.
- C. Install plastic pipe markers in accordance with manufacturer's instructions.
- D. Install plastic tape pipe markers complete around pipe in accordance with manufacturer's instructions.
- E. Use tags on piping 3/4 inch (20 mm) diameter and smaller.
 - 1. Identify service, flow direction, and pressure.
 - 2. Install in clear view and align with axis of piping.
 - 3. Locate identification not to exceed 20 feet (6 m) on straight runs including risers and drops, adjacent to each valve and Tee, at each side of penetration of structure or enclosure, and at each obstruction.
- F. Locate ceiling tacks to locate valves or dampers above lay-in panel ceilings. Locate in corner of panel closest to equipment.

END OF SECTION

SECTION 23 05 93
TESTING, ADJUSTING, AND BALANCING FOR HVAC

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Testing, adjustment, and balancing of air systems.
- B. Measurement of final operating condition of HVAC systems.

1.02 REFERENCE STANDARDS

- A. AABC MN-1 - AABC National Standards for Total System Balance; 2002.
- B. ASHRAE Std 111 - Measurement, Testing, Adjusting, and Balancing of Building HVAC Systems; 2008.
- C. NEBB (TAB) - Procedural Standards for Testing Adjusting and Balancing of Environmental Systems; 2015, with Errata (2017).
- D. SMACNA (TAB) - HVAC Systems Testing, Adjusting and Balancing; 2002.

1.03 SUBMITTALS

- A. Final Report: Indicate deficiencies in systems that would prevent proper testing, adjusting, and balancing of systems and equipment to achieve specified performance.
 - 1. Revise TAB plan to reflect actual procedures and submit as part of final report.
 - 2. Submit draft copies of report for review prior to final acceptance of Project. Provide final copies for Engineer and for inclusion in operating and maintenance manuals.
 - 3. Include actual instrument list, with manufacturer name, serial number, and date of calibration.
 - 4. Form of Test Reports: Where the TAB standard being followed recommends a report format use that; otherwise, follow ASHRAE Std 111.
 - 5. Units of Measure: Report data in I-P (inch-pound) units only.
 - 6. Include the following on the title page of each report:
 - a. Name of Testing, Adjusting, and Balancing Agency.
 - b. Address of Testing, Adjusting, and Balancing Agency.
 - c. Telephone number of Testing, Adjusting, and Balancing Agency.
 - d. Project name.
 - e. Project location.
 - f. Project Engineer.
 - g. Project Contractor.
 - h. Report date.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 GENERAL REQUIREMENTS

- A. Perform total system balance in accordance with one of the following:
 - 1. AABC MN-1, AABC National Standards for Total System Balance.
 - 2. NEBB Procedural Standards for Testing Adjusting Balancing of Environmental Systems.
 - 3. SMACNA (TAB) HVAC Systems Testing, Adjusting and Balancing.
 - 4. NBC, National Balancing Council.
- B. Begin work after completion of systems to be tested, adjusted, or balanced and complete work prior to Substantial Completion of the project.
- C. Where HVAC systems and/or components interface with life safety systems, including fire and smoke detection, alarm, and control, coordinate scheduling and testing and inspection procedures with the authorities having jurisdiction.

- D. TAB Agency Qualifications:
 - 1. Company specializing in the testing, adjusting, and balancing of systems specified in this section.
 - 2. Having minimum of three years documented experience.
 - 3. Certified by one of the following:
 - a. AABC, Associated Air Balance Council: www.aabc.com; upon completion submit AABC National Performance Guaranty.
 - b. TABBB, The Testing, Adjusting, and Balancing Bureau of National Energy Management Institute: www.tabbcertified.org.
 - c. NBC, National Balancing Council: www.nbctab.org.
- E. TAB Supervisor and Technician Qualifications: Certified by same organization as TAB agency.

3.02 EXAMINATION

- A. Verify that systems are complete and operable before commencing work. Ensure the following conditions:
 - 1. Systems are started and operating in a safe and normal condition.
 - 2. Temperature control systems are installed complete and operable.
 - 3. Proper thermal overload protection is in place for electrical equipment.
 - 4. Final filters are clean and in place. If required, install temporary media in addition to final filters.
 - 5. Duct systems are clean of debris.
 - 6. Fans are rotating correctly.
 - 7. Fire and volume dampers are in place and open.
 - 8. Access doors are closed and duct end caps are in place.
 - 9. Air outlets are installed and connected.
 - 10. Duct system leakage is minimized.
- B. Beginning of work means acceptance of existing conditions.

3.03 ADJUSTMENT TOLERANCES

- A. Air Handling Systems: Adjust to within plus or minus 5 percent of design for supply systems and plus or minus 10 percent of design for return and exhaust systems.
- B. Air Outlets and Inlets: Adjust total to within plus 10 percent and minus 5 percent of design to space. Adjust outlets and inlets in space to within plus or minus 10 percent of design.

3.04 RECORDING AND ADJUSTING

- A. Ensure recorded data represents actual measured or observed conditions.
- B. Permanently mark settings of valves, dampers, and other adjustment devices allowing settings to be restored. Set and lock memory stops.
- C. After adjustment, take measurements to verify balance has not been disrupted or that such disruption has been rectified.
- D. Leave systems in proper working order, replacing belt guards, closing access doors, closing doors to electrical switch boxes, and restoring thermostats to specified settings.

3.05 SCOPE

- A. Test, adjust, and balance the following:
 - 1. Fans.
 - 2. Air Inlets and Outlets.

END OF SECTION

SECTION 23 09 13
INSTRUMENTATION AND CONTROL DEVICES FOR HVAC

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Thermostats.
- B. Automatic dampers.
- C. Damper operators.
- D. Miscellaneous accessories.

1.02 RELATED REQUIREMENTS

- A. Section 23 09 93 - Sequence of Operations for HVAC Controls.
- B. Division 26 - Electrical.

1.03 REFERENCE STANDARDS

- A. AMCA 500-D - Laboratory Methods of Testing Dampers for Rating; 2012.
- B. NEMA DC 3 - Residential Controls - Electrical Wall-Mounted Room Thermostats; 2013.
- C. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; 2015.

1.04 SUBMITTALS

- A. Product Data: Provide description and engineering data for each control system component. Include sizing as requested. Provide data for each system component and software module.
- B. Project Record Documents: Record actual locations of control components, including panels, thermostats, and sensors. Accurately record actual location of control components, including panels, thermostats, and sensors.
 - 1. Revise shop drawings to reflect actual installation and operating sequences.
- C. Operation and Maintenance Data: Include inspection period, cleaning methods, recommended cleaning materials, and calibration tolerances.

PART 2 PRODUCTS

2.01 EQUIPMENT - GENERAL

- A. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc., as suitable for the purpose specified and indicated.

2.02 DAMPERS

- A. Performance: Test in accordance with AMCA 500-D.
- B. Frames: Galvanized steel, welded or riveted with corner reinforcement, minimum 16 gage, 0.06 inch (1.5 mm).
- C. Blades: Galvanized steel, maximum blade size 8 inches (200 mm) wide, 48 inches (1200 mm) long, minimum 16 gage, 0.06 inch (1.5 mm), positively locked to square shafts.
- D. Blade Seals: Synthetic elastomeric mechanically attached, field replaceable.
- E. Jamb Seals: Spring stainless steel.
- F. Shaft Bearings: Corrosion resistant, permanently lubricated synthetic sleeve.

2.03 DAMPER OPERATORS

- A. General: Provide smooth proportional control with sufficient power for air velocities 20 percent greater than maximum design velocity and to provide tight seal against maximum system pressures. Provide spring return for two position control and for fail safe operation.
 - 1. Provide sufficient number of operators to achieve unrestricted movement throughout damper range.

- B. Electric Operators:
 - 1. Spring return, adjustable stroke motor having oil immersed gear train, with minimum position potentiometer.

2.04 THERMOSTATS

- A. Electric Room Thermostats:
 - 1. Type: NEMA DC 3, 24 volts, with setback/setup temperature control.
 - 2. Service: cooling and heating.
- B. Line Voltage Thermostats:
 - 1. Integral manual On/Off/Auto selector switch, single or two pole as required.
 - 2. Dead band: Maximum 2 degrees F (one degree C).
 - 3. Rating: Motor load.
- C. Room Thermostat Accessories:
 - 1. Insulating Bases: For thermostats located on exterior walls.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Check and verify location of thermostats with plans and room details before installation. Locate 60 inches (1500 mm) above floor. Align with lighting switches and humidistats.
- C. Electrical material and installation shall be in accordance with appropriate requirements of Division 26.

END OF SECTION

**SECTION 23 09 93
SEQUENCE OF OPERATIONS FOR HVAC CONTROLS**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. This section defines the manner and method by which controls function. Requirements for each type of control system operation are specified. Equipment, devices, and system components required for control systems are specified in other sections.
- B. Sequence of operation for:
 - 1. Well House:
 - a. Exhaust Fan (EF-1) and Louver (L-1)
 - b. Electric Unit Heater (EUH-1).

1.02 SUBMITTALS

- A. Sequence of Operation Documentation: Submit written sequence of operation for entire HVAC system and each piece of equipment.
 - 1. State each sequence in small segments and give each segment a unique number for referencing in Functional Test procedures; provide a complete description regardless of the completeness and clarity of the sequences specified in Contract Documents.
 - 2. Include at least the following sequences:
 - a. Normal operating mode.
 - b. Unoccupied mode.
 - c. Shutdown.
 - d. Detailed sequences for all control strategies, such as economizer control, optimum start/stop, staging, optimization, demand limiting, etc.
 - e. Seasonal operational differences and recommendations.
 - f. Interactions and interlocks with other systems.
 - 3. Include initial and recommended values for all adjustable settings, setpoints and parameters that are typically set or adjusted by operating staff; and any other control settings or fixed values, delays, etc. that will be useful during testing and operating the equipment.
 - 4. For packaged controlled equipment, include manufacturer's furnished sequence of operation amplified as required to describe the relationship between the packaged controls and the control system, indicating which points are adjustable control points and which points are only monitored.
- B. Project Record Documents: Record actual locations of components and setpoints of controls, including changes to sequences made after submission of shop drawings.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 WELL HOUSE: EXHAUST FAN (EF-1), LOUVER (L-1) & ELECTRIC UNIT HEATER (EUH-1)

- A. Cooling Mode: When the space temperature rises above 85 deg F (adj) the louver damper shall open, the exhaust fan shall energize and the electric heater fan shall energize.
- B. Heating Mode: When the space temperature drops below 55 deg F (adj) the electric unit heater shall energize to heat the space and modulate to maintain temperature.

END OF SECTION

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SECTION 23 31 00
HVAC DUCTS AND CASINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Metal ductwork.

1.02 RELATED REQUIREMENTS

- A. Section 23 07 13 - Duct Insulation: External insulation and duct liner.
- B. Section 23 05 93 - Testing, Adjusting, and Balancing for HVAC.

1.03 REFERENCE STANDARDS

- A. ASHRAE (FUND) - ASHRAE Handbook - Fundamentals; Most Recent Edition Cited by Referring Code or Reference Standard.
- B. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2014.
- C. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2015.
- D. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2015a.
- E. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; 2015.
- F. SMACNA (LEAK) - HVAC Air Duct Leakage Test Manual; Sheet Metal and Air Conditioning Contractors' National Association; 2012, 2nd Edition.
- G. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible; 2005.
- H. UL 181 - Standard for Factory-Made Air Ducts and Air Connectors; current edition, including all revisions.

1.04 FIELD CONDITIONS

- A. Do not install duct sealants when temperatures are less than those recommended by sealant manufacturers.
- B. Maintain temperatures within acceptable range during and after installation of duct sealants.

PART 2 PRODUCTS

2.01 DUCT ASSEMBLIES

- A. Regulatory Requirements: Construct ductwork to comply with NFPA 90A standards.

2.02 MATERIALS

- A. Galvanized Steel for Ducts: Hot-dipped galvanized steel sheet, ASTM A653/A653M FS Type B, with G90/Z275 coating.
- B. Joint Sealers and Sealants: Non-hardening, water resistant, mildew and mold resistant.
 - 1. Type: Heavy mastic or liquid used alone or with tape, suitable for joint configuration and compatible with substrates, and recommended by manufacturer for pressure class of ducts.
 - 2. Surface Burning Characteristics: Flame spread index of zero and smoke developed index of zero, when tested in accordance with ASTM E84.
 - 3. Manufacturers:
 - a. Carlisle HVAC Products; Hardcast Iron-Grip 601 Water Based Duct Sealant: www.carlislehvac.com/#sle.
- C. Hanger Rod: ASTM A36/A36M; steel, galvanized; threaded both ends, threaded one end, or continuously threaded.
- D. Low Pressure Supply (Heating Systems): 1/2 inch w.g. (125 Pa) pressure class, galvanized steel.
- E. General Exhaust: 1/2 inch w.g. (125 Pa) pressure class, galvanized steel.

- F. Outside Air Intake: 1/2 inch w.g. (125 Pa) pressure class, galvanized steel.

2.03 DUCTWORK FABRICATION

- A. Fabricate and support in accordance with SMACNA (DCS) and as indicated.
- B. No variation of duct configuration or size permitted except by written permission. Size round duct installed in place of rectangular ducts in accordance with ASHRAE (FUND) Handbook - Fundamentals.
- C. Provide duct material, gages, reinforcing, and sealing for operating pressures indicated.
- D. Construct T's, bends, and elbows with radius of not less than 1-1/2 times width of duct on centerline. Where not possible and where rectangular elbows must be used, provide air foil turning vanes of perforated metal with glass fiber insulation.
- E. Provide turning vanes of perforated metal with glass fiber insulation when acoustical lining is indicated.
- F. T's, bends, and elbows: Construct according to SMACNA (DCS).
- G. Increase duct sizes gradually, not exceeding 15 degrees divergence wherever possible; maximum 30 degrees divergence upstream of equipment and 45 degrees convergence downstream.
- H. Fabricate continuously welded round and oval duct fittings in accordance with SMACNA (DCS).

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install, support, and seal ducts in accordance with SMACNA (DCS).
- B. Install in accordance with manufacturer's instructions.
- C. During construction provide temporary closures of metal or taped polyethylene on open ductwork to prevent construction dust from entering ductwork system.
- D. Flexible Ducts: Connect to metal ducts with adhesive.
- E. Duct sizes indicated are inside clear dimensions. For lined ducts, maintain sizes inside lining.
- F. Install and seal metal and flexible ducts in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible.
- G. Locate ducts with sufficient space around equipment to allow normal operating and maintenance activities.
- H. Connect diffusers or light troffer boots to low pressure ducts with 6 foot maximum length of flexible duct held in place with strap or clamp.
- I. During construction provide temporary closures of metal or taped polyethylene on open ductwork to prevent construction dust from entering ductwork system.
- J. At exterior wall louvers, seal duct to louver frame. Outdoor air ductwork shall be sloped to wall louver.

END OF SECTION

SECTION 23 34 23
HVAC POWER VENTILATORS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Wall exhausters.

1.02 REFERENCE STANDARDS

- A. AMCA (DIR) - (Directory of) Products Licensed Under AMCA International Certified Ratings Program; 2015.
- B. AMCA 99 - Standards Handbook; 2010.
- C. AMCA 204 - Balance Quality and Vibration Levels for Fans; 2005.
- D. AMCA 210 - Laboratory Methods of Testing Fans for Certified Aerodynamic Performance Rating; 2007.
- E. AMCA (DIR) - [Directory of] Products Licensed Under AMCA International Certified Ratings Program; Air Movement and Control Association International, Inc.; <http://www.amca.org/certified/search/company.aspx>.
- F. AMCA 300 - Reverberant Room Method for Sound Testing of Fans; 2014.
- G. AMCA 301 - Methods for Calculating Fan Sound Ratings from Laboratory Test Data; 2014.

1.03 SUBMITTALS

- A. Product Data: Provide data on fans and accessories including fan curves with specified operating point clearly plotted, power, RPM, sound power levels at rated capacity, and electrical characteristics and connection requirements.

1.04 EXTRA MATERIALS

- A. Supply two sets of belts for each fan.

PART 2 PRODUCTS

2.01 POWER VENTILATORS - GENERAL

- A. Static and Dynamically Balanced: AMCA 204 - Balance Quality and Vibration Levels for Fans.
- B. Performance Ratings: Determined in accordance with AMCA 210 and bearing the AMCA Certified Rating Seal.
- C. Sound Ratings: AMCA 301, tested to AMCA 300 and bearing AMCA Certified Sound Rating Seal.
- D. Fabrication: Comply with AMCA 99.
- E. Electrical Components: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.
- F. Manufacturers: Greenheck, Fantech, Loren Cook, Acme.

2.03 WALL EXHAUSTERS

- A. Fan Unit: direct driven with spun aluminum housing; resiliently mounted motor; 1/2 inch (13 mm) mesh, 0.062 inch (1.6 mm) thick aluminum wire bird screen.
- B. Disconnect Switch: Factory wired, non-fusible, in housing for thermal overload protected motor, and wall mounted solid state speed controller. Shall be Class 1, Division 1 where indicated on plans.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install in accordance with manufacturer's instructions.

END OF SECTION

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**SECTION 26 00 00
ELECTRICAL GENERAL PROVISIONS**

PART 1 GENERAL

1.01 DESCRIPTION OF WORK:

- A. Work included in this Division consists of providing all demolition, labor, materials, equipment, tools, supervision, start-up services, Owner's instructions, including all incidental and related items necessary to complete installation, and successfully test, start up and operate building in a practical and efficient manner. Electrical Systems indicated on Drawings and described in each Section of Division 26 Specification and conforming with all Contract Documents.
- B. Work not included under this Division:
 - 1. Field painting of equipment, except for repair to damaged factory finishes.
- C. The General Provisions of this Contract, including General and Supplementary Conditions and other General Requirements Sections, apply to the Work specified in this Section.
- D. This Section is not intended to supersede, but to clarify, the definitions in Division 1, General Requirements and Supplementary Conditions.

1.02 DRAWINGS AND SPECIFICATIONS:

- A. Drawings are diagrammatic and indicate general arrangement of systems and work included in Contract, and shall serve only as design drawings, and not as working drawings, for general layout of various equipment and systems.
- B. Drawings and Specifications are intended to supplement each other, and all work specified or indicated in either shall be provided. Should drawings disagree in themselves or with Specifications, the better quality or greater quantity of work shall be provided.
- C. Drawings and Specifications are intended to include all work and materials necessary for completion of the work. Any incidental item of material, labor or detail required for the proper execution and completion of the work and omitted from either the drawings and specifications or both, but required by governing codes local regulations, trade practices, operational functions, and good workmanship, shall be provided as part of the Contract Work without extra charge, even though not specifically detailed or specified.

1.03 SITE AND PROJECT DOCUMENT EXAMINATION:

- A. Submission of a proposal is considered evidence the Contractor has visited site, examined Drawings and Specifications of all trades including Architectural, Structural and Mechanical, and fully informed himself with all project and site conditions, and is proficient, experienced and knowledgeable of all standards, codes, ordinances, permits and regulations which affect his respective trade, and that all costs are included in his proposal.
- B. The Contractor and/or Sub-Contractor shall insure all required permits, and assessments have been obtained prior to any work beginning. Contractor shall verify requirement to include privilege fees, plan review fees, and permits as part of his formal bid.

1.04 STANDARDS, CODES AND PERMITS:

- A. Refer to Division 1, General Requirements and Supplementary Conditions.
- B. All work under Electrical Sections shall comply with latest edition of applicable standards and codes of the following, including local codes and variances:
 - 1. NECA - Standards for Installation
 - 2. NFPA - National Fire Protection Association
 - 3. NEC - Latest edition of NFPA 70
 - 4. UL - Underwriter's Laboratories
 - 5. NEMA - National Electric Manufacturers Association
 - 6. NESC - National Electric Safety Code (H13)
 - 7. OSHA - Occupational Safety and Health Act
 - 8. IEEE - Institute of Electrical and Electronics Engineers

- C. All work shall be provided and tested in accordance with all applicable local, county, state laws, ordinances, code rules and regulations, including Michigan Department of Labor, General Rules, Part 8-Electrical Code Rules.
- D. No work shall be covered or enclosed until work is tested in accordance with applicable codes and regulations, and successful tests witnessed and approved by authorized inspection authority. Written approvals shall be secured by Contractor and submitted to Engineer before final acceptance of work.

1.05 SUBMITTALS:

- A. Proposal Supplement:
 - 1. Contractor to submit one (1) copy of Proposal Supplement - SECTION 26 00 10 - ELECTRICAL EQUIPMENT AND MATERIALS, at the time of Bid opening, listing the manufacturers upon which his bid was based, including all items being provided by Sub-Contractors.
 - 2. After Proposal Supplement and Sub-Contractors are approved, no deviation shall be permitted without written approval of Engineer.
- B. Shop Drawings:
 - 1. Submit nine (9) hard-copies or one (1) electronic copy of shop drawings on all equipment and materials indicated in the specifications or on drawings.
 - 2. At the time of submittal for review by the Engineer, shop drawings shall include signatures or stamps indicating that the Contractor and/or the Sub-Contractor has reviewed the submittals and has coordinated the required space, quantities required, services and work of other trades for the equipment or system being submitted.
 - 3. Submittals shall be in the form of bound folders with the name of the Project, Architect, Engineer and the submitting Contractor indicated on the cover. Submittals requiring drawings too large to be bound into the folder shall be folded and inserted in pockets bound into the folder.
 - 4. Submit complete manufacturer's shop drawings of all equipment, accessories and controls, including dimensions, weights, capacities, construction details, installation, controls, wiring diagrams, and motor data.
 - 5. Engineer's approval of show drawings is for general application only and is a service only and not considered as a guarantee of total compliance with or as relieving Contractor of basic responsibilities under all Contract Documents, and does not approve changes in quantities, time or cost.
 - 6. After approval, each Contractor is responsible to provide information to all other trades involved in, or affected by, installation of his equipment and work.
- C. Operating and Maintenance Instructions and Manuals:
 - 1. Contractor shall provide for all items of equipment three (3) bound and indexed sets of operating/installation and maintenance instructions to Engineer for approval. After approval, manuals will be given to Owner by the Engineer.
 - 2. Manuals shall include a complete set of shop drawings submitted, indexed with tabs for each section.

1.06 ELECTRICAL SERVICE REQUIREMENTS:

- A. Permanent Electrical Service:
 - 1. The Contractor is to verify with the Electrical Utility Company the electrical system amperage, voltage and phase and report any variations from what is indicated on the drawings to the Engineer. Contractor is to obtain written verification of the available symmetrical and asymmetrical RMS fault current from the Electrical Utility Company. Basis of design and bidding shall be a minimum of 65,000 system integrated A.I.C.on "MDP-1" overcurrent devices and branch circuit panelboard overcurrent devices.
 - 2. The Contractor shall select the over current protection devices and coordinate with the fault current. Submit a list of the devices and how coordination will be achieved. This submittal shall be in the form of a shop drawing.

3. Under the base bid, the Contractor shall furnish and install electrical conduits and conductors from main disconnect switch to padmount transformer secondary terminals or the electric meter. Actual connection of wires to secondary terminals of transformer shall be done by the Electrical Utility Company.
4. The Contractor shall also supply and install the concrete pad for the new pad-mount transformer. Coordinate the size and requirements with the Electrical Utility Company.
5. Any costs from the Electrical Utility Company associated with bringing permanent power to the site shall be paid for by the Owner.

PART 2 PRODUCTS

2.01 STANDARDS:

- A. All products shall be of established manufacturers regularly engaged in making type of materials to be provided and complete with all parts, accessories, trimmings, connections, etc. as specified in detail or as described in manufacturer's catalog.
- B. All material shall be labeled or listed by Underwriter's Laboratories, Inc. Assembled electrical equipment supplied to the job site shall be listed or labeled and/or approved by the authority having jurisdiction.

2.02 SUBSTITUTION AND CHANGES:

- A. Contractor and/or Equipment Supplier may propose alternate equipment or materials of EQUAL or better quality, function, performance, durability and appearance. This information is to be submitted to the Engineer's Office ten (10) working days prior to bid due date to allow for proper review time and to issue an addendum incorporating the acceptable substitution(s). It is the submitter's responsibility to provide sufficient material for review as required by Engineer's Office. Acceptance and approval is the responsibility of the Engineer.
- B. Contractor and/or Equipment Supplier is liable for any added costs to himself or others and is responsible for verifying dimensions, clearance and roughing-in requirements, when product not named as the basis of design are used and is responsible for advising other Contractors of variations and submit revised drawing layout for approval of Engineer.
- C. See Section 26 00 10 for voluntary alternates.
 1. No substitutions will be accepted after bids are received. The lighting or electrical equipment specified herein has been carefully chosen for its ability to meet the luminous performance and/or design criteria of this project. Substitutions in all likelihood will be unable to meet all of the same requirements as the specified equipment.
 2. When only one manufacturer is listed within the description of the luminaire or electrical equipment, the design engineering or architectural aesthetics will not allow substitution of other manufacturer.
 3. When two or more manufacturers are listed within the description of the luminaire or electrical equipment, the Contractor may elect to submit to the Engineer a substitute fixture for review. All submittals must follow paragraph 2.02.A of this section.
 4. Substitution submittals shall consist of a physical description, dimensioned drawing and complete photometric and electric data of the proposed lamp, luminaire or electrical equipment. Working samples may be requested and shall be supplied to the Engineer for a visual check of finish and operating characteristics.
 5. Contractor will be responsible for ALL costs (engineering time, manufacturer's costs, distributor costs, etc.) incurred to replace equipment not approved if substitutions are made by the distributor, manufacturer's rep., contractor or subcontractor.

2.03 EQUIPMENT REQUIREMENTS AND CONNECTIONS:

- A. Motor Starters and Controls:
 1. Contractor shall provide all manual or magnetic motor starters and combination motor starter disconnects as required for all motors as indicated on all Electrical Drawings.
 2. Contractor shall provide factory installed motor starters integral with packaged equipment containing thermal overcurrent protection in all underground conductors with heater coils selected for specific motor usage for all motors.

- B. Electrical Wiring and Controls:
 - 1. Contractor shall furnish and install all motors, drives, and controllers integral to equipment and factory-mounted controls for all mechanical equipment.
 - 2. Contractor shall furnish and install all electrical devices requiring mechanical connections, and/or electrical connections, such as pressure switches, limit switches, float switches, solenoid valves, motor operated valves, motor operated dampers, fire stats, freeze stats, thermostats, override timers, E.P.'s, P.E.'s, temperature control cabinet, air compressor with starter, etc.
 - 3. Contractor shall furnish and install all power and Class 2 and 3 wiring, conduit, boxes for their association equipment in 2.03, B, 2.
 - 4. Contractor shall install all power wiring, conduit to motors and/or factory mounted control panels as indicated on Electrical Drawings or as indicated in Specifications.
 - 5. All electrical wiring work by Contractor shall be in accordance with Division 26 requirements.
- C. Instrumentation Wiring and Controls:
 - 1. Contractor shall furnish and install all conduits and cables as shown on plans. Contractor shall terminate all cables of Class 2 or 3.
 - 2. Contractor shall furnish and install all electrical devices requiring electrical connections of 120v or higher voltage circuits. Contractor shall commission and calibrate all equipment.
 - 3. All electrical wiring work shall be in accordance with Division 16 requirements.

PART 3 EXECUTION

3.01 COORDINATION OF ELECTRICAL WORK:

- A. The Contractor shall be responsible for all Sub-Contractors and Suppliers, and include in his bid all materials, labor and equipment involved in accordance with all local customs, rules, regulations, jurisdictional awards, decisions and secure compliance of all parts of the Specifications and Drawings regardless of Sectional inclusion in these Specifications.
- B. The Contractor and Sub-Contractor shall be responsible for all parts applicable to his trade in accordance with the Specifications and Drawings, and shall be responsible for coordinating locations and arrangements of his work with all other relevant Mechanical, Architectural, Structural and Electrical Specifications, Drawings and Shop Drawings.

3.02 EQUIPMENT CLEARANCE:

- A. Contractor to coordinate with the equipment location to insure adequate clearance is maintained as required by the National Electrical Code and applicable state and local codes, as well as accessibility for future maintenance and operation.
- B. Electrical work shall be arranged with building construction to provide minimum 6'-8" overhead clearance where possible.

3.03 WALL, FLOOR AND CEILING OPENINGS:

- A. Locate all openings and advise of details and templates of all openings necessary for inspection of electrical work.
- B. In general, openings and required lintels shall be provided through this Contractor. Size and location is the responsibility of this Contractor. Cracks and rough edges left following installation of equipment shall be caulked or covered by Contractor.

3.04 FIELD CHANGES:

- A. The Contractor shall not make any field changes that affect timing, costs or performance without written approval from the Architect/Engineer in the form of a Change Order, Field Change Order or a Supplemental Instruction. The Contractor assumes liability for any additional costs for changes made without such instruction or approval. Should any unauthorized change be determined by the Architect/Engineer as lessening the value of the project, a credit will be determined and issued as a change to the Contract.

3.05 PROJECT CLOSEOUT:

- A. Final Acceptance and payment will only be made after final punchlist completion and receipt at the Engineer's Office of:
 - 1. All Guarantees/Warranties
 - 2. Operating and Maintenance Instruction Manuals
 - 3. Record Drawings (As Built)
 - 4. Certificates of Inspection
 - 5. Test Reports
 - 6. Lamps and ballasts.

3.06 CERTIFICATES OF INSPECTION AND TEST REPORTS:

- A. Submit to the Engineer's Office evidence that installation has been inspected and approved by local or state electrical inspector and/or the authority having jurisdiction.

3.07 GUARANTEES AND WARRANTIES:

- A. At the end of a one year period of continuous operation, make a complete inspection of all systems, fixtures, equipment, safety devices and controls to insure equipment is operating properly, and report to Engineer in writing.

3.08 RECORD DRAWINGS:

- A. Maintain a white-print set of Electrical Contract Drawings in clean, undamaged condition for markup of actual installation on Electrical Contract Drawings which vary substantially from the work as shown. These drawings are to be available for inspection by the Engineer on a weekly basis. Drawings shall indicate at a minimum the routing of all conduits over 2" on size, revised circuiting, revised panel schedules, emergency lighting controller (EPCs, BLTCs, etc.) locations, and addendum, bulletin and field changes.

3.09 OPERATING AND MAINTENANCE INSTRUCTIONS:

- A. Provide instruction of Owner's personnel in operation and maintenance procedures for all systems equipment.
- B. Provide 3 - bound & tabbed sets of operating & maintenance instruction manuals for all electrical equipment

3.10 PLACING SYSTEMS INTO OPERATION:

- A. Contractor shall be responsible for all startup procedures, system checks and balancing associated with his equipment.
- B. All equipment shall be installed, tested and operated in accordance with manufacturer's recommendations at normal operating conditions.
- C. When reconnecting existing circuits to new panels, individually turn on each circuit while using a current indicating meter on the equipment grounding conductor. This is to check the individual branch circuits' current flow on the E.G.C.. If current flow is found on the E.G.C., investigate the circuit to find why this current flow exists (parallel neutral path, conduit with no E.G.C., etc.), and notify the Owner/Architect/Engineer of this problem to be properly addressed in a bulletin.
- D. All permanent electrical equipment operated during construction periods shall be cleaned and damaged equipment replaced.

3.11 ADJUSTMENTS AND BALANCING:

- A. Contractor shall make all necessary adjustments to equipment installed or connected by him under this contract so as to insure proper operation of the same.

3.12 GUARANTEES AND WARRANTIES:

- A. All labor, materials and equipment shall be guaranteed by Contractor and/or warranted by Manufacturer for one year after acceptance date and/or one normal continuous complete seasons operation applicable to equipment or system except where specified longer for special

equipment. Contractor shall secure such warranty from all Suppliers (not one year from shipment date), or Contractor to assume warranty.

- B. Acceptance date of substantial completion shall be Owner occupancy as determined by Architect/Engineer.
- C. Contractor shall make all necessary alterations, repairs, adjustments, replacements during guarantee periods as directed by Architect/Engineer to comply with Drawings and Specifications at no cost to Owner.
- D. Repair or replacements made under guarantee bear further one year guarantee from date of acceptance of repair or replacement.

3.13 IDENTIFICATION:

- A. All service switches, motor disconnects, controllers, etc., whether or not furnished under this Division shall be marked to identify the equipment served and the origin of the power source. Distribution panels, branch panels and switchboards shall be identified as to the designation indication on the Contract Drawings and voltage characteristics. Individual switches in Distribution Panels and Switchboards shall be identified as to equipment being fed.
- B. All identification shall be done with engraved 5-ply lamacoid plates with ¼" white lettering on a black background. "Dymo" or tape markers ARE NOT acceptable.
- C. Concisely and clearly type out all branch panel schedules indicating room or area served along with the item(s) connected to each circuit.
- D. See Electrical Drawing Detail for additional identification requirements.

3.14 TRAINING:

- A. The option of video taping any and all training sessions shall be given to the Owner at no additional cost, with the Contractor conducting the video taping and with two (2) copies of all tapes being turned over to the Owner for future use.
- B. E.C. shall conduct 2 - 4 hour training session on the operation and controls of all electrical equipment. Notify owner 72 hours prior to session.

END OF SECTION

**SECTION 26 00 10
ELECTRICAL EQUIPMENT AND MATERIALS**

PART 1 GENERAL

1.01 INSTRUCTION:

- A. The Contractor is to either copy or remove this specification section from the spec book and complete as follows:
 - 1. Indicate the specific manufacturer on which the bidder's base bid price is based in the blank space provided.
 - 2. All equipment is to be bid as specified. Material or equipment from another manufacturer may be bid as a Voluntary Alternate, but the dollar amount must be shown as an "Add" or "Deduct" to the base bid. Provide the name of the alternate manufacturer in the space provided.
 - 3. Insert the name(s) of each subcontractor used in your bid in the space provided in Part 3.
 - 4. This form shall be submitted with the bid.

1.02 RELATED DOCUMENTS:

- A. The other Contract Documents complement the requirements of this Section. The General Requirements apply to the work of this section.

1.03 DEVIATIONS FROM SPECIFIED MATERIAL:

- A. See Section 26 00 00, Part 2, Paragraph 2.02 - Substitutions and Changes. Base bid shall be based on manufacturers listed in this specification or on the drawings.

PART 2 PRODUCTS

2.01 THE FOLLOWING IS A LIST OF APPROVED MANUFACTURERS, GROUPED ACCORDING TO TYPES OF MATERIALS OR EQUIPMENT.

- A. Wiring Devices:
 - 1. Pass & Seymour, Hubbell, Leviton, Cooper, and Eaton
- B. Motor Starters/Contactors:
 - 1. Square D (basis of design) or pre-approved equal
- C. Variable Frequency Motor Controllers:
 - 1. Square D (basis of design) or pre-approved equal
- D. Main Distribution Panelboards.
 - 1. Square D (basis of design) or pre-approved equal
- E. Surge Protective Device.
 - 1. Raycap (basis of design) or pre-approved equal
- F. Branch Panels:
 - 1. Square D (basis of design) or pre-approved equal
- G. Safety Switches:
 - 1. Square D (basis of design) or pre-approved equal
- H. Dry Type Transformers:
 - 1. Square D (basis of design) or pre-approved equal
- I. Automatic Transfer Switch:
 - 1. Cummins (basis of design), Generac Industrial, Caterpillar, Thomson, Kohler, or pre-approved equal
- J. Natural Gas Generator:
 - 1. Cummins (basis of design), Generac Industrial, Caterpillar, Kohler, or pre-approved equal
- K. Light Fixtures:
 - 1. Type A: Metalux (basis of design), Lithonia, or pre-approved equal
 - 2. Type B: Lumark (basis of design), Lithonia, or pre-approved equal

PART 3 SUBCONTRACTORS

3.01 INSERT THE NAME OF EACH SUBCONTRACTOR AND WORK TO BE PERFORMED BELOW:

- A. Subcontractor _____
Work Performed _____
- B. Subcontractor _____
Work Performed _____
- C. Subcontractor _____
Work Performed _____

END OF SECTION

**SECTION 26 00 50
BASIC MATERIALS AND METHODS**

PART 1 GENERAL

1.01 MATERIALS:

- A. All materials and equipment furnished for installation on this project shall be new and in strict accordance with Contract Documents. All packaged materials shall be delivered in their original containers which shall show the manufacturer's name and the identifying designations as to size, quality, etc. Materials delivered to the project unmarked or mutilated packages will be ordered to be removed from the site at once. Materials or equipment judged as "damaged" by the Architect/Engineer shall be removed from the project and site.
- B. Should any dispute arise to the quality of any material, the decision shall rest entirely with the Architect/Engineer and shall be based on the requirement that all materials furnished shall be first class in every respect, and what is usual or customary in erecting other buildings shall in no way enter into the consideration or decision whatever as it pertains to the project under consideration.
- C. All materials and equipment furnished under work of all Division 16 sections shall be UL approved and listed, and shall bear the Underwriter's Label.

1.02 SUBMITTALS:

- A. Submit shop drawings for the following: (See 26 00 00 1.05 B 1 thru 6)
 - 1. Wiring devices.
 - 2. Motor starters/contactors.
 - 3. Variable Frequency Motor Controllers.
 - 4. Main Distribution Panelboards.
 - 5. Branch circuit panelboards.
 - 6. Safety switches / breakers.
 - 7. Surge Protective Device.
 - 8. Transformers.
 - 9. Automatic Transfer Switch.
 - 10. Natural Gas Generator.
 - 11. Indoor and outdoor light fixtures (See 26 51 00 1.03 A thru D).

PART 2 PRODUCTS

2.01 RACEWAYS:

- A. Aluminum conduit is not acceptable in this Contract.
- B. PVC Coated Metal Conduit.
 - 1. Description: NEMA RN 1; rigid steel conduit with external PVC coating, 40 mil (0.1 mm) thick.
 - 2. Fittings and Conduit Bodies: NEMA FB 1; steel fittings with external PVC coating to match conduit.
- C. Rigid Metal Conduit:
 - 1. Rigid metal conduit shall be hot dipped galvanized steel, meeting Federal Standard WW-C-581.
 - 2. Threaded fittings shall be used on rigid metal conduit.
- D. Electric Metallic Tubing:
 - 1. Electrical metallic tubing shall be standard weight, meeting Federal Standard WW-C-563 and bear the manufacturer's name and Underwriter's Label on each length. Maximum permissible size tubing shall be 4".
 - 2. Provide compression-type steel fittings or set screw-type steel fittings. Crimp-type connectors are not acceptable.

- E. Flexible Metal Conduit:
 - 1. Flexible metallic conduit shall meet Federal Standard WW-C-566 and is to have separate grounding conductor. Minimum permissible size shall be 1/2".
 - 2. Fittings shall be malleable iron, threaded type.
- F. Liquid-Tight Flexible Metal Conduit:
 - 1. Liquid-tight flexible metal conduit shall be single strip, flexible, continuous, interlocked, and double-wrapped steel. It shall be galvanized inside and outside, with a liquid-tight jacket of flexible polyvinyl chloride (PVC). Minimum permissible size shall be 1/2".
 - 2. Connectors shall be insulated throat, malleable iron.
- G. Liquid-Tight Flexible Non-Metallic Conduit:
 - 1. Liquid-tight flexible non-metallic conduit shall be single strip, flexible polyvinyl chloride (PVC). Minimum permissible size shall be 1/2".
 - 2. Connectors shall be non-metallic (PVC) compression type UL labeled and listed to be used on liquid-tight flexible non-metallic conduit.
- H. Rigid Non-Metallic Conduit:
 - 1. Rigid non-metallic conduit (PVC) shall be Schedule 40, rigid heavy wall polyvinyl chloride, 90 degrees C., UL rated.
 - 2. Fittings shall be solvent weld type of the same material as the conduit.
 - 3. All 45 degree bends or greater shall be made with rigid metal conduit fittings.
- I. Wireways:
 - 1. Wireways shall be lay-in type and shall be UL listed as a wireway or auxiliary gutter. It shall be constructed with a hinged cover and knockouts. It shall be primed with a corrosion resistant primer and gray epoxy finish.
- J. Metal-Clad Cable:
 - 1. Metal-Clad Cable is NOT acceptable in this project.

2.02 WIRE AND CABLE:

- A. All wiring shall be copper and shall be installed in conduit or tubing unless specified otherwise.
- B. All wire shall be new and in the original cartons or on manufacturer's shipping reels.
- C. No wire smaller than #12 may be used unless specified under descriptions of special systems. Wire #10 and larger shall be stranded.
- D. All branch circuit wiring shall be color coded black, red, and blue phases and white neutral for 120/240V, 1 phase, 3 wire system and 120/240V, 3 phase, 4 wire system, and brown, orange, yellow and white stripped neutral for 277/480V, 3 phase, 4 wire system. All grounding / bonding conductors shall be green or bare. Phase color consistent throughout the entire branch circuit system.
- E. All neutral runs including feeders shall be white full length of conductor or identified per NEC.
- F. Select from the following wire types to comply with the project's installation requirements and NEC standards.
 - 1. Type THHN/THWN rated installation. 600 volt, 90 degrees C., in conduit, stranded copper, size No. 12 AWG up to and including No. 10 AWG.
 - 2. Type THWN-2 rated insulation, 600 volt, 90 degrees C., in conduit, stranded copper, size No. 8 AWG up to No. 750 MCM AWG.

2.03 WIRE CONNECTORS AND JOINTS:

- A. All conductors #8 AWG and smaller shall be joined with electrical spring connectors with vinyl insulating cap. Conductors larger than #8 shall be joined by compression type connectors.
- B. **All connections and termination shall be made with Ideal "Nolox" anti-oxidizing paste.**

2.04 OUTLET BOXES:

- A. Convenience outlet and switch boxes shall be a minimum 4"sq. x 2 1/8" deep with 1 or 2 gang, 2" deep plaster ring. When installed in poured walls, 3 1/8" minimum deep masonry box shall be used; when installed in masonry blocks, minimum 4"sq. x 2 1/8" deep with 1 or 2 gang, 2" deep plaster ring shall be used.

2.05 JUNCTION BOXES AND PULL BOXES:

- A. When used, pull boxes and junction boxes shall be galvanized and have flat steel covers fastened with screws and set flush with the finished surface and located in an accessible area. When installed in damp locations, gaskets and seals shall be provided. Junction boxes shall be sized to meet N.E.C. Standards based on conduit and conductors. Provide identifying labels on each box.

2.06 WIRING DEVICES:

- A. Receptacles:
 - 1. Receptacles shall be commercial specification grade.
 - a. 20 Amp, 125 Volt, duplex, ground fault, weatherproof (NEMA 5-20R).
 - b. 20 Amp, 125 Volt, duplex, ground fault (NEMA 5-20R).
 - c. 20 Amp, 125 Volt, duplex (NEMA 5-20R).
- B. Device Plates:
 - 1. Plates shall be brushed smooth stainless steel, except plates used on surface mounted boxes. Surface mounted outlets plates shall be raised, pressed metal type. Mounting screws shall be metal with same finish as plate and with countersunk head. Plates shall be single ganged, or combination, to accommodate arrangement indicated on drawings.

2.07 MOTOR CONTROLLERS:

- A. 120 volt, less than 1/4hp:
 - 1. Provide motor toggle switch with heater, pilot light and lockout guard. Mount adjacent to motor. Size heater per NEC and manufacturer's recommendations. Based on Sq-D #FGJ5P (surface mount) or # FF1P FL1 (flush mount)
- B. 120 volt, 1/3hp to 1hp:
 - 1. Provide NEMA rated combination magnetic motor starter and disconnect in appropriate enclosure with H.O.A. selector switch, red pilot light, 1 - N.O. & 1 - N.C. Aux. coil. Combination motor starter disconnect shall be Sq-D Class 8539 with breaker sized for respective motor load or two speed starters as shown on plans. Mount within sight and within 50' of motor. Size heaters per NEC and manufacturer's recommendations.
- C. 208v, 1ph; 208v, 3ph; 480v. 1ph; and 480v, 3ph; 1/2hp or larger:
 - 1. Provide NEMA rated combination magnetic motor starter and disconnect in appropriate enclosure with H.O.A. selector switch, red pilot light, 120 volt control transformer, 1 - N.O. & 1 - N.C. Aux. coil. Combination motor starter disconnect shall be based on Sq-D Class 8539 with breaker sized for respective motor load or two speed starters as shown on plans. Mount within sight and within 50' of motor. Size heaters per NEC and manufacturer's recommendations.

2.08 MAIN DISTRIBUTION PANELBOARDS & METERING EQUIPMENT:

- A. Main distribution and metering equipment shall be of the circuit breaker type with main lugs or main switch as indicated on drawings rated at 250 volts or 600 volt maximum, 3 phase, 4wire AC, respectively, capable of withstanding available fault current and be U.L.S.E. labeled and listed, surface mount, bottom fed. Circuit breakers shall be system series rated. Main Distribution Panelboards shall be based on Square "D" type I-Line.

2.09 BRANCH CIRCUIT PANELBOARDS:

- A. Branch circuit panelboards shall be of the circuit breaker type with main lugs or main switch as indicated on drawings rated at 120/240 volts maximum, 1 phase, 3 wire AC capable of

withstanding available fault current and be U.L. labeled and listed, surface or flush mounted, bottom or top fed with ground bar kits. Circuit breakers shall be system series rated. Panelboards shall be based on Square "D" type NQ.

2.10 FUSES:

- A. Fuses 600 Amperes and Less: Dual element, current limiting, time delay, one-time fuse, 250 or 600 volt, UL Class J. Supply Owner with 3 - spare fuses of each size if applicable.
- B. Fuses 601 Amperes and Larger: Current limiting, fast-acting, one time fuse, 600 volt, UL Class L. Supply Owner with 1 - spare fuse of each size if applicable.
- C. Interrupting Rating: 200,000 rms amperes.

2.11 SAFETY SWITCHES:

- A. Furnish and install all required safety switches.
- B. Safety switches shall be NEMA heavy duty type "HD", fusible or non-fusible as shown on drawings and be U.L. labeled and listed. Switches shall be furnished in NEMA-1 general purpose dry location enclosures unless otherwise shown on drawings. Weatherproof switches shall be NEMA-3R (raintight).
- C. Switches shall be horsepower rated with interlocking provisions to prevent unauthorized opening of the switch covers in the "ON" position. Switches shall be capable of being physically locked in the open (off) position.
- D. Switches shall be Sq-D type "HD" 250v or 600v, respectively.

PART 3 EXECUTION

3.01 RACEWAYS:

- A. Conduit or tubing shall be installed in a manner which complies with all applicable provisions of the National Electrical Code and at least six inches from parallel runs of steam pipes, flues, or hot water pipes.
- B. Ends of all conduit or tubing shall terminate in a bushing or fitting having factory installed insulating liners. Provide plastic bushings on all conduit or tubing with wire larger than #4 AWG. Exposed runs shall be supported by hangers, clamps, or straps secured by toggle bolts in hollow construction or expansion bolts or inserts in poured or brick walls. No lead anchors shall be allowed
- C. Every precaution shall be taken to protect the conduit from damage and from water, dirt, concrete, etc., getting into the system during construction. Capped bushings shall be used on all conduit terminations until wire is installed. If, in the opinion of the Engineer, conduit or tubing has become damaged or contains unremovable foreign matter, it shall be replaced at the Contractor's expense.
- D. Rigid metal conduit shall be used in all poured construction, fill, outside masonry walls, areas exposed to weather, under drives and walks, and in areas where tubing may become damaged..
- E. Rigid non-metallic conduit (PVC) may be used in lieu of rigid metal conduit below grade or where concealed in concrete. Provide a separate bare stranded copper grounding conductor in the raceway sized in accordance with Table 250.122 of the NEC.
- F. Electrical metallic conduit (EMT) shall be used for feeders and branch circuits above ground & above suspended accessible ceilings; for switch and receptacle legs which terminate above suspended accessible ceilings; for exposed feeders and branch circuits; for switch legs in moveable partitions.
- G. Flexible metal conduit shall be used for connections to the following equipment: lighting fixtures only. Maximum length of flexible metallic conduit shall be 6'-0". Longer length may be permitted at the discretion of the Owner or as indicated on the plans. Minimum size shall be

½". Flexible metal conduit used for lighting fixture connections shall be "Greenfield" type. Fittings shall be insulated throat, flex-steel connectors.

- H. Use liquid-tight flexible steel conduit and liquid-tight flexible non-metallic conduit for final connections to all indoor and outdoor motors and mechanical equipment with a length not to exceed 36".
- I. At all wall penetrations, space around circuits shall be filled with mortar or other approved filler. Penetrations through walls, floors or ceilings must not alter the fire rating of the assembly.
- J. All conduit and boxes shall be flush mounted and concealed. No exposed conduit will be allowed, except in electrical and mechanical spaces, and where specifically noted.

3.02 WIRE AND CABLE:

- A. All wiring shall be installed in approved raceways. Conductors shall be continuous between outlets or junction boxes with splice made only within such boxes.
- B. Any branch circuits over 50 feet in length shall be installed with one wire size larger than the circuit rating. Example: 1P/20amp breaker with #12 THHN wire run 50'+ shall be increased to a #10 THHN wire.
- C. **All connections and terminations shall be made with Ideal "Nolox" anti-oxidizing paste.**

3.03 OUTLET BOXES:

- A. A standard galvanized outlet box shall be installed for each and every outlet shown.
- B. Set boxes squarely with faces flush to finished surfaces. The exact location of all outlets shall be approved by the Architect/Engineer before same are place and Contractor shall consult Architect/Engineer at all times relative to the location of outlets. No outlets shall be placed behind plumbing or heating pipes or where they will interfere with ducts, pipes, equipment, or other work.
- C. Each outlet shall be rigidly supported from the building construction (independent of the raceway system).

3.04 WIRING DEVICES:

- A. Receptacles shall be mounted approximately 18" above floor or at other heights indicated on drawings.
- B. E.C. shall be responsible for protection of receptacles from painting, plastering, etc.
- C. Wall switches shall be mounted approximately 4'-0" above floor unless they interfere with wainscoting or trim.
- D. E.C. shall be responsible for masking switches for protection from painting, plastering, etc.
- E. E.C. shall confirm all door swings with Contractor before installing switches.
- F. Wall plates shall be installed plumb and level with all edges in contact with attaching surface.
- G. E.C. shall confirm all ADA and barrier free requirements are meant and install according to their regulations.

3.05 SUPPORTS AND HANGERS:

- A. Provide and install necessary steel brackets, rods, clamps, etc., for support of all work under this contract. All supports shall be plated or painted and shall be secured to structural members after Architect's approval.

3.06 SLEEVES AND INSERTS:

- A. The Contractor shall be responsible for the proper location of all sleeves, chases, openings and inserts for the installation of his equipment.
- B. Holes through walls, floors or structural members shall be located only where permitted by the Architect.

3.07 UNDERGROUND WORK:

- A. Prior to any underground excavating, trenching, pole base augering, etc. call MISS DIG at 1-800-482-7171 no less than 72 hours in advance of any earthwork.

END OF SECTION

SECTION 26 05 19
LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Single conductor building wire.
- B. Wiring connectors.
- C. Electrical tape.
- D. Oxide inhibiting compound.
- E. Wire pulling lubricant.
- F. Cable ties.

1.02 RELATED REQUIREMENTS

- A. Section 07 84 00 - Firestopping.
- B. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.

1.03 REFERENCE STANDARDS

- A. ASTM B3 - Standard Specification for Soft or Annealed Copper Wire 2013 (Reapproved 2018).
- B. ASTM B8 - Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft 2011 (Reapproved 2017).
- C. ASTM B33 - Standard Specification for Tin-Coated Soft or Annealed Copper Wire for Electrical Purposes 2010, with Editorial Revision (2020).
- D. ASTM B787/B787M - Standard Specification for 19 Wire Combination Unilay-Stranded Copper Conductors for Subsequent Insulation 2004 (Reapproved 2020).
- E. ASTM B800 - Standard Specification for 8000 Series Aluminum Alloy Wire for Electrical Purposes - Annealed and Intermediate Tempers 2005 (Reapproved 2021).
- F. ASTM B801 - Standard Specification for Concentric-Lay-Stranded Conductors of 8000 Series Aluminum Alloy Wire for Subsequent Covering of Insulation 2018.
- G. ASTM D3005 - Standard Specification for Low-Temperature Resistant Vinyl Chloride Plastic Pressure-Sensitive Electrical Insulating Tape 2017.
- H. NECA 1 - Standard for Good Workmanship in Electrical Construction 2015.
- I. NECA 104 - Recommended Practice for Installing Aluminum Building Wire and Cable 2012.
- J. NEMA WC 70 - Power Cables Rated 2000 Volts or Less for the Distribution of Electrical Energy 2021.
- K. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- L. UL 44 - Thermoset-Insulated Wires and Cables Current Edition, Including All Revisions.
- M. UL 83 - Thermoplastic-Insulated Wires and Cables Current Edition, Including All Revisions.
- N. UL 486A-486B - Wire Connectors Current Edition, Including All Revisions.
- O. UL 486C - Splicing Wire Connectors Current Edition, Including All Revisions.
- P. UL 510 - Polyvinyl Chloride, Polyethylene, and Rubber Insulating Tape Current Edition, Including All Revisions.

PART 2 PRODUCTS

2.01 CONDUCTOR AND CABLE APPLICATIONS

- A. Do not use conductors and cables for applications other than as permitted by NFPA 70 and product listing.

- B. Provide single conductor building wire installed in suitable raceway unless otherwise indicated, permitted, or required.
- C. Nonmetallic-sheathed cable is not permitted.
- D. Underground feeder and branch-circuit cable is not permitted.
- E. Service entrance cable is not permitted.
- F. Armored cable is not permitted.
- G. Metal-clad cable is not permitted.

2.02 CONDUCTOR AND CABLE GENERAL REQUIREMENTS

- A. Provide products that comply with requirements of NFPA 70.
- B. Provide products listed, classified, and labeled as suitable for the purpose intended.
- C. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, etc. as required for a complete operating system.
- D. Comply with NEMA WC 70.
- E. Thermoplastic-Insulated Conductors and Cables: Listed and labeled as complying with UL 83.
- F. Thermoset-Insulated Conductors and Cables: Listed and labeled as complying with UL 44.
- G. Conductor Material:
 - 1. Provide copper conductors only. Aluminum conductors are not acceptable for this project. Conductor sizes indicated are based on copper.
 - 2. Copper Conductors: Soft drawn annealed, 98 percent conductivity, uncoated copper conductors complying with ASTM B3, ASTM B8, or ASTM B787/B787M unless otherwise indicated.
 - 3. Tinned Copper Conductors: Comply with ASTM B33.
- H. Minimum Conductor Size:
 - 1. Branch Circuits: 12 AWG.
 - 2. Control Circuits: 14 AWG.
- I. Conductor Color Coding:
 - 1. Color code conductors as indicated unless otherwise required by the authority having jurisdiction. Maintain consistent color coding throughout project.
 - 2. Color Coding Method: Integrally colored insulation.
 - 3. Color Code:
 - a. 480Y/277 V, 3 Phase, 4 Wire System:
 - 1) Phase A: Brown.
 - 2) Phase B: Orange.
 - 3) Phase C: Yellow.
 - 4) Neutral/Grounded: Gray.
 - b. 240/120 V, 1 or 3 Phase, 3 or 4 Wire System:
 - 1) Phase A: Black.
 - 2) Phase B: Red.
 - 3) Phase C: Blue
 - 4) Neutral/Grounded: White.
 - c. Equipment Ground, All Systems: Green.

2.03 SINGLE CONDUCTOR BUILDING WIRE

- A. Description: Single conductor insulated wire.
- B. Conductor Stranding:
 - 1. Feeders and Branch Circuits:
 - a. Size 10 AWG and Smaller: Solid.
 - b. Size 8 AWG and Larger: Stranded.

- C. Insulation Voltage Rating: 600 V.
- D. Insulation:
 - 1. Copper Building Wire: Type THHN/THWN or THHN/THWN-2, except as indicated below.

2.04 WIRING CONNECTORS

- A. Description: Wiring connectors appropriate for the application, suitable for use with the conductors to be connected, and listed as complying with UL 486A-486B or UL 486C as applicable.

2.05 ACCESSORIES

- A. Electrical Tape:
 - 1. Vinyl Insulating Electrical Tape: Complying with ASTM D3005 and listed as complying with UL 510; minimum thickness of 7 mil (0.18 mm); resistant to abrasion, corrosion, and sunlight; conformable for application down to 0 degrees F (-18 degrees C) and suitable for continuous temperature environment up to 221 degrees F (105 degrees C).
- B. Oxide Inhibiting Compound: Listed; suitable for use with the conductors or cables to be installed.
- C. Wire Pulling Lubricant: Listed; suitable for use with the conductors or cables to be installed and suitable for use at the installation temperature.
- D. Cable Ties: Material and tensile strength rating suitable for application.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that interior of building has been protected from weather.
- B. Verify that work likely to damage wire and cable has been completed.
- C. Verify that raceways, boxes, and equipment enclosures are installed and are properly sized to accommodate conductors and cables in accordance with NFPA 70.
- D. Verify that field measurements are as indicated.
- E. Verify that conditions are satisfactory for installation prior to starting work.

3.02 PREPARATION

- A. Clean raceways thoroughly to remove foreign materials before installing conductors and cables.

3.03 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Perform work in accordance with NECA 1 (general workmanship).
- C. Installation in Raceway:
 - 1. Tape ends of conductors and cables to prevent infiltration of moisture and other contaminants.
 - 2. Pull all conductors and cables together into raceway at same time.
 - 3. Do not damage conductors and cables or exceed manufacturer's recommended maximum pulling tension and sidewall pressure.
 - 4. Use suitable wire pulling lubricant where necessary, except when lubricant is not recommended by the manufacturer.
- D. Paralleled Conductors: Install conductors of the same length and terminate in the same manner.
- E. Secure and support conductors and cables in accordance with NFPA 70 using suitable supports and methods approved by the authority having jurisdiction. Provide independent support from building structure. Do not provide support from raceways, piping, ductwork, or other systems.
- F. Install conductors with a minimum of 12 inches (300 mm) of slack at each outlet.

- G. Neatly train and bundle conductors inside boxes, wireways, panelboards and other equipment enclosures.
- H. Group or otherwise identify neutral/grounded conductors with associated ungrounded conductors inside enclosures in accordance with NFPA 70.
- I. Make wiring connections using specified wiring connectors.
 - 1. Make splices and taps only in accessible boxes. Do not pull splices into raceways or make splices in conduit bodies or wiring gutters.
 - 2. Remove appropriate amount of conductor insulation for making connections without cutting, nicking or damaging conductors.
 - 3. Do not remove conductor strands to facilitate insertion into connector.
 - 4. Clean contact surfaces on conductors and connectors to suitable remove corrosion, oxides, and other contaminates. Do not use wire brush on plated connector surfaces.
 - 5. Connections for Aluminum Conductors: Fill connectors with oxide inhibiting compound where not pre-filled by manufacturer.
- J. Insulate splices and taps that are made with uninsulated connectors using methods suitable for the application, with insulation and mechanical strength at least equivalent to unspliced conductors.
- K. Insulate ends of spare conductors using vinyl insulating electrical tape.
- L. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 07 84 00.
- M. Unless specifically indicated to be excluded, provide final connections to all equipment and devices, including those furnished by others, as required for a complete operating system.

END OF SECTION

**SECTION 26 05 26
GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Grounding and bonding requirements.
- B. Conductors for grounding and bonding.
- C. Connectors for grounding and bonding.
- D. Ground bars.
- E. Ground rod electrodes.

1.02 REFERENCE STANDARDS

- A. IEEE 81 - IEEE Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Grounding System 2012.
- B. NECA 1 - Standard for Good Workmanship in Electrical Construction 2015.
- C. NEMA GR 1 - Grounding Rod Electrodes and Grounding Rod Electrode Couplings 2017.
- D. NETA ATS - Acceptance Testing Specifications for Electrical Power Equipment and Systems 2017.
- E. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- F. UL 467 - Grounding and Bonding Equipment Current Edition, Including All Revisions.

1.03 SUBMITTALS

- A. Product Data: Provide for grounding electrodes and connections.
- B. Test Reports: Indicate overall resistance to ground and resistance of each electrode.
- C. Project Record Documents: Record actual locations of components and grounding electrodes.
- D. Certificate of Compliance: Indicate approval of installation by authority having jurisdiction.

1.04 QUALITY ASSURANCE

- A. Comply with requirements of NFPA 70.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.
- B. Products: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

PART 2 PRODUCTS

2.01 GROUNDING AND BONDING REQUIREMENTS

- A. Do not use products for applications other than as permitted by NFPA 70 and product listing.
- B. Unless specifically indicated to be excluded, provide all required components, conductors, connectors, conduit, boxes, fittings, supports, accessories, etc. as necessary for a complete grounding and bonding system.
- C. Where conductor size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.
- D. Grounding System Resistance:
 - 1. Achieve specified grounding system resistance under normally dry conditions unless otherwise approved by Engineer. Precipitation within the previous 48 hours does not constitute normally dry conditions.
 - 2. Grounding Electrode System: Not greater than 5 ohms to ground, when tested according to IEEE 81 using "fall-of-potential" method.

- E. Grounding Electrode System:
 - 1. Provide connection to required and supplemental grounding electrodes indicated to form grounding electrode system.
 - a. Provide continuous grounding electrode conductors without splice or joint.
 - b. Install grounding electrode conductors in raceway where exposed to physical damage. Bond grounding electrode conductor to metallic raceways at each end with bonding jumper.
 - 2. Metal Underground Water Pipe(s):
 - a. Provide connection to underground metal domestic and fire protection (where present) water service pipe(s) that are in direct contact with earth for at least 10 feet (3.0 m) at an accessible location not more than 5 feet (1.5 m) from the point of entrance to the building.
 - b. Provide bonding jumper(s) around insulating joints/pipes as required to make pipe electrically continuous.
 - c. Provide bonding jumper around water meter of sufficient length to permit removal of meter without disconnecting jumper.
 - 3. Metal In-Ground Support Structure:
 - a. Provide connection to metal in-ground support structure that is in direct contact with earth in accordance with NFPA 70.
 - 4. Concrete-Encased Electrode:
 - a. Provide connection to concrete-encased electrode consisting of not less than 20 feet (6.0 m) of either steel reinforcing bars or bare copper conductor not smaller than 4 AWG embedded within concrete foundation or footing that is in direct contact with earth in accordance with NFPA 70.
 - 5. Ground Rod Electrode(s):
 - a. Provide three electrodes in an equilateral triangle configuration unless otherwise indicated or required.
 - b. Space electrodes not less than 10 feet (3.0 m) from each other and any other ground electrode.
 - 6. Provide additional ground electrode(s) as required to achieve specified grounding electrode system resistance.
- F. Separately Derived System Grounding:
 - 1. Separately derived systems include, but are not limited to:
 - a. Transformers (except autotransformers such as buck-boost transformers).
 - 2. Provide grounding electrode conductor to connect derived system grounded conductor to nearest effectively grounded metal building frame. Unless otherwise indicated, make connection at neutral (grounded) bus in source enclosure.
 - 3. Provide bonding jumper to connect derived system grounded conductor to nearest metal building frame and nearest metal water piping in the area served by the derived system, where not already used as a grounding electrode for the derived system. Make connection at same location as grounding electrode conductor connection.
 - 4. Provide system bonding jumper to connect system grounded conductor to equipment ground bus. Make connection at same location as grounding electrode conductor connection. Do not make any other connections between neutral (grounded) conductors and ground on load side of separately derived system disconnect.
 - 5. Where the source and first disconnecting means are in separate enclosures, provide supply-side bonding jumper between source and first disconnecting means.
- G. Bonding and Equipment Grounding:
 - 1. Provide bonding for equipment grounding conductors, equipment ground busses, metallic equipment enclosures, metallic raceways and boxes, device grounding terminals, and other normally non-current-carrying conductive materials enclosing electrical conductors/equipment or likely to become energized as indicated and in accordance with NFPA 70.

2. Provide insulated equipment grounding conductor in each feeder and branch circuit raceway. Do not use raceways as sole equipment grounding conductor.
 3. Where circuit conductor sizes are increased for voltage drop, increase size of equipment grounding conductor proportionally in accordance with NFPA 70.
 4. Unless otherwise indicated, connect wiring device grounding terminal to branch circuit equipment grounding conductor and to outlet box with bonding jumper.
 5. Terminate branch circuit equipment grounding conductors on solidly bonded equipment ground bus only. Do not terminate on neutral (grounded) or isolated/insulated ground bus.
 6. Provide bonding jumper across expansion or expansion/deflection fittings provided to accommodate conduit movement.
- H. Communications Systems Grounding and Bonding:
1. Provide intersystem bonding termination at service equipment or metering equipment enclosure and at disconnecting means for any additional buildings or structures in accordance with NFPA 70.
 2. Provide bonding jumper in raceway from intersystem bonding termination to each communications room or backboard and provide ground bar for termination.
 - a. Bonding Jumper Size: 6 AWG, unless otherwise indicated or required.
 - b. Raceway Size: 3/4 inch (21 mm) trade size unless otherwise indicated or required.
 - c. Ground Bar Size: 1/4 by 2 by 12 inches (6 by 50 by 300 mm) unless otherwise indicated or required.

2.02 GROUNDING AND BONDING COMPONENTS

- A. General Requirements:
1. Provide products listed, classified, and labeled as suitable for the purpose intended.
 2. Provide products listed and labeled as complying with UL 467 where applicable.
- B. Conductors for Grounding and Bonding, in Addition to Requirements of Section 26 05 26:
1. Use insulated copper conductors unless otherwise indicated.
 - a. Exceptions:
 - 1) Use bare copper conductors where installed underground in direct contact with earth.
 - 2) Use bare copper conductors where directly encased in concrete (not in raceway).
- C. Connectors for Grounding and Bonding:
1. Description: Connectors appropriate for the application and suitable for the conductors and items to be connected; listed and labeled as complying with UL 467.
 2. Unless otherwise indicated, use exothermic welded connections for underground, concealed and other inaccessible connections.
 3. Unless otherwise indicated, use mechanical connectors, compression connectors, or exothermic welded connections for accessible connections.
- D. Ground Bars:
1. Description: Copper rectangular ground bars with mounting brackets and insulators.
 2. Size: As indicated.
 3. Holes for Connections: As indicated or as required for connections to be made.
- E. Ground Rod Electrodes:
1. Comply with NEMA GR 1.
 2. Material: Copper-bonded (copper-clad) steel.
 3. Size: 3/4 inch (19 mm) diameter by 10 feet (3.0 m) length, unless otherwise indicated.
 4. Where rod lengths of greater than 10 feet (3.0 m) are indicated or otherwise required, sectionalized ground rods may be used.
- F. Foundation Electrodes: minimum size 4 AWG.

2.03 EQUIPMENT GROUNDING CONDUCTORS

- A. Install a green equipment grounding conductor sized per N.E.C. 250-95 in ALL conduit. Conduit shall not be relied on for equipment grounding.
- B. Wire: As shown on plans.
- C. Grounding Electrode Conductor: Size to meet NFPA 70 requirements.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that work likely to damage grounding and bonding system components has been completed.
- B. Verify that field measurements are as indicated.
- C. Verify that conditions are satisfactory for installation prior to starting work.
- D. Verify that final backfill and compaction has been completed before driving rod electrodes.

3.02 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Perform work in accordance with NECA 1 (general workmanship).
- C. Ground Rod Electrodes: Unless otherwise indicated, install ground rod electrodes vertically. Where encountered rock prohibits vertical installation, install at 45 degree angle or bury horizontally in trench at least 30 inches (750 mm) deep in accordance with NFPA 70 or install at 45 degree angle or bury horizontally in trench at least 30 inches (750 mm) deep in accordance with NFPA 70.
- D. Make grounding and bonding connections using specified connectors.
 - 1. Remove appropriate amount of conductor insulation for making connections without cutting, nicking or damaging conductors. Do not remove conductor strands to facilitate insertion into connector.
 - 2. Remove nonconductive paint, enamel, or similar coating at threads, contact points, and contact surfaces.
 - 3. Exothermic Welds: Make connections using molds and weld material suitable for the items to be connected in accordance with manufacturer's recommendations.
 - 4. Mechanical Connectors: Secure connections according to manufacturer's recommended torque settings.
 - 5. Compression Connectors: Secure connections using manufacturer's recommended tools and dies.
- E. Identify grounding and bonding system components in accordance with Section 26 05 53.
- F. Install ground electrodes & building steel at locations indicated. Install bonding jumper to internal building metallic water piping system. Install additional rod electrodes and/or building steel columns as required to achieve specified resistance to ground (5 ohms) or less. Install additional rod electrodes as required to achieve specified resistance to ground.
- G. Provide grounding electrode conductor and connect to reinforcing steel in foundation footing where indicated. Bond steel together.
- H. Provide bonding to meet requirements described in Quality Assurance.
- I. Equipment Grounding Conductor: Provide separate, insulated conductor within each feeder and branch circuit raceway. Terminate each end on suitable lug, bus, or bushing.

3.03 FIELD QUALITY CONTROL

- A. See Section 01 40 00 - Quality Requirements, for additional requirements.
- B. Perform inspection in accordance with Section 01 40 00.
- C. Inspect and test in accordance with NETA ATS except Section 4.
- D. Perform inspections and tests listed in NETA ATS, Section 7.13.

- E. Perform ground electrode resistance tests under normally dry conditions. Precipitation within the previous 48 hours does not constitute normally dry conditions.
- F. Investigate and correct deficiencies where measured ground resistances do not comply with specified requirements.

END OF SECTION

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**SECTION 26 05 33.13
CONDUIT FOR ELECTRICAL SYSTEMS**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Galvanized steel rigid metal conduit (RMC).
- B. PVC-coated galvanized steel rigid metal conduit (RMC).
- C. Flexible metal conduit (FMC).
- D. Liquidtight flexible metal conduit (LFMC).
- E. Electrical metallic tubing (EMT).
- F. Rigid polyvinyl chloride (PVC) conduit.
- G. Liquidtight flexible nonmetallic conduit (LFNC).
- H. Conduit fittings.

1.02 RELATED REQUIREMENTS

- A. Section 07 84 00 - Firestopping.
- B. Section 26 05 26 - Grounding and Bonding for Electrical Systems.
- C. Section 26 05 53 - Identification for Electrical Systems.
- D. Section 26 05 33.16 - Boxes for Electrical Systems.
- E. Section 31 23 16 - Excavation.
- F. Section 31 23 23 - Fill: Bedding and backfilling.

1.03 REFERENCE STANDARDS

- A. ANSI C80.1 - American National Standard for Electrical Rigid Steel Conduit (ERSC) 2015.
- B. ANSI C80.3 - American National Standard for Electrical Metallic Tubing -- Steel (EMT-S) 2015.
- C. NECA 1 - Standard for Good Workmanship in Electrical Construction 2015.
- D. NECA 101 - Standard for Installing Steel Conduits (Rigid, IMC, EMT) 2013.
- E. NECA 111 - Standard for Installing Nonmetallic Raceways (RNC, ENT, LFNC) 2017.
- F. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable 2014.
- G. NEMA RN 1 - Polyvinyl-Chloride (PVC) Externally Coated Galvanized Rigid Steel Conduit and Intermediate Metal Conduit 2018.
- H. NEMA TC 2 - Electrical Polyvinyl Chloride (PVC) Conduit 2020.
- I. NEMA TC 3 - Polyvinyl Chloride (PVC) Fittings for Use with Rigid PVC Conduit and Tubing 2021.
- J. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- K. UL 1 - Flexible Metal Conduit Current Edition, Including All Revisions.
- L. UL 6 - Electrical Rigid Metal Conduit-Steel Current Edition, Including All Revisions.
- M. UL 360 - Liquid-Tight Flexible Steel Conduit Current Edition, Including All Revisions.
- N. UL 514B - Conduit, Tubing, and Cable Fittings Current Edition, Including All Revisions.
- O. UL 651 - Schedule 40, 80, Type EB and A Rigid PVC Conduit and Fittings Current Edition, Including All Revisions.
- P. UL 797 - Electrical Metallic Tubing-Steel Current Edition, Including All Revisions.

- Q. UL 1660 - Liquid-Tight Flexible Nonmetallic Conduit Current Edition, Including All Revisions.

1.04 SUBMITTALS

- A. Project Record Documents: Accurately record actual routing of conduits larger than 2 inches (51 mm).

1.05 QUALITY ASSURANCE

- A. Comply with requirements of NFPA 70.
B. Products: Listed and classified by Underwriters Laboratories Inc. as suitable for purpose specified and shown.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Receive, inspect, handle, and store conduit and fittings in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.01 CONDUIT REQUIREMENTS

- A. Provide all conduit, fittings, supports, and accessories required for a complete raceway system.
B. Provide products listed, classified, and labeled as suitable for the purpose intended.
C. Where conduit size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.

2.02 GALVANIZED STEEL RIGID METAL CONDUIT (RMC)

- A. Description: NFPA 70, Type RMC galvanized steel rigid metal conduit complying with ANSI C80.1 and listed and labeled as complying with UL 6.
B. Fittings:
1. Non-Hazardous Locations: Use fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
2. Hazardous (Classified) Locations: Use fittings listed and labeled as complying with UL 1203 for the classification of the installed location.
3. Material: Use steel or malleable iron.
4. Connectors and Couplings: Use threaded type fittings only. Threadless set screw and compression (gland) type fittings are not permitted.

2.03 PVC-COATED GALVANIZED STEEL RIGID METAL CONDUIT (RMC)

- A. Description: NFPA 70, Type RMC galvanized steel rigid metal conduit with external polyvinyl chloride (PVC) coating complying with NEMA RN 1 and listed and labeled as complying with UL 6.
B. Exterior Coating: Polyvinyl chloride (PVC), nominal thickness of 40 mil (1.02 mm).
C. PVC-Coated Fittings:
1. Manufacturer: Same as manufacturer of PVC-coated conduit to be installed.
2. Non-Hazardous Locations: Use fittings listed and labeled as complying with UL 514B.
3. Hazardous (Classified) Locations: Use fittings listed and labeled as complying with UL 1203 for the classification of the installed location.
4. Material: Use steel or malleable iron.
5. Exterior Coating: Polyvinyl chloride (PVC), minimum thickness of 40 mil (1.02 mm).
D. PVC-Coated Supports: Furnish with exterior coating of polyvinyl chloride (PVC), minimum thickness of 15 mil (0.38 mm).

2.04 FLEXIBLE METAL CONDUIT (FMC)

- A. Description: NFPA 70, Type FMC standard wall steel flexible metal conduit listed and labeled as complying with UL 1, and listed for use in classified firestop systems to be used.

- B. Fittings:
 - 1. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
 - 2. Material: Use steel or malleable iron.

2.05 LIQUIDTIGHT FLEXIBLE METAL CONDUIT (LFMC)

- A. Description: NFPA 70, Type LFMC polyvinyl chloride (PVC) jacketed steel flexible metal conduit listed and labeled as complying with UL 360.
- B. Fittings:
 - 1. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
 - 2. Material: Use steel or malleable iron.

2.06 ELECTRICAL METALLIC TUBING (EMT)

- A. Description: NFPA 70, Type EMT steel electrical metallic tubing complying with ANSI C80.3 and listed and labeled as complying with UL 797.
- B. Fittings:
 - 1. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
 - 2. Material: Use steel or malleable iron.
 - 3. Connectors and Couplings: Use compression (gland) or set-screw type.
 - a. Do not use indenter type connectors and couplings.

2.07 RIGID POLYVINYL CHLORIDE (PVC) CONDUIT

- A. Description: NFPA 70, Type PVC rigid polyvinyl chloride conduit complying with NEMA TC 2 and listed and labeled as complying with UL 651; Schedule 40 unless otherwise indicated, Schedule 80 where subject to physical damage; rated for use with conductors rated 90 degrees C.
- B. Fittings:
 - 1. Manufacturer: Same as manufacturer of conduit to be connected.
 - 2. Description: Fittings complying with NEMA TC 3 and listed and labeled as complying with UL 651; material to match conduit.

2.08 LIQUIDTIGHT FLEXIBLE NONMETALLIC CONDUIT (LFNC)

- A. Description: NFPA 70, Type LFNC liquidtight flexible nonmetallic conduit listed and labeled as complying with UL 1660.
- B. Fittings:
 - 1. Manufacturer: Same as manufacturer of conduit to be connected.
 - 2. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B; suitable for the type of conduit to be connected.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify that mounting surfaces are ready to receive conduits.
- C. Verify that conditions are satisfactory for installation prior to starting work.
- D. Verify routing and termination locations of conduit prior to rough-in.
- E. Conduit routing is shown on drawings in approximate locations unless dimensioned. Route as required to complete wiring system.

3.02 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.

- B. Perform work in accordance with NECA 1 (general workmanship).
- C. Install galvanized steel rigid metal conduit (RMC) in accordance with NECA 101.
- D. Install PVC-coated galvanized steel rigid metal conduit (RMC) using only tools approved by the manufacturer.
- E. Install rigid polyvinyl chloride (PVC) conduit in accordance with NECA 111.
- F. Install liquidtight flexible nonmetallic conduit (LFNC) in accordance with NECA 111.
- G. Conduit Routing:
 - 1. Unless dimensioned, conduit routing indicated is diagrammatic.
 - 2. When conduit destination is indicated without specific routing, determine exact routing required.
 - 3. Conduits installed underground or embedded in concrete may be routed in the shortest possible manner unless otherwise indicated. Route all other conduits parallel or perpendicular to building structure and surfaces, following surface contours where practical.
 - 4. Arrange conduit to maintain adequate headroom, clearances, and access.
 - 5. Arrange conduit to provide no more than the equivalent of four 90 degree bends between pull points.
 - 6. Arrange conduit to provide no more than 150 feet (46 m) between pull points.
 - 7. Route conduits above water and drain piping where possible.
 - 8. Arrange conduit to prevent moisture traps. Provide drain fittings at low points and at sealing fittings where moisture may collect.
 - 9. Maintain minimum clearance of 6 inches (150 mm) between conduits and piping for other systems.
 - 10. Maintain minimum clearance of 12 inches (300 mm) between conduits and hot surfaces. This includes, but is not limited to:
 - 11. Group parallel conduits in the same area together on a common rack.
- H. Conduit Support:
 - 1. Secure and support conduits in accordance with NFPA 70 and Section 26 05 29 using suitable supports and methods approved by the authority having jurisdiction.
 - 2. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.
 - 3. Installation Above Suspended Ceilings: Do not provide support from ceiling support system. Do not provide support from ceiling grid or allow conduits to lay on ceiling tiles.
 - 4. Use conduit strap to support single surface-mounted conduit.
 - a. Use clamp back spacer with conduit strap for damp and wet locations to provide space between conduit and mounting surface.
 - 5. Use metal channel (strut) with accessory conduit clamps to support multiple parallel surface-mounted conduits.
 - 6. Use trapeze hangers assembled from threaded rods and metal channel (strut) with accessory conduit clamps to support multiple parallel suspended conduits.
 - 7. Where conduit support intervals specified in NFPA 70 and NECA standards differ, comply with the most stringent requirements.
- I. Connections and Terminations:
 - 1. Use approved zinc-rich paint or conduit joint compound on field-cut threads of galvanized steel conduits prior to making connections.
 - 2. Where two threaded conduits must be joined and neither can be rotated, use three-piece couplings or split couplings. Do not use running threads.
 - 3. Use suitable adapters where required to transition from one type of conduit to another.
 - 4. Provide drip loops for liquidtight flexible conduit connections to prevent drainage of liquid into connectors.

5. Terminate threaded conduits in boxes and enclosures using threaded hubs or double lock nuts for dry locations and raintight hubs for wet locations.
 6. Provide insulating bushings or insulated throats at all conduit terminations to protect conductors.
 7. Secure joints and connections to provide maximum mechanical strength and electrical continuity.
- J. Penetrations:
1. Do not penetrate or otherwise notch or cut structural members, including footings and grade beams, without approval of Structural Engineer.
 2. Make penetrations perpendicular to surfaces unless otherwise indicated.
 3. Provide sleeves for penetrations as indicated or as required to facilitate installation. Set sleeves flush with exposed surfaces unless otherwise indicated or required.
 4. Conceal bends for conduit risers emerging above ground.
 5. Seal interior of conduits entering the building from underground at first accessible point to prevent entry of moisture and gases.
 6. Provide suitable modular seal where conduits penetrate exterior wall below grade.
 7. Where conduits penetrate waterproof membrane, seal as required to maintain integrity of membrane.
 8. Make penetrations for roof-mounted equipment within associated equipment openings and curbs where possible to minimize roofing system penetrations. Where penetrations are necessary, seal as indicated or as required to preserve integrity of roofing system and maintain roof warranty. Include proposed locations of penetrations and methods for sealing with submittals.
 9. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 07 84 00.
- K. Underground Installation:
1. Provide trenching and backfilling in accordance with Sections 31 23 16 and 31 23 16.
- L. Concrete Encasement: Where conduits not otherwise embedded within concrete are indicated to be concrete-encased, provide concrete in accordance with Section 03 30 00 with minimum concrete cover of 3 inches (76 mm) on all sides unless otherwise indicated.
- M. Hazardous (Classified) Locations: Where conduits cross boundaries of hazardous (classified) locations, provide sealing fittings located as indicated or in accordance with NFPA 70.
- N. Conduit Movement Provisions: Where conduits are subject to movement, provide expansion and expansion/deflection fittings to prevent damage to enclosed conductors or connected equipment. This includes, but is not limited to:
1. Where conduits cross structural joints intended for expansion, contraction, or deflection.
 2. Where calculated in accordance with NFPA 70 for rigid polyvinyl chloride (PVC) conduit installed above ground to compensate for thermal expansion and contraction.
 3. Where conduits are subject to earth movement by settlement or frost.
- O. Condensation Prevention: Where conduits cross barriers between areas of potential substantial temperature differential, provide sealing fitting or approved sealing compound at an accessible point near the penetration to prevent condensation. This includes, but is not limited to:
1. Where conduits pass from outdoors into conditioned interior spaces.
 2. Where conduits pass from unconditioned interior spaces into conditioned interior spaces.
- P. Provide pull string in all empty conduits and in conduits where conductors and cables are to be installed by others. Leave minimum slack of 12 inches (300 mm) at each end.
- Q. Provide grounding and bonding in accordance with Section 26 05 26.

3.03 CLEANING

- A. Clean interior of conduits to remove moisture and foreign matter.

3.04 INTERFACE WITH OTHER PRODUCTS

- A. Install conduit to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 07 8400.
- B. Route conduit through roof openings for piping and ductwork wherever possible. Where separate roofing penetration is required, coordinate location and installation method with roofing installation.

END OF SECTION

**SECTION 26 05 33.16
BOXES FOR ELECTRICAL SYSTEMS**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Outlet and device boxes up to 100 cubic inches (1,650 cu cm), including those used as junction and pull boxes.
- B. Cabinets and enclosures, including junction and pull boxes larger than 100 cubic inches (1,650 cu cm).
- C. Boxes for hazardous (classified) locations.
- D. Underground boxes/enclosures.

1.02 RELATED REQUIREMENTS

- A. Section 03 30 00 - Cast-in-Place Concrete.
- B. Section 07 84 00 - Firestopping.
- C. Section 26 05 26 - Grounding and Bonding for Electrical Systems.
- D. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.

1.03 REFERENCE STANDARDS

- A. NECA 1 - Standard for Good Workmanship in Electrical Construction 2015.
- B. NECA 130 - Standard for Installing and Maintaining Wiring Devices 2010.
- C. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable 2014.
- D. NEMA OS 1 - Sheet-Steel Outlet Boxes, Device Boxes, Covers, and Box Supports 2013.
- E. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum) 2020.
- F. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- G. SCTE 77 - Specification for Underground Enclosure Integrity 2017.
- H. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations Current Edition, Including All Revisions.
- I. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations Current Edition, Including All Revisions.
- J. UL 508A - Industrial Control Panels Current Edition, Including All Revisions.
- K. UL 514A - Metallic Outlet Boxes Current Edition, Including All Revisions.
- L. UL 1203 - Explosion-Proof and Dust-Ignition-Proof Electrical Equipment for Use in Hazardous (Classified) Locations Current Edition, Including All Revisions.

1.04 QUALITY ASSURANCE

- A. Comply with requirements of NFPA 70.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.
- B. Products: Provide products listed and classified by Underwriters Laboratories Inc., as suitable for the purpose specified and indicated.

PART 2 PRODUCTS

2.01 BOXES

- A. General Requirements:
 - 1. Do not use boxes and associated accessories for applications other than as permitted by NFPA 70 and product listing.
 - 2. Provide all boxes, fittings, supports, and accessories required for a complete raceway system and to accommodate devices and equipment to be installed.
 - 3. Provide products listed, classified, and labeled as suitable for the purpose intended.
 - 4. Where box size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.
 - 5. Provide grounding terminals within boxes where equipment grounding conductors terminate.
- B. Outlet and Device Boxes Up to 100 cubic inches (1,650 cu cm), Including Those Used as Junction and Pull Boxes:
 - 1. Use sheet-steel boxes for dry locations unless otherwise indicated or required.
 - 2. Use cast iron boxes or cast aluminum boxes for damp or wet locations unless otherwise indicated or required; furnish with compatible weatherproof gasketed covers.
 - 3. Use suitable concrete type boxes where flush-mounted in concrete.
 - 4. Use suitable masonry type boxes where flush-mounted in masonry walls.
 - 5. Use raised covers suitable for the type of wall construction and device configuration where required.
 - 6. Use shallow boxes where required by the type of wall construction.
 - 7. Do not use "through-wall" boxes designed for access from both sides of wall.
 - 8. Sheet-Steel Boxes: Comply with NEMA OS 1, and list and label as complying with UL 514A.
 - 9. Cast Metal Boxes: Comply with NEMA FB 1, and list and label as complying with UL 514A; furnish with threaded hubs.
 - 10. Boxes for Supporting Luminaires and Ceiling Fans: Listed as suitable for the type and weight of load to be supported; furnished with fixture stud to accommodate mounting of luminaire where required.
 - 11. Boxes for Ganged Devices: Use multigang boxes of single-piece construction. Do not use field-connected gangable boxes unless specifically indicated or permitted.
 - 12. Wall Plates: Comply with Section 26 27 26.
- C. Cabinets and Enclosures, Including Junction and Pull Boxes Larger Than 100 cubic inches (1,650 cu cm):
 - 1. Comply with NEMA 250, and list and label as complying with UL 50 and UL 50E, or UL 508A.
 - 2. NEMA 250 Environment Type, Unless Otherwise Indicated:
 - 3. Junction and Pull Boxes Larger Than 100 cubic inches (1,650 cu cm):
 - a. Provide screw-cover or hinged-cover enclosures unless otherwise indicated.
- D. Underground Boxes/Enclosures:
 - 1. Description: In-ground, open bottom boxes furnished with flush, non-skid covers with legend indicating type of service and stainless steel tamper resistant cover bolts.
 - 2. Size: As indicated on drawings.
 - 3. Depth: As required to extend below frost line to prevent frost upheaval, but not less than 12 inches (300 mm).
 - 4. Applications:
 - a. Sidewalks and Landscaped Areas Subject Only to Occasional Nondeliberate Vehicular Traffic: Use polymer concrete enclosures, with minimum SCTE 77 Tier 8 load rating.

- b. Parking Lots, in Areas Subject Only To Occasional Nondeliberate Vehicular Traffic: Use polymer concrete enclosures, with minimum SCTE 77 Tier 15 load rating.
 - c. Do not use polymer concrete enclosures in areas subject to deliberate vehicular traffic.
- 5. Polymer Concrete Underground Boxes/Enclosures: Comply with SCTE 77.
 - a. Combination fiberglass/polymer concrete boxes/enclosures are acceptable.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify that mounting surfaces are ready to receive boxes.
- C. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Install boxes in accordance with NECA 1 (general workmanship) and, where applicable, NECA 130, including mounting heights specified in those standards where mounting heights are not indicated.
- C. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.
- D. Box Locations:
 - 1. Locate boxes to be accessible. Provide access panels as required and where approved by the Architect.
 - 2. Locate boxes so that wall plates do not span different building finishes.
 - 3. Locate boxes so that wall plates do not cross masonry joints.
 - 4. Unless otherwise indicated, where multiple outlet boxes are installed at the same location at different mounting heights, install along a common vertical center line.
 - 5. Do not install flush-mounted boxes on opposite sides of walls back-to-back. Provide minimum 6 inches (150 mm) horizontal separation unless otherwise indicated.
- E. Box Supports:
 - 1. Secure and support boxes in accordance with NFPA 70 and Section 26 05 29 using suitable supports and methods approved by the authority having jurisdiction.
 - 2. Provide independent support from building structure except for cast metal boxes (other than boxes used for fixture support) supported by threaded conduit connections in accordance with NFPA 70. Do not provide support from piping, ductwork, or other systems.
- F. Install boxes plumb and level.
- G. Flush-Mounted Boxes:
 - 1. Install boxes in noncombustible materials such as concrete, tile, gypsum, plaster, etc. so that front edge of box or associated raised cover is not set back from finished surface more than 1/4 inch (6 mm) or does not project beyond finished surface.
 - 2. Install boxes in combustible materials such as wood so that front edge of box or associated raised cover is flush with finished surface.
 - 3. Repair rough openings around boxes in noncombustible materials such as concrete, tile, gypsum, plaster, etc. so that there are no gaps or open spaces greater than 1/8 inch (3 mm) at the edge of the box.
- H. Install boxes as required to preserve insulation integrity.
- I. Underground Boxes/Enclosures:
 - 1. Install enclosure on gravel base, minimum 6 inches (150 mm) deep.
 - 2. Flush-mount enclosures located in concrete or paved areas.

3. Mount enclosures located in landscaped areas with top at 1 inch (25 mm) above finished grade.
4. Provide cast-in-place concrete collar constructed in accordance with Section 03 30 00, minimum 10 inches wide by 12 inches deep (250 mm wide by 300 mm deep), around enclosures that are not located in concrete areas.
5. Install additional bracing inside enclosures in accordance with manufacturer's instructions to minimize box sidewall deflections during backfilling. Backfill with cover bolted in place.
- J. Install permanent barrier between ganged wiring devices when voltage between adjacent devices exceeds 300 V.
- K. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 07 84 00.
- L. Close unused box openings.
- M. Install blank wall plates on junction boxes and on outlet boxes with no devices or equipment installed or designated for future use.
- N. Provide grounding and bonding in accordance with Section 26 05 26.
- O. Identify boxes in accordance with Section 26 05 53.

3.03 CLEANING

- A. Clean interior of boxes to remove dirt, debris, plaster and other foreign material.

3.04 PROTECTION

- A. Immediately after installation, protect boxes from entry of moisture and foreign material until ready for installation of conductors.
- B. Clean exposed surfaces and restore finish.

END OF SECTION

**SECTION 26 05 53
IDENTIFICATION FOR ELECTRICAL SYSTEMS**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Electrical identification requirements.
- B. Identification nameplates and labels.
- C. Wire and cable markers.
- D. Underground warning tape.
- E. Warning signs and labels.
- F. Field-painted identification of conduit and boxes.

1.02 REFERENCE STANDARDS

- A. ANSI Z535.2 - American National Standard for Environmental and Facility Safety Signs 2011.
- B. ANSI Z535.4 - American National Standard for Product Safety Signs and Labels 2011.
- C. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- D. UL 969 - Marking and Labeling Systems Current Edition, Including All Revisions.

1.03 QUALITY ASSURANCE

- A. Comply with requirements of NFPA 70.

1.04 FIELD CONDITIONS

- A. Do not install adhesive products when ambient temperature is lower than recommended by manufacturer.
- B. Products: Listed and classified by Underwriters Laboratories Inc. as suitable for purpose specified and shown.

PART 2 PRODUCTS

2.01 IDENTIFICATION REQUIREMENTS

- A. Identification for Equipment:
 - 1. Use identification nameplate to identify each piece of electrical distribution and control equipment and associated sections, compartments, and components.
 - a. Motor Control Centers:
 - 1) Identify ampere rating.
 - 2) Identify voltage and phase.
 - 3) Identify power source and circuit number. Include location when not within sight of equipment.
 - 4) Use identification nameplate to identify load(s) served for each branch device. Do not identify spares and spaces.
 - b. Panelboards:
 - 1) Identify ampere rating.
 - 2) Identify voltage and phase.
 - 3) Identify power source and circuit number. Include location when not within sight of equipment.
 - 4) Use typewritten circuit directory to identify load(s) served for panelboards with a door. Identify spares and spaces using pencil.
 - 5) For power panelboards without a door, use identification nameplate to identify load(s) served for each branch device. Do not identify spares and spaces.
 - c. Transformers:
 - 1) Identify kVA rating.
 - 2) Identify voltage and phase for primary and secondary.

- 3) Identify power source and circuit number. Include location when not within sight of equipment.
 - 4) Identify load(s) served. Include location when not within sight of equipment.
 - d. Enclosed switches, circuit breakers, and motor controllers:
 - 1) Identify voltage and phase.
 - 2) Identify power source and circuit number. Include location when not within sight of equipment.
 - 3) Identify load(s) served. Include location when not within sight of equipment.
 2. Available Fault Current Documentation: Use identification label to identify the available fault current and date calculations were performed at locations requiring documentation by NFPA 70 including but not limited to the following.
 - a. Service equipment.
 - b. Industrial control panels.
 - c. Motor control centers.
 - d. Elevator control panels.
 - e. Industrial machinery.
 3. Arc Flash Hazard Warning Labels: Use warning labels to identify arc flash hazards for electrical equipment, such as switchboards, panelboards, industrial control panels, meter socket enclosures, and motor control centers that are likely to require examination, adjustment, servicing, or maintenance while energized.
 - a. Legend: Include orange header that reads "WARNING", followed by the word message "Arc Flash and Shock Hazard; Appropriate PPE Required; Do not operate controls or open covers without appropriate personal protection equipment; Failure to comply may result in injury or death; Refer to NFPA 70E for minimum PPE requirements" or approved equivalent.
- B. Identification for Conductors and Cables:
1. Color Coding for Power Conductors 600 V and Less: Comply with Section 26 05 19.
 2. Use identification nameplate or identification label to identify color code for ungrounded and grounded power conductors inside door or enclosure at each piece of feeder or branch-circuit distribution equipment when premises has feeders or branch circuits served by more than one nominal voltage system.
- C. Identification for Boxes:
1. Use voltage markers to identify highest voltage present.
 2. Use identification labels or handwritten text using indelible marker to identify circuits enclosed.
- D. Identification for Devices:
1. Use identification label or engraved wallplate to identify serving branch circuit for all receptacles.
 - a. For receptacles in public areas or in areas as directed by Architect, provide identification on inside surface of wallplate.
 2. Use identification label to identify receptacles protected by upstream GFI protection, where permitted.

2.02 IDENTIFICATION NAMEPLATES AND LABELS

- A. Identification Nameplates:
1. Materials:
 - a. Indoor Clean, Dry Locations: Use plastic nameplates.
 - b. Outdoor Locations: Use plastic, stainless steel, or aluminum nameplates suitable for exterior use.
 2. Plastic Nameplates: Two-layer or three-layer laminated acrylic or electrically non-conductive phenolic with beveled edges; minimum thickness of 1/16 inch (1.6 mm); engraved text.

3. Stainless Steel Nameplates: Minimum thickness of 1/32 inch (0.8 mm); engraved or laser-etched text.
 4. Aluminum Nameplates: Anodized; minimum thickness of 1/32 inch (0.8 mm); engraved or laser-etched text.
 5. Mounting Holes for Mechanical Fasteners: Two, centered on sides for sizes up to 1 inch (25 mm) high; Four, located at corners for larger sizes.
- B. Identification Labels:
1. Materials: Use self-adhesive laminated plastic labels; UV, chemical, water, heat, and abrasion resistant.
 2. Text: Use factory pre-printed or machine-printed text. Do not use handwritten text unless otherwise indicated.
- C. Format for Equipment Identification:
1. Minimum Size: 1 inch (25 mm) by 2.5 inches (64 mm).
 2. Legend:
 - a. Equipment designation or other approved description.
 3. Text: All capitalized unless otherwise indicated.
 4. Minimum Text Height:
 - a. Equipment Designation: 1/2 inch (13 mm).
 - b. Other Information: 1/4 inch (6 mm).
 5. Color:
 - a. Normal Power System: White text on black background.

2.03 WIRE AND CABLE MARKERS

- A. Markers for Conductors and Cables: Use wrap-around self-adhesive vinyl cloth, wrap-around self-adhesive vinyl self-laminating, heat-shrink sleeve, plastic sleeve, plastic clip-on, or vinyl split sleeve type markers suitable for the conductor or cable to be identified.
- B. Markers for Conductor and Cable Bundles: Use plastic marker tags secured by nylon cable ties.
- C. Legend: Power source and circuit number or other designation indicated.
- D. Text: Use factory pre-printed or machine-printed text, all capitalized unless otherwise indicated.
- E. Minimum Text Height: 1/8 inch (3 mm).
- F. Color: Black text on white background unless otherwise indicated.

2.04 UNDERGROUND WARNING TAPE

- A. Materials: Use non-detectable type polyethylene tape suitable for direct burial, unless otherwise indicated.
- B. Non-detectable Type Tape: 6 inches (152 mm) wide, with minimum thickness of 4 mil (0.1 mm).
- C. Legend: Type of service, continuously repeated over full length of tape.
- D. Color:
1. Tape for Buried Power Lines: Black text on red background.
 2. Tape for Buried Communication, Alarm, and Signal Lines: Black text on orange background.

2.05 WARNING SIGNS AND LABELS

- A. Comply with ANSI Z535.2 or ANSI Z535.4 as applicable.
- B. Warning Signs:
1. Materials:
 - a. Indoor Dry, Clean Locations: Use factory pre-printed rigid plastic or self-adhesive vinyl signs.
 - b. Outdoor Locations: Use factory pre-printed rigid aluminum signs.

2. Rigid Signs: Provide four mounting holes at corners for mechanical fasteners.
 3. Minimum Size: 7 by 10 inches (178 by 254 mm) unless otherwise indicated.
- C. Warning Labels:
1. Materials: Use factory pre-printed or machine-printed self-adhesive polyester or self-adhesive vinyl labels; UV, chemical, water, heat, and abrasion resistant; produced using materials recognized to UL 969.
 2. Machine-Printed Labels: Use thermal transfer process printing machines and accessories recommended by label manufacturer.
 3. Minimum Size: 2 by 4 inches (51 mm by 102 mm) unless otherwise indicated.

PART 3 EXECUTION

3.01 PREPARATION

- A. Clean surfaces to receive adhesive products according to manufacturer's instructions.

3.02 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Install identification products to be plainly visible for examination, adjustment, servicing, and maintenance. Unless otherwise indicated, locate products as follows:
1. Surface-Mounted Equipment: Enclosure front.
 2. Flush-Mounted Equipment: Inside of equipment door.
 3. Free-Standing Equipment: Enclosure front; also enclosure rear for equipment with rear access.
 4. Elevated Equipment: Legible from the floor or working platform.
 5. Branch Devices: Adjacent to device.
 6. Interior Components: Legible from the point of access.
 7. Boxes: Outside face of cover.
 8. Conductors and Cables: Legible from the point of access.
 9. Devices: Outside face of cover.
- C. Install identification products centered, level, and parallel with lines of item being identified.
- D. Secure nameplates to exterior surfaces of enclosures using stainless steel screws and to interior surfaces using self-adhesive backing or epoxy cement.
- E. Install self-adhesive labels and markers to achieve maximum adhesion, with no bubbles or wrinkles and edges properly sealed.
- F. Install underground warning tape above buried lines with one tape per trench at 3 inches (75 mm) below finished grade.
- G. Secure rigid signs using stainless steel screws.
- H. Mark all handwritten text, where permitted, to be neat and legible.

END OF SECTION

**SECTION 26 05 75
MANUFACTURER'S ENGINEERING SERVICES**

PART 1 GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. This Section includes requirements for manufacturer's engineering services to assist in energizing and testing all busway and switchboard and providing breaker coordination and short circuit systems studies.

1.03 SUBMITTALS

- A. System Coordination and Short Circuit Study Report: Submit six copies of final report. Report shall be submitted within 60 days following award of purchase order.

1.04 INSTALLATION AND SERVICE ENGINEERING

- A. The manufacturer of the switchboard and busway shall provide an experienced Field Service Engineer to accomplish the following tasks:
 - 1. Inspection: Visually inspect all busway, switchboard and breakers upon completion of installation and prior to energization to assure that wiring is correct, interconnections complete and installation is in compliance with manufacturer's criteria.
 - 2. Provide engineering support during the energization and check out of busway and switchboard. Perform any calibration or adjustment necessary for the equipment to meet performance specifications.
 - 3. Field Service Engineer shall be at job site a minimum of 16 hours, and longer if necessary, to fulfill testing/inspection requirements.

1.05 SYSTEM STUDIES

- A. Perform the studies described below and submit 6 copies to Architect within 90 days after award of the contract. At time of submission, provide competent systems engineer to review findings and recommendations.
 - 1. Short Circuit Study: Shall be performed on a digital computer to check the adequacy and to verify correct application of circuit protective devices and other system components specified. Include representation of the power company's system, the base quantities selected, impedance source data, calculation methods and tabulations, one-line and impedance diagrams, conclusions and recommendations. Short circuit momentary duties, when applicable, and interrupting duties shall be calculated on the basis of an assumed bolted three-phase short circuit at each low-voltage bus, switchboard, motor control center, distribution panelboard, pertinent branch circuit panelboard, and other significant locations throughout the systems. The short circuit tabulations shall include significant X to R ratios, asymmetry factors, kVA, and symmetrical fault current.
 - 2. Coordination Study: Provide a protective device time-current coordination study with coordination plots of key or limiting devices plus tabulated data including ratings or settings selected. In the study, a professional engineering balance shall be achieved between the competing objectives of protection and continuity of service for the system specified, taking into account the basic factors of sensitivity, selectivity, and speed. As applicable, the coordination plots required shall graphically indicate the coordination proposed for the several systems centered on full scale log forms. The coordination plots shall include complete titles, representative one-line diagrams and legends, associated power company's relay or system characteristics, significant motor starting characteristics, complete operating bands for low-voltage circuit breaker trip devices, fuses, as applicable, and the associated system load protective devices. The coordination plots shall define the types of protective devices selected, together with the proposed pick-up settings required. The short-time region shall indicate the low-voltage circuit breaker and

instantaneous trip devices, fuse manufacturing tolerance bands, and significant symmetrical and asymmetrical fault currents. Low-voltage power circuit breakers shall be separated from each other, where feasible, by a 16 percent current margin for coordination and protection in the event of secondary line-to-line faults.

3. Report: Include recommendations for changes in device short circuit ratings where deemed necessary. Include, in tabulated form, recommended device time delay and pick-up settings for switchboard breakers and for breakers with adjustable instantaneous trip range.

PART 2 PRODUCTS

2.01 NOT USED

PART 3 EXECUTION

3.01 NOT USED

END OF SECTION

**SECTION 26 22 00
LOW-VOLTAGE TRANSFORMERS**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. General purpose transformers.

1.02 RELATED REQUIREMENTS

- A. Section 03 30 00 - Cast-in-Place Concrete: Concrete equipment pads.
- B. Section 26 05 26 - Grounding and Bonding for Electrical Systems.
- C. Section 26 05 29 - Hangers and Supports for Electrical Systems.
- D. Section 26 05 33.13 - Conduit for Electrical Systems: Flexible conduit connections.
- E. Section 26 05 33.13 - Conduit for Electrical Systems: Flexible conduit connections.

1.03 REFERENCE STANDARDS

- A. 10 CFR 431, Subpart K - Energy Efficiency Program for Certain Commercial and Industrial Equipment - Distribution Transformers Current Edition.
- B. IEEE C57.94 - IEEE Recommended Practice for Installation, Application, Operation, and Maintenance of Dry-Type Distribution and Power Transformers 2015.
- C. IEEE C57.96 - IEEE Standard Guide for Loading Dry-Type Distribution and Power Transformers 2013.
- D. NECA 1 - Standard for Good Workmanship in Electrical Construction 2015.
- E. NECA 409 - Standard for Installing and Maintaining Dry-Type Transformers 2015.
- F. NEMA ST 1 - Specialty Transformers (Except General Purpose Type); National Electrical Manufacturers Association; 1988 (R1997).
- G. NEMA ST 20 - Dry-Type Transformers for General Applications 2014.
- H. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum) 2020.
- I. NEMA TP 1 - Guide for Determining Energy Efficiency for Distribution Transformers; 2002.
- J. NEMA TP 2 - Standard Test Method for Measuring the Energy Consumption of Distribution Transformers; 2005.
- K. NEMA TP 3 - Standard for the Labeling of Distribution Transformer Efficiency; 2000.
- L. NETA ATS - Acceptance Testing Specifications for Electrical Power Equipment and Systems 2017.
- M. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- N. UL 506 - Standard for Specialty Transformers Current Edition, Including All Revisions.
- O. UL 1561 - Standard for Dry-Type General Purpose and Power Transformers Current Edition, Including All Revisions.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Include voltage, kVA, impedance, tap configurations, insulation system class and rated temperature rise, efficiency, sound level, enclosure ratings, outline and support point dimensions, weight, required clearances, service condition requirements, and installed features.
- C. Source Quality Control Test Reports: Include reports for tests designated in NEMA ST 20 as design and routine tests.

- D. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.
- E. Project Record Documents: Record actual locations of transformers.

1.05 QUALITY ASSURANCE

- A. Comply with requirements of NFPA 70.
- B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
- C. Products: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.
- B. Handle in accordance with manufacturer's written instructions. Lift only with lugs provided for the purpose. Handle carefully to avoid damage to transformer internal components, enclosure, and finish.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Square D: www.squared.com.
- B. Substitutions: See Section 26 00 10 - Electrical Equipment and Materials.

2.02 TRANSFORMERS - GENERAL REQUIREMENTS

- A. Description: Factory-assembled, dry type transformers for 60 Hz operation designed and manufactured in accordance with NEMA ST 20 and listed, classified, and labeled as suitable for the purpose intended.
- B. Unless noted otherwise, transformer ratings indicated are for continuous loading according to IEEE C57.96 under the following service conditions:
 - 1. Altitude: Less than 3,300 feet (1,000 m).
 - 2. Ambient Temperature:
 - a. Greater than 10 kVA: Not exceeding 104 degrees F (40 degrees C).
 - b. Less than 10 kVA: Not exceeding 77 degrees F (25 degrees C).
 - 3. Ambient Temperature: Not exceeding 86 degrees F (30 degrees C) average or 104 degrees F (40 degrees C) maximum measured during any 24 hour period.
- C. Core: High grade, non-aging silicon steel with high magnetic permeability and low hysteresis and eddy current losses. Keep magnetic flux densities substantially below saturation point, even at 10 percent primary overvoltage. Tightly clamp core laminations to prevent plate movement and maintain consistent pressure throughout core length.
- D. Impregnate core and coil assembly with non-hydroscopic thermo-setting varnish to effectively seal out moisture and other contaminants.
- E. Basic Impulse Level: 10 kV.
- F. Ground core and coil assembly to enclosure by means of a visible flexible copper grounding strap.
- G. Isolate core and coil from enclosure using vibration-absorbing mounts.
- H. Nameplate: Include transformer connection data, ratings, wiring diagrams, and overload capacity based on rated winding temperature rise.

2.03 GENERAL PURPOSE TRANSFORMERS

- A. Description: Self-cooled, two winding transformers listed and labeled as complying with UL 506 or UL 1561; ratings as indicated on the drawings.

- B. Primary Voltage: 480 volts delta, 3 phase.
- C. Secondary Voltage: 120/240 volts, 1 or 3 phase as noted.
- D. Insulation System and Allowable Average Winding Temperature Rise:
 - 1. Less than 15 kVA: Class 180 degrees C insulation system with 115 degrees C average winding temperature rise.
 - 2. 15 kVA and Larger: Class 220 degrees C insulation system with 150 degrees C average winding temperature rise.
- E. Coil Conductors: Continuous windings with terminations brazed or welded.
- F. Winding Taps:
 - 1. Less than 3 kVA: None.
 - 2. 3 kVA through 15 kVA: Two 5 percent full capacity primary taps below rated voltage.
 - 3. 15 kVA through 300 kVA: Two 2.5 percent full capacity primary taps above and four 2.5 percent full capacity primary taps below rated voltage.
- G. Energy Efficiency: Comply with 10 CFR 431, Subpart K.
 - 1. Test efficiency according to NEMA TP 2.
 - 2. Label transformer according to NEMA TP 3.
- H. Sound Levels: Standard sound levels complying with NEMA ST 20
- I. Mounting Provisions:
 - 1. Less than 15 kVA: Suitable for wall mounting.
 - 2. 15 kVA through 75 kVA: Suitable for wall, floor, or trapeze mounting.
 - 3. Larger than 75 kVA: Suitable for floor mounting.
- J. Transformer Enclosure: Comply with NEMA ST 20.
 - 1. Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:
 - 2. Construction: Steel.
 - a. Less than 15 kVA: Totally enclosed, non-ventilated.
 - b. 15 kVA and Larger: Ventilated.
 - 3. Finish: Manufacturer's standard grey, suitable for outdoor installations.
 - 4. Provide lifting eyes or brackets.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Perform work in accordance with NECA 1 (general workmanship).
- B. Install products in accordance with manufacturer's instructions.
- C. Install transformers in accordance with NECA 409 and IEEE C57.94.
- D. Use flexible conduit, under the provisions of Section 26 05 33.13, 2 feet (600 mm) minimum length, for connections to transformer case. Make conduit connections to side panel of enclosure.
- E. Arrange equipment to provide minimum clearances as specified on transformer nameplate and in accordance with manufacturer's instructions and NFPA 70.
- F. Install transformers plumb and level.
- G. Transformer Support:
 - 1. Provide required support and attachment in accordance with Section 26 05 29, where not furnished by transformer manufacturer.
 - 2. Use integral transformer flanges, accessory brackets furnished by manufacturer, or field-fabricated supports to support wall-mounted transformers.
 - 3. Unless otherwise indicated, mount floor-mounted transformers on properly sized 3 inch (80 mm) high concrete pad constructed in accordance with Section 03 30 00.

- 4. Use trapeze hangers assembled from threaded rods and metal channel (strut) to support suspended transformers. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.
- H. Mount wall-mounted transformers using integral flanges or accessory brackets furnished by the manufacturer.
- I. Mount floor-mounted transformers on properly sized 3 inch (80 mm) high concrete pad constructed in accordance with Section 03 30 00.
- J. Mount floor-mounted transformers using vibration isolators suitable for isolating the transformer noise from the building structure.
- K. Provide grounding and bonding in accordance with Section 26 05 26.
- L. Remove shipping braces and adjust bolts that attach the core and coil mounting bracket to the enclosure according to manufacturer's recommendations in order to reduce audible noise transmission.
- M. Where not factory-installed, install lugs sized as required for termination of conductors as indicated.

3.02 FIELD QUALITY CONTROL

- A. See Section 01 40 00 - Quality Requirements, for additional requirements.
- B. Perform field inspection, testing, and adjusting in accordance with Section 01 40 00.
- C. Inspect and test in accordance with NETA ATS, except Section 4.
- D. Perform inspections and tests listed in NETA ATS Sections 7.2.1.1 and 7.2.1.2. Tests and inspections listed as optional are not required.

3.03 ADJUSTING

- A. Measure primary and secondary voltages and make appropriate tap adjustments.
- B. Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.

END OF SECTION

**SECTION 26 24 16
PANELBOARDS**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Power distribution panelboards.
- B. Lighting and appliance panelboards.
- C. Overcurrent protective devices for panelboards.

1.02 RELATED REQUIREMENTS

- A. Section 26 05 26 - Grounding and Bonding for Electrical Systems.
- B. Section 26 05 26 - Grounding and Bonding for Electrical Systems.
- C. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.
- D. Section 26 05 75 – Manufacturer's Engineering Services.

1.03 REFERENCE STANDARDS

- A. FS W-C-375 - Circuit Breakers, Molded Case; Branch Circuit and Service 2013e (Amended 2017).
- B. NECA 1 - Standard for Good Workmanship in Electrical Construction 2015.
- C. NECA 407 - Standard for Installing and Maintaining Panelboards 2015.
- D. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum) 2020.
- E. NEMA PB 1 - Panelboards 2011.
- F. NEMA PB 1.1 - General Instructions for Proper Installation, Operation and Maintenance of Panelboards Rated 600 Volts or Less 2013.
- G. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- H. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations Current Edition, Including All Revisions.
- I. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations Current Edition, Including All Revisions.
- J. UL 67 - Panelboards Current Edition, Including All Revisions.
- K. UL 489 - Molded-Case Circuit Breakers, Molded-Case Switches and Circuit Breaker Enclosures Current Edition, Including All Revisions.

1.04 SUBMITTALS

- A. Shop Drawings: Indicate outline and support point dimensions, voltage, main bus ampacity, overcurrent protective device arrangement and sizes, short circuit current ratings, conduit entry locations, conductor terminal information, and installed features and accessories.
 - 1. Clearly indicate whether proposed short circuit current ratings are fully rated or, where acceptable, series rated systems.
- B. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.
- C. Project Record Documents: Record actual installed locations of panelboards and actual installed circuiting arrangements.

1.05 QUALITY ASSURANCE

- A. Comply with requirements of NFPA 70.

1.06 MAINTENANCE MATERIALS

- A. Furnish two of each panelboard key.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Schneider Electric; Square D Products; www.schneider-electric.us/#sle.

2.02 PANELBOARDS - GENERAL REQUIREMENTS

- A. Provide products listed, classified, and labeled as suitable for the purpose intended.
- B. Unless otherwise indicated, provide products suitable for continuous operation under the following service conditions:
 - 1. Altitude: Less than 6,600 feet (2,000 m).
 - 2. Ambient Temperature:
 - a. Panelboards Containing Circuit Breakers: Between 23 degrees F (-5 degrees C) and 104 degrees F (40 degrees C).
- C. Short Circuit Current Rating:
 - 1. Provide panelboards with listed short circuit current rating not less than the available fault current at the installed location as determined by short circuit study performed in accordance with Section 26 05 75.
 - 2. Listed series ratings are acceptable, except where not permitted by motor contribution according to NFPA 70.
 - 3. Label equipment utilizing series ratings as required by NFPA 70.
- D. Mains: Configure for top or bottom incoming feed as indicated or as required for the installation.
- E. Branch Overcurrent Protective Devices: Replaceable without disturbing adjacent devices.
- F. Bussing: Sized in accordance with UL 67 temperature rise requirements.
 - 1. Provide solidly bonded equipment ground bus in each panelboard, with a suitable lug for each feeder and branch circuit equipment grounding conductor.
- G. Conductor Terminations: Suitable for use with the conductors to be installed.
- H. Enclosures: Comply with NEMA 250, and list and label as complying with UL 50 and UL 50E.
 - 1. Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:
 - 2. Boxes: Galvanized steel unless otherwise indicated.
 - a. Provide wiring gutters sized to accommodate the conductors to be installed.
 - 3. Fronts:
 - a. Fronts for Surface-Mounted Enclosures: Same dimensions as boxes.
 - b. Fronts for Flush-Mounted Enclosures: Overlap boxes on all sides to conceal rough opening.
 - 4. Lockable Doors: All locks keyed alike unless otherwise indicated.
- I. Future Provisions: Prepare all unused spaces for future installation of devices including bussing, connectors, mounting hardware and all other required provisions.

2.03 POWER DISTRIBUTION PANELBOARDS

- A. Description: Panelboards complying with NEMA PB 1, power and feeder distribution type, circuit breaker type, and listed and labeled as complying with UL 67; ratings, configurations and features as indicated on the drawings.
- B. Conductor Terminations:
 - 1. Main and Neutral Lug Material: Copper, suitable for terminating copper conductors only.
 - 2. Main and Neutral Lug Type: Mechanical.

Bussing:

1. Phase and Neutral Bus Material: Copper.
2. Ground Bus Material: Copper.

D. Circuit Breakers:

1. Provide bolt-on type or plug-in type secured with locking mechanical restraints.

E. Enclosures:

1. Provide surface-mounted enclosures unless otherwise indicated

2.04 LIGHTING AND APPLIANCE PANELBOARDS

- A. Description: Panelboards complying with NEMA PB 1, lighting and appliance branch circuit type, circuit breaker type, and listed and labeled as complying with UL 67; ratings, configurations and features as indicated on the drawings.

B. Conductor Terminations:

1. Main and Neutral Lug Material: Copper suitable for terminating copper conductors only.
2. Main and Neutral Lug Type: Mechanical.

C. Bussing:

1. Phase Bus Connections: Arranged for sequential phasing of overcurrent protective devices.
2. Phase and Neutral Bus Material: Copper.
3. Ground Bus Material: Copper.

D. Circuit Breakers: Thermal magnetic bolt-on type unless otherwise indicated.

E. Enclosures:

1. Provide surface-mounted or flush-mounted enclosures as indicated.
2. Provide clear plastic circuit directory holder mounted on inside of door.

2.05 OVERCURRENT PROTECTIVE DEVICES

A. Molded Case Circuit Breakers:

1. Description: Quick-make, quick-break, over center toggle, trip-free, trip-indicating circuit breakers listed and labeled as complying with UL 489, and complying with FS W-C-375 where applicable; ratings, configurations, and features as indicated on the drawings.
2. Interrupting Capacity:
 - a. Provide circuit breakers with interrupting capacity as required to provide the short circuit current rating indicated, but not less than:
 - 1) 10,000 rms symmetrical amperes at 240 VAC or 208 VAC.
 - 2) 14,000 rms symmetrical amperes at 480 VAC.
 - b. Fully Rated Systems: Provide circuit breakers with interrupting capacity not less than the short circuit current rating indicated.
 - c. Series Rated Systems: Provide circuit breakers listed in combination with upstream devices to provide interrupting rating not less than the short circuit current rating indicated.
3. Conductor Terminations:
 - a. Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.
4. Thermal Magnetic Circuit Breakers: For each pole, furnish thermal inverse time tripping element for overload protection and magnetic instantaneous tripping element for short circuit protection.
5. Multi-Pole Circuit Breakers: Furnish with common trip for all poles.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Perform work in accordance with NECA 1 (general workmanship).
- B. Install products in accordance with manufacturer's instructions.
- C. Install panelboards in accordance with NECA 407 and NEMA PB 1.1.

- D. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.
- E. Provide required support and attachment in accordance with Section 26 05 29.
- F. Install panelboards plumb.
- G. Install flush-mounted panelboards so that trims fit completely flush to wall with no gaps and rough opening completely covered.
- H. Mount panelboards such that the highest position of any operating handle for circuit breakers or switches does not exceed 79 inches (2000 mm) above the floor or working platform.
- I. Provide minimum of six spare 1 inch (27 mm) trade size conduits out of each flush-mounted panelboard stubbed into accessible space above ceiling and below floor.
- J. Provide grounding and bonding in accordance with Section 26 05 26.
- K. Install all field-installed branch devices, components, and accessories.
- L. Provide filler plates to cover unused spaces in panelboards.
- M. Provide typed circuit directory for each branch circuit panelboard. Revise directory to reflect circuiting changes required to balance phase loads.
- N. Provide engraved plastic nameplates under the provisions of Section 26 0553.

3.02 ADJUSTING

- A. Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.
- B. Adjust alignment of panelboard fronts.
- C. Load Balancing: For each panelboard, rearrange circuits such that the difference between each measured steady state phase load does not exceed 20 percent and adjust circuit directories accordingly. Maintain proper phasing for multi-wire branch circuits.

END OF SECTION

**SECTION 26 29 23
VARIABLE-FREQUENCY MOTOR CONTROLLERS FOR PROCESS**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Variable-frequency motor controllers.

1.02 ABBREVIATIONS AND ACRONYMS

- A. IGBT: Insulated gate bipolar transistor.
- B. PID: Proportional-integral-derivative.
- C. PWM: Pulse width modulation.
- D. VFD: Variable-frequency drive.

1.03 DEFINITIONS

- A. Variable-frequency motor controllers may also be identified as VFDs, AFDs, variable-frequency drives, or adjustable-frequency drives.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordinate work to provide VFDs suitable for use with driven equipment.
- B. Preinstallation Meeting: Review material selections and installation procedures with manufacturer's representative and affected installers.
- C. Scheduling: Do not schedule functional demonstration testing until operational readiness testing is complete and associated report and certification have been submitted.

1.05 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Provide sufficient information to determine compliance with Contract Documents. Identify submittal data with specific equipment tags and/or service descriptions to which they pertain. Identify specific model numbers, options, and features of equipment proposed.
- C. Indicate deviations from Contract Documents with reference to corresponding drawing or specification number and written justification for deviation.
- D. Product Data: Provide manufacturer's standard catalog pages and data sheets for variable frequency drives, enclosures, components, and accessories.
 - 1. Indicate rated input kVA and output kVA or HP, topology, converter/inverter type, percent efficiency, and operating/electrical characteristics.
 - 2. Include maximum Btu (kJ) heat release data and ambient cooling requirements.
- E. Shop Drawings: Indicate enclosure dimensions, shipping section dimensions, weights, foundation requirements, required clearances, location and size of each field connection, and mounting and installation instructions.
 - 1. Include project-specific elementary and interconnection diagrams for power, signal, control, and communications wiring that provide minimum detail shown for drawings in NFPA 79 appendix.
 - 2. Include electronic 2D dimensional drawings and 3D model CAD files for standard units upon request.
- F. Operation and Maintenance Data:
 - 1. Provide detailed information on system operation, equipment programming and setup, replacement parts, and recommended maintenance procedures and intervals.
 - a. Include manufacturer, supplier, support, and repair center contact information.
 - b. Include manufacturer's standard operation and maintenance data assembled for each size and type of equipment furnished.
 - c. Include contact information for parts stocking location closest to Owner.
 - d. Include list of furnished and recommended spare parts.

- e. Identify critical spare parts associated with long lead times and/or those critical to unit operation.
 - f. Identify maintenance spare parts required to regularly perform scheduled equipment maintenance including, but not limited to, consumable parts required to be exchanged during scheduled maintenance periods.
- G. Project Record Documents:
- 1. Construction, installation, schematic, and wiring diagrams updated to as-installed and commissioned state.
 - 2. Configured settings/parameters for adjustable components updated to as-installed and commissioned state, noted if different from factory default.

1.06 QUALITY ASSURANCE

- A. Comply with the following:
- 1. NFPA 70.
 - 2. Requirements of authorities having jurisdiction.
 - 3. Applicable local codes.
- B. Manufacturer Qualifications:
- 1. Firm engaged in manufacture of specified products of types and sizes required, and whose products have been in satisfactory use in similar service for minimum of 10 years.
 - 2. Certified in accordance with ISO 9001 with applicable quality assurance system regularly reviewed and audited by third-party registrar. Develop and control manufacturing, inspection, and testing procedures under guidelines of quality assurance system.
 - 3. Service, repair, and technical support services available 24 hours per day, 7 days per week from manufacturer or their representative.
 - 4. Certified in accordance with ISO 14001.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Prior to delivery to project site, verify suitable storage space is available to store materials in well-ventilated area protected from weather, moisture, soiling, extreme temperatures, humidity, and corrosive atmospheres.
- B. Protect materials during delivery and storage and maintain within manufacturer's written storage requirements. At minimum, store indoors in clean, dry space with uniform temperature to prevent condensation and protect electronics from potential damage from electrical and magnetic energy.
- C. Deliver materials to project site in supplier's or manufacturer's original wrappings and containers, labeled with supplier's or manufacturer's name, material or product brand name, and equipment tag number or service name as identified in Contract Documents.
- D. Inspect products and report concealed damage or violation of delivery, storage, and handling requirements.

1.08 FIELD CONDITIONS

- A. Maintain field conditions within manufacturer's required service conditions during and after installation.

1.09 WARRANTY

- A. See Section 017800 - Closeout Submittals for additional warranty requirements.
- B. Manufacturer Warranty: Provide manufacturer warranty for defects in material and workmanship for 48 months from date of commissioning or 54 months from date of shipment, whichever comes first. Complete forms in Owner's name and register with manufacturer.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Schneider Electric; Altivar Process ATV600; www.se.com/#sle.

2.02 VARIABLE-FREQUENCY MOTOR CONTROLLERS

- A. Basis of Design: Schneider Electric; Altivar Process ATV600; www.se.com/#sle.
- B. Compact Drive Systems; **Altivar Process ATV660**:
 - 1. Combination enclosed drive controller with integrated enclosures for wall or floor mounting depending on size.
 - 2. Provide circuit breaker disconnect and adequate room for power peripherals, including isolation and bypass contactors, within same enclosure.
 - 3. Available with full range of standard and engineered options for various application requirements.
 - 4. Utilize **Altivar Process ATV630** standard drive unit as power converter.
- C. Description: Digitally controlled drive using pulse width modulation (PWM) for starting and speed control of standard IEC or NEMA MG 1 design, AC inverter-duty asynchronous motors and synchronous motors with permanent magnets by adjustment of output voltage and frequency.
- D. Unless otherwise indicated, match VFD to load (variable or constant torque) and actual motor being controlled considering speed, current, kVA, and inrush requirements.
- E. General Requirements:
 - 1. List and label as complying with UL 508 or UL 61800-5-1.
 - 2. Comply with:
 - a. IEC 60068-2-78.
 - b. IEC 60146-1-1.
 - c. IEC 60664-1.
 - d. IEC 60447.
 - e. IEC 61439-1.
 - f. IEC 60364-1.
 - g. IEC 60204-1.
 - h. IEC 60529.
 - i. IEC 61000 (SERIES).
 - j. IEC 61800 (SERIES).
 - k. IEC 60721-3-3.
 - l. IEC 60255-149.
 - m. IEC 61000-4-2.
 - n. NEMA ICS 4.
 - o. NEMA ICS 7.
 - 3. Sustainability; **SE Green Premium**:
 - a. Provide products designed for sustainable performance with available documentation on regulatory compliance, material content, environmental impact, and circularity attributes including but not limited to:
 - 1) Compliance with RoHS and REACH directives.
 - 2) Product environmental profiles (PEPs).
 - 3) Product end-of-life instructions.
 - b. Component Materials: Recyclable, nontoxic, and flame retardant.
 - c. Product Recyclability Rate: Greater than 70 percent.
 - d. Comply with IEC 62635 guidelines to reduce carbon footprint, with available documentation of product carbon foot print.
 - 4. Environmental Requirements:
 - a. Rated to withstand the following environmental conditions while providing 100 percent output current continuously:
 - 1) Storage Temperature: From minus 40 degrees F (minus 40 degrees C) to 158 degrees F (70 degrees C).

- 2) Operating Temperature:
 - (a) UL 50E Type 1: From 5 degrees F (minus 15 degrees C) to 122 degrees F (50 degrees C) without derating, up to 140 degrees F (60 degrees C) with derating of power stage.
 - (b) Enclosed: From 14 degrees F (minus 10 degrees C) to 104 degrees F (40 degrees C) without derating, down to 14 degrees F (minus 10 degrees C) with enclosure heater, up to 131 degrees F (55 degrees C) with derating of power stage.
 - 3) Relative Humidity: Between 0 and 95 percent without condensation in accordance with IEC 60068-2-78.
 - 4) Operating Altitude: Up to 3,280 feet (1000 m) without derating, up to 15,748 feet (4800 m) with derating.
 - 5) Corrosion Protection Level: IEC 60721-3-3, Class 3C3 for cooling air and chemical gases.
 - 6) Biological Protection Level: IEC 60721-3-3, Class 3B1.
 - 7) Dust Protection Level: IEC 60721-3-3, Class 3S3.
 - 8) Vibration and Shock Protection Level: IEC 60721-3-3, Class 3M3.
 - b. Derating: Provide derating factor as required in accordance with environmental conditions to prevent degradation of unit lifetime, performance, overload capability, or reliability.
 - c. Enclosure:
 - 1) Integral Enclosure: UL 50E Type 12, unless otherwise indicated.
 - 2) User Interface Terminal: UL 50E Type 12, mounted on front face of enclosure, and accessible for programming and controls with main door closed.
 - 3) Provide front-accessible cabinet constructed in accordance with IEC 60439-1.
 - 4) Provide bottom conduit entry to allow for top mounted cooling components.
 - 5) Provide forced-air and heat-sink cooling system that does not require liquid or air condition cooling components for ambient temperatures within drive's stated ambient temperature operating range.
- F. Performance Requirements:
1. Provide normal duty rating unless otherwise indicated.
 2. Normal Duty:
 - a. Overload Capability: Allow 110 percent current overload for one minute.
 - b. Overtorque Capability: Allow 110 percent of rated motor torque during 60 seconds, every 10 minutes.
 3. Input Voltage Tolerance: Plus 10 percent/minus 15 percent of nominal input voltage range.
 4. Rated Frequency: 50 Hz to 60 Hz, plus/minus 5 percent; **operate from 40 to 72 Hz when powered by standby or emergency generators**.
 5. Displacement Power Factor: 0.97, minimum.
 6. Harmonics Mitigation:
 - a. Compact Drive Systems; **Altivar Process ATV660**:
 - 1) Available Ratings: 100 hp and below at 460 VAC.
 - 2) Provide integral impedance of 3 percent, minimum, for current total harmonic distortion (THD-I) less than 48 percent at 80 to 100 percent load in accordance with IEC 61000-3-12.
 7. Efficiency:
 - a. Compact Drive Systems; **Altivar Process ATV660**: Greater than 97.5 percent at nominal load.
 8. Surge Immunity: IEC 61000-4-5, Level 3.
 9. Comply with SEMI F47 for degraded running operation during undervoltage conditions.
 - a. 50 percent undervoltage for up to 200 milliseconds.
 - b. 30 percent undervoltage for up to 500 milliseconds.

- c. 20 percent undervoltage for up to 1 second.
 - 10. Speed Range:
 - a. Motor Quadrant: 1:100 in sensorless vector control.
 - b. Generator Quadrant: 1:50 in sensorless vector control.
 - 11. Speed Accuracy: Plus/minus 10 percent of nominal motor slip in sensorless vector control.
 - 12. Torque Control Accuracy: Plus/minus 15 percent in sensorless vector control for AC motors.
- G. Application Requirements:
- 1. Supported Motor Control Types:
 - a. Volts per hertz vector control, standard.
 - b. Volts per hertz vector control, 5 points.
 - c. Volts per hertz vector control, quad.
 - d. Synchronous motor control.
 - e. Volts per hertz vector control, energy savings.
 - 2. Provide real time clock management with battery backup.
 - 3. Support automatic tuning of motor parameters through measurement of motor without rotation, and without disconnection of load from motor.
 - 4. Provide functionality adjustable within drive parameters to reduce voltage surges on motor cables.
 - 5. Voltage Reflection Suppression: Provide AC chokes and filters as required for installation and motor requirements.
 - a. Motors Complying with IEC TS 60034-25 or NEMA MG 1 Part 31:
 - 1) Unshielded Motor Cable Length up to 1,640 feet (500 m): Provide dV/dt filter.
 - b. Motors not Complying with IEC TS 60034-25 or NEMA MG 1 Part 31.
 - 1) Unshielded Motor Cable Length up to 164 feet (50 m): Provide dV/dt filter.
 - 6. Protection:
 - a. Listed as complying with UL 508 or UL 61800-5-1 for use on distribution systems.
 - b. Short Circuit Current Rating:
 - 1) Coordinated in accordance with UL 61800-5-1 and NEMA ICS 7.1.
 - 2) Minimum Short Circuit Current Rating:
 - (a) Compact Drive Systems[; **Altivar Process ATV660**]: 100 kA.
 - c. Micro-Short Voltage Sag Immunity: Comply with SEMI F47.
 - d. Upon power-up, automatically test for valid operation of memory, option module, loss of analog reference input, loss of communication, DC to DC power supply, control power, and precharge circuit.
 - e. Protect against short circuits between output phases and ground, and logic and analog outputs.
 - f. Provide selectable ride through function enabling logic to maintain control for minimum of one second without tripping.
 - g. Deceleration Mode: Programmable for normal and trip conditions.
 - h. Stop Modes: Freewheel stop, fast stop.
 - i. Upon loss of analog process follower reference signal, trip and/or operate at user-defined speed set by software programmed speed settings or last speed.
 - j. Integrate protection against IGBT and heat sink overtemperature.
 - k. Solid State Thermal Protection: Listed as complying with IEC 61800-5-1, Class 10 overload protection; comply with IEC 60947-2.
 - l. Provide motor thermal memory retention function.
 - m. Support protection of motor with temperature probes connected.
 - n. Support limiting motor surge to twice DC bus voltage.
 - o. Provide internal error detection.
 - p. IGBT Protection:
 - 1) Overcurrent protection.

- 2) Checkup sequence.
- 3) Checkup sequence before PWM enable sequence.
- 4) Overheat protection.
- q. Current Protection:
 - 1) Phase short circuit protection.
 - 2) Ground protection.
 - 3) Overcurrent protection.
- r. Voltage Error Protection:
 - 1) Mains overvoltage protection.
 - 2) Mains undervoltage protection.
 - 3) DC bus overvoltage protection.
 - 4) DC bus precharge protection.
- s. Thermal Protection:
 - 1) Overtemperature protection.
 - 2) Fan management.
 - 3) Switching frequency management.
- t. Motor Protection Functions:
 - 1) Motor output phase detection.
 - 2) Motor surge voltage.
 - 3) Motor overload detection.
 - 4) Motor stall protection.
- u. Application Protection Functions:
 - 1) Catch-on-fly function.
 - 2) Mains input phase lost protection.
 - 3) Motor overspeed input protection.
 - 4) Current limitation.
 - 5) Power limitation.
 - 6) Reverse inhibition.
 - 7) Underload protection.
 - 8) Overload protection.
 - 9) External error management.
 - 10) Loss of follower signal.
 - 11) Thermal sensor management.
 - 12) PID feedback.
 - 13) Customer-defined input.
- H. Control and Interface Requirements:
 - 1. Indicators:
 - a. LED near connection point of device that displays when hazardous voltage is present.
 - b. Three LEDs for local diagnostics.
 - c. Three dual-color LEDs for embedded communication status.
 - d. Four dual-color LEDs for optional communication status.
 - 2. User Interface:
 - a. Provide detachable UL 50E Type 12/IEC 60529 IP65 rated bi-color backlit graphical user interface terminal with keypad and capacitive wheel for monitoring, annunciation, and configuration. Change graphical display to red backlit color when alarm occurs.
 - b. Door-mount interface with 7/8 inch (22 mm) hole.
 - c. Provide "Simply Start" menu for commissioning; provide accessible parameter setting with plain text messaging and actual setting range.
 - d. Support password protection via keypad.
 - e. Support saving and downloading VFD configurations and porting them to other VFDs.
 - f. Provide mini-USB port for mass storage or PC device connection.

- g. Self-Diagnostic Capabilities: Display alarms, errors, and warnings as they occur and store minimum of 15 last messages in memory; accessible by PC maintenance tools or web server with flash record for data logging expertise.
 - h. Utilize identical user interfaces throughout power range to avoid user confusion and need for training in several different units.
 - i. Display messages in plain text; support multiple languages including English, French, and Spanish.
 - j. Provide QR code or equivalent for access to enhanced diagnostics, documentation, and customer service.
3. Control Interface:
- a. Interface with automation systems to monitor, control, display, and record data for use in processing reports. Retain settings within nonvolatile memory.
 - b. Speed Command and Reference Control Sources:
 - 1) I/O terminals.
 - 2) Communication network.
 - 3) Web server.
 - 4) Remote graphic display terminal.
 - c. Inputs/Outputs:
 - 1) Analog Inputs: **Three** programmable 0(4)-20 mA or 0-10 VDC.
 - (a) Two analog inputs also programmable for temperature sensors (PTC, PT100, PT1000, KTY84).
 - 2) Analog Outputs: Two programmable 0(4)-20 mA or 0-10 VDC.
 - 3) Discrete Inputs: **Six** programmable isolated logic inputs, sink or source.
 - (a) Two discrete inputs also programmable as 0-30 kHz pulse inputs.
 - (b) Two discrete inputs dedicated for safe torque off safety function in accordance with IEC 61508-1 SIL3.
 - 4) Discrete Outputs: **Three** programmable relay contacts **and one open collector output**.
 - (a) One discrete output dedicated to product watchdog logic.
 - d. Programmable Analog Input Available Assignments:
 - 1) Speed reference.
 - 2) Summing reference.
 - 3) Subtracting reference.
 - 4) Multiplying reference.
 - 5) Torque reference.
 - 6) Torque limitation.
 - 7) PID feedback.
 - 8) Manual PID reference.
 - 9) PID speed reference.
 - 10) Forced local reference.
 - e. Programmable Analog Output Available Assignments:
 - 1) Motor current.
 - 2) Motor frequency.
 - 3) Motor torque, signed or unsigned.
 - 4) Motor power.
 - 5) Motor voltage.
 - 6) Output frequency, signed or unsigned.
 - f. Programmable Discrete Input Available Assignments:
 - 1) Run.
 - 2) Forward.
 - 3) Reverse.
 - 4) Jog.
 - 5) Preset speeds.

- 6) Plus speed.
 - 7) Minus speed
- g. Programmable Discrete Output Available Assignments:
 - 1) Ready.
 - 2) Drive running.
 - 3) Frequency reference attained.
 - 4) Current attained.
 - 5) High speed attained.
 - 6) Drive error.
 - 7) Current present.
 - 8) Power removed.
 - 9) Alarm groups.
 - 10) Alarms: Load slipping, 4-20 mA loss, brake control, external error, PTC, PID error, PID feedback, IGBT temperature, undervoltage, torque control, drive temperature, braking resistor, fan counter, fan feedback, customer warning, power threshold, and electrical power drift.
- h. Safety Inputs:
 - 1) Two inputs dedicated to safe torque off (STO) safety function, which prohibits unintended equipment operation, in accordance with IEC 61508-1 SIL3.
 - 2) Comply with ISO 13849-1 and ISO 13849-2 (PL e).
 - 3) Manufacturer to provide certified schematics and list of devices to comply with IEC 60204-1 stopping category 0 and 1.
 - 4) Integrate safety contacts in accordance with EN-81 (SERIES).
- 4. Communications:
 - a. Provide one Modbus and one Ethernet Modbus TCP communications port.
 - b. Ethernet Ports: Comply with IPv6, provide capability for web server access and network management via SNMP and clock synchronization.
 - c. Embedded Web Server:
 - 1) Support enhanced diagnostic, mini usb, parameter access, and energy management.
 - 2) Support creation of user-defined custom dashboard for viewing drive and process status through tables, charts, and graphical views.
 - 3) Support export of data in standard table format using web server, for energy consumption information and error/warning history.
 - d. Comply with Cyber Security Management ISA Secure/Achilles.
 - e. Provide communications modules **capable of being** remotely powered by separate external 24 VDC source for continued communications with drive power supply off.
 - f. Integration Connectivity:
 - 1) DHCP protocol for fast device replacement.
 - 2) DTM library in accordance with standard FDT technology.
- 5. Configuration:
 - a. Support independent command and speed reference signals from:
 - 1) Terminals.
 - 2) Modbus port.
 - 3) Ethernet port.
 - 4) Communication option card.
 - 5) Keypad display.
 - b. Speed Setpoint Function:
 - 1) Maximum output frequency function.
 - 2) Low and high speed scaling and limitation function.
 - 3) Jump frequency.
 - 4) Up-down speed references.

- c. Stop Function:
 - 1) Deceleration ramp on power loss.
- d. Acceleration/Deceleration, Time-Adjustable Ramp Function:
 - 1) Ramp Type: Linear ramp, S shape ramp, with U or customized profile.
 - 2) Ramp deceleration adaptation.
 - 3) Ramp switching.
- e. Application Programming Dedicated to Pumps:
 - 1) Pump Control and Monitoring Functions:
 - (a) Centrifugal pump characteristics and configurations.
 - (b) Pump Monitoring Function: Define data relevant for pump including acceleration, low speed, and high speed.
 - (c) Application Units Function: Define units used in applications.
 - (d) Pump Cyclic Start Protection: Protect pump against excessive restarts in dedicated time period.
 - (e) Multi-pump functions.
 - 2) Pump Protection Functions:
 - (a) Anti-Jam Function: Remove automatically clogging substances from pump impellers.
 - (b) Pipe Cleaning Function: Start pump regularly to avoid sedimentation in pump impeller.
 - (c) Cavitation pump protection.
 - (d) Inlet protection to avoid system dry running.
 - 3) Application Control Functions:
 - (a) Stop-and-Go Function: Reduce consumption in standby mode.
 - (b) Pulse input to connect flow meter.
 - (c) Process Control (PID) Function: Maintain process at given pressure or flow reference.
 - (d) Flow Limitation Function: Limit consumption of water.
 - (e) Friction Loss Compensation Function: Compensate for pressure losses in pipes due to friction.
 - (f) Pipe Fill Function: Manage smooth control during pipe filling and lessen effects of water hammer.
 - (g) Sleep Wake-Up Function: Manage periods of application when process demand is low and when not needed.
 - (h) Low Demand Function: Define periods of application when process demand is low to save energy.
 - (i) Jockey Pump Control Function: Start jockey pump, during sleep period, to maintain emergency service pressure or demand including low water.
 - (j) Sensor Management: Define use to drive inputs to manage pressure sensor or flow sensor.
 - 4) Application Protection Functions:
 - (a) High Flow Protection Function: Detect pipe burst or detect running outside normal working area.
 - (b) Outlet Pressure Protection Function: Fix minimum and maximum pressure.
 - 5) Pump Curve Input to Optimize Pump Performance:
 - (a) Input and storage of pump characteristics including five points of pump curve.
 - (b) Best Efficiency Point (BEP) Function: Run in optimum conditions and detect deviation from that point.
- 6. Diagnostics and Configuration:
 - a. Windows-Based PC Software: Support setting and modifying of parameters, controlling drive, reading actual values, and analyzing trends; support wired or wireless connection to VFD.

- b. Display faults in plain text on help screens for troubleshooting; codes are not acceptable.
 - c. Provide real time clock management for time stamping of detected errors.
 - d. Display detected errors with QR codes for troubleshooting.
 - e. Provide LED lights to indicate VFD status.
 - f. Support dynamic display of I/O status.
- 7. Energy Management:
 - a. Data Logging Function: Keep files ready for maintenance or user.
 - b. Provide energy management information through web server, keypad, facet for SCADA, or communication networks.
 - c. Support display of energy efficiency and energy management chart.
 - 1) Report in KW.
 - 2) Energy History: Instant, weekly, monthly, and yearly.
 - 3) Trend base on variation/time.
 - 4) Power Measurement Accuracy: Less than 5 percent.
 - d. Support display of efficient set point for pump based on pump characteristics.
 - e. Support display of efficiency board including CO2 savings, savings viewer, and return of investment.

2.03 SOURCE QUALITY CONTROL

- A. See Section 014000 - Quality Requirements for additional requirements.
- B. Factory Acceptance Testing (FAT): Provide factory functional testing of VFDs prior to shipment.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Examine equipment exterior and interior for damage, including but not limited to, structure, moisture, and mildew.
- B. Examine for conditions detrimental to completion of work.

3.02 INSTALLATION

- A. Install equipment in accordance with manufacturer's written instructions.

3.03 FIELD QUALITY CONTROL

- A. See Section 014000 - Quality Requirements for additional requirements.
- B. Manufacturer Services: **Provide services of manufacturer's field representative to perform functional testing, commissioning, and first parameter adjusting.**
 - 1. Include necessary material, equipment, labor, and technical supervision.
 - 2. Replace damaged or malfunctioning equipment and report discrepancies or installation issues.
 - 3. Identify motor controllers with label indicating inspection/testing agency and date of service.
- C. Operational Readiness Testing:
 - 1. Inspect and test equipment and associated systems for conformance to Contract Documents, including equipment manufacturer's recommendations, and readiness for operation.
 - a. Visually inspect for physical damage and proper installation.
 - b. Perform tests in accordance with manufacturer's instructions.
 - c. Perform tests to verify compliance with Contract Documents.
 - d. Perform tests to verify equipment is ready for operation.
 - e. Touch-up paint chips and scratches with manufacturer-supplied paint.

3.04 CLOSEOUT ACTIVITIES

- A. See Section 017800 - Closeout Submittals for additional submittals.
- B. See Section 017900 - Demonstration and Training for additional requirements.
- C. Functional Demonstration Testing: Demonstrate proper operation of transformers and associated systems to Owner's designated representative, observing and documenting compliance with Contract Documents.
- D. Training:
 - 1. Train Owner's personnel on operation and maintenance of system.
 - a. Accommodate minimum of **four** attendees.
 - b. Provide not less than **one** session(s) with **TWO hours** of classroom and hands-on training.
 - c. Training Reference: **Use submitted operations and maintenance manuals for each participant.**
 - d. Instructor: Factory-trained manufacturer's representative.
 - e. Location: Project site.
 - 2. Provide sufficient time and detail in each session to cover the following at minimum:
 - a. Operation theory.
 - b. Major equipment components.
 - c. Equipment operation.
 - d. Equipment configurations.
 - e. Maintenance, troubleshooting, and repair.
 - f. Component-level parts replacement.

3.05 PROTECTION

- A. Protect installed motor controllers from subsequent construction operations.

END OF SECTION

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**SECTION 26 32 15
NATURAL GAS GENERATOR SET**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes packaged engine-generator sets suitable for use in applications with the features as specified and indicated where the engine generators will be used as the Standby power source for the system.

1.3 DEFINITIONS

- A. Emergency Standby Power (ESP): Per ISO 8528: The maximum power available during a variable electrical power sequence, under the stated operating conditions, for which a generating set is capable of delivering in the event of a utility power outage or under test conditions for up to 200 hours of operation per year with the maintenance intervals and procedures being carried out as prescribed by the manufacturers. The permissible average power output (Ppp) over 24 hours of operation shall not exceed 70 percent of the ESP unless otherwise agreed by the RIC engine manufacturer.
- B. Operational Bandwidth: The total variation from the lowest to highest value of a parameter over the range of conditions indicated, expressed as a percentage of the nominal value of the parameter.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of packaged engine generator indicated. Include rated capacities, operating characteristics, and furnished specialties and accessories. In addition, include the following:
 - 1. Thermal damage curve for generator.
 - 2. Time-current characteristic curves for generator protective device.
 - 3. Sound test data, based on a free field requirement.
- B. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, and location and size of each field connection.
 - 1. Dimensioned outline plan and elevation drawings of engine-generator set and other components specified.
 - 2. Wiring Diagrams: Control interconnection, Customer connections.
- C. Certifications:
 - 1. Submit statement of compliance which states the proposed product(s) is certified to the emissions standards required by the location for EPA, stationary emergency application.

1.5 INFORMATIONAL SUBMITTALS

- A. Source quality-control test reports.
 - 1. Certified summary of prototype-unit test report. See requirements in Part 2 "Source Quality Control" Article Part A. Include statement indicating torsional compatibility of components.
 - 2. Certified Test Report: Provide certified test report documenting factory test per the requirements of this specification, as well as certified factory test of generator set sensors per NFPA110 level 1.
 - 3. List of factory tests to be performed on units to be shipped for this Project.
 - 4. Report of exhaust emissions and compliance statement certifying compliance with applicable regulations.
- B. Warranty:
 - 1. Submit manufacturer's warranty statement to be provided for this Project.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.

- B. Manufacturer Qualifications: A qualified manufacturer. Maintain, within Michigan of Project site, a service center capable of providing training, parts, and emergency maintenance repairs.
- C. Source Limitations: Obtain packaged generator sets and auxiliary components through one source from a single manufacturer.
- D. Comply with NFPA 37 (Standard For the Installation and Use of Stationary Combustion Engines and Gas Turbines).
- E. Comply with NFPA 70 (National Electrical Code. Equipment shall be suitable for use in systems in compliance to Article 700, 701, and 702).
- F. Comply with NFPA 110 (Emergency and Standby Power Systems) requirements for Level 1 emergency power supply system.
- G. Comply with UL 2200.

1.7 PROJECT CONDITIONS

- A. Environmental Conditions: Engine-generator system shall withstand the following environmental conditions without mechanical or electrical damage or degradation of performance capability:
 - 1. Ambient Temperature: 0.0 deg C (32.0 deg F) to 25.0 deg C (77.0 deg F).
 - 2. Relative Humidity: 0 to 95 percent.
 - 3. Altitude: Sea level to 361.0 feet (110.0 m).

1.8 WARRANTY

- A. Base Warranty: Manufacturer shall provide base warranty coverage on the material and workmanship of the generator set for a minimum of twenty-four (24) months for Standby product and twelve (12) months for Prime/Continuous product from registered commissioning and start-up.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: The basis for this specification is Cummins Power Generation equipment, approved equals may be considered if equipment performance is shown to meet the requirements herein.
- B. The manufacturer must certify that the engine and generator/alternator end are the product of one company which has complete unit responsibility for the performance of the engine generator set and its accessories.
- C. Generac Industrial, Caterpillar, and Kohler are acceptable equivalent manufacturers and must provide their sizing report at the same time as submitting 260010.

2.2 ENGINE-GENERATOR SET

- A. Factory-assembled and -tested, engine-generator set.
- B. Mounting Frame: Maintain alignment of mounted components without depending on concrete foundation; and have lifting attachments.
 - 1. Rigging Information: Indicate location of each lifting attachment, generator-set center of gravity, and total package weight in submittal drawings.
- C. Capacities and Characteristics:
 - 1. Power Output Ratings: Electrical output power rating for Standby operation of not less than 125.0kW, at 80 percent lagging power factor, 277/480, Series Wye, Three phase, 4 -wire, 60 hertz.
 - 2. Alternator shall be capable of accepting maximum 497.0 kVA in a single step and be capable of recovering to a minimum of 90% of rated no load voltage. Following the application of the specified kVA load at near zero power factor applied to the generator set.
 - 3. Nameplates: For each major system component to identify manufacturer's name and address, and model and serial number of component. The engine-generator nameplate shall include information of the power output rating of the equipment.
- D. Performance - Vendors shall size equipment for the following loads and steps. All equipment vendors shall quote equipment that meets performance requirements:
 - 1. Step One Loads:
 - a. 60 HP Well Pump, on VFD, 480V, three phase
 - b. 15 kW Electric Heater, 480V, three phase

- c. Exhaust Fan, 1/4 HP, 120V, single phase
- d. LED Lights, 800 watts, 120V, single phase
- e. Receptacles, 1 KW, 120V, single phase
- f. Miscellaneous, 5 KW, 120V, single phase
- 2. Step Two Loads:
 - g. 60 HP Well Pump, on VFD, 480V, three phase
- 3. With the above loads the package shall be loaded less than 75% of capacity, maximum frequency dip shall be less than 15 Hz and maximum starting voltage dip shall be 35% or less. **Provide generator calculation report when 260010 is submitted.**
- 4. Voltage regulation shall not exceed one percent for any constant load between no load and rated load. Random voltage variation with any steady load from no load to full load shall not exceed +/- 0.5 percent.
- 5. Frequency regulation shall be isochronous from steady state no load to steady state rated load. Random frequency variation with any steady load from no load to full load shall not exceed plus or minus 0.25%.
- 6. Cooling system shall not derate in the enclosure at temperatures below required 104°F.
- E. Generator-Set Performance:
 - 1. Steady-State Voltage Operational Bandwidth: 1.0 percent of rated output voltage from no load to full load.
 - 2. Transient Voltage Performance: Not more than 11 percent variation for 50 percent step-load increase or decrease. Voltage shall recover and remain within the steady-state operating band within 1 seconds. On application of a 100% load step the generator set shall recover to stable voltage within 10 seconds.
 - 3. Steady-State Frequency Operational Bandwidth: 0.5 percent of rated frequency from no load to full load.
 - 4. Steady-State Frequency Stability: When system is operating at any constant load within the rated load, there shall be no random speed variations outside the steady-state operational band and no hunting or surging of speed.
 - 5. Transient Frequency Performance: Not more than 7 percent variation for 50 percent step-load increase or decrease. Frequency shall recover and remain within the steady-state operating band within 4 seconds. On application of a 100% load step the generator set shall recover to stable frequency within 10 seconds.
 - 6. Output Waveform: At full load, harmonic content measured line to line or line to neutral shall not exceed 5 percent total and 3 percent for any single harmonic. Telephone influence factor, determined according to NEMA MG 1, shall not exceed 50.
 - 7. Sustained Short-Circuit Current: (For engine-generator sets using a PMG-excited alternator) For a 3-phase, bolted short circuit at system output terminals, system shall supply a minimum of 300 percent of rated full-load current for not less than 8 seconds without damage to generator system components. For a 1-phase, bolted short circuit at system output terminals, system shall regulate both voltage and current to prevent over-voltage conditions on the non-faulted phases.
 - 8. Start Time: Comply with NFPA 110, Level 1, Type 10, system requirements.
 - 9. Ambient Condition Performance: Engine generator shall be designed to allow operation at full rated load in an ambient temperature under site conditions, based on highest ambient condition. Ambient temperature shall be as measured at the air inlet to the engine generator for enclosed units, and at the control of the engine generator for machines installed in equipment rooms.

2.3 ENGINE

- A. Fuel: Natural Gas
- B. Rated Engine Speed: 1800RPM.
- C. Lubrication System: The following items are mounted on engine or skid:
 - 1. Lube oil pump: shall be positive displacement, mechanical, full pressure pump.
 - 2. Filter and Strainer: Provided by the engine manufacturer of record to provide adequate filtration for the prime mover to be used.

3. Crankcase Drain: Arranged for complete gravity drainage to an easily removable container with no disassembly and without use of pumps, siphons, special tools, or appliances.
- D. Engine Fuel System: The engine fuel system shall be installed in strict compliance to the engine manufacturer's instructions
- E. Coolant Jacket Heater: Electric-immersion type, factory installed in coolant jacket system. Comply with NFPA 110 requirements for Level 1 equipment for heater capacity and performance.
 1. Designed for operation on a single 120 VAC, Three phase, 60Hz power connection. Heater voltage shall be shown on the project drawings.
 2. Installed with isolation valves to isolate the heater for replacement of the element without draining the engine cooling system or significant coolant loss.
 3. Provided with a 12VDC thermostat, installed at the engine thermostat housing
- F. Governor: Adjustable isochronous, with speed sensing. The governing system dynamic capabilities shall be controlled as a function of engine coolant temperature to provide fast, stable operation at varying engine operating temperature conditions. The control system shall actively control the fuel rate as appropriate to the state of the engine generator. Fuel rate shall be regulated as a function of starting, accelerating to start disconnect speed, accelerating to rated speed, and operating in various isochronous states.
- G. Cooling System: Closed loop, liquid cooled
 1. The generator set manufacturer shall provide prototype test data for the specific hardware proposed demonstrating that the machine will operate at rated standby load in an outdoor ambient condition of 50 deg C.
 2. Coolant: Solution of 50 percent ethylene-glycol-based antifreeze and 50 percent water, with anticorrosion additives as recommended by engine manufacturer.
 3. Size of Radiator overflow tank: Adequate to contain expansion of total system coolant from cold start to 110 percent load condition.
 4. Expansion Tank: Constructed of welded steel plate and rated to withstand maximum closed-loop coolant system pressure for engine used. Equip with gage glass and petcock.
 5. Temperature Control: Self-contained, thermostatic-control valve modulates coolant flow automatically to maintain optimum constant coolant temperature as recommended by engine manufacturer.
 6. Duct Flange: Generator sets installed indoors shall be provided with a flexible radiator duct adapter flange.
- H. Muffler/Silencer: Selected with performance as required to meet sound requirements of the application, sized as recommended by engine manufacturer and selected with exhaust piping system to not exceed engine manufacturer's engine backpressure requirements. For generator sets with outdoor enclosures the silencer shall be inside the enclosure.
- I. Air-Intake Filter: Engine-mounted air cleaner with replaceable dry-filter element and restriction indicator.
- J. Starting System: 12 or 24V, as recommended by the engine manufacturer; electric, with negative ground.
 1. Components: Sized so they will not be damaged during a full engine-cranking cycle with ambient temperature at maximum specified in Part 1 "Project Conditions" Article.
 2. Cranking Cycle: As required by NFPA 110 for level 1 systems.
 3. Battery Cable: Size as recommended by engine manufacturer for cable length as required. Include required interconnecting conductors and connection accessories.
 4. Battery Compartment: Factory fabricated of metal with acid-resistant finish.
 5. Battery-Charging Alternator: Factory mounted on engine with solid-state voltage regulation. The battery charging alternator shall have sufficient capacity to recharge the batteries with all parasitic loads connected within 4 hours after a normal engine starting sequence.
 6. Battery Chargers: Unit shall comply with UL 1236, provide fully regulated, constant voltage, current limited, battery charger for each battery bank. It will include the following features:
 - a. Operation: Equalizing-charging rate based on generator set manufacturer's recommendations shall be initiated automatically after battery has lost charge until an adjustable equalizing voltage is achieved at battery terminals. Unit shall

then be automatically switched to a lower float-charging mode and shall continue to operate in that mode until battery is discharged again.

- b. Automatic Temperature Compensation: Adjust float and equalize voltages for variations in ambient temperature from minus 20 deg C to plus 40 deg C to prevent overcharging at high temperatures and undercharging at low temperatures.
- c. Automatic Voltage Regulation: Maintain constant output voltage regardless of input voltage variations up to plus or minus 10 percent.
- d. Safety Functions: Sense abnormally low battery voltage and close contacts providing low battery voltage indication on control and monitoring panel. Sense high battery voltage and loss of ac input or dc output of battery charger. Either condition shall close contacts that provide a battery-charger malfunction indication at system control and monitoring panel.
- e. Provide LED indication of general charger condition, including charging, faults, and modes. Provide a LCD display to indicate charge rate and battery voltage. Charger shall provide relay contacts for fault conditions as required by NFPA110.
- f. Enclosure and Mounting: NEMA, Type 1, wall-mounted cabinet.

2.4 CONTROL AND MONITORING

- A. Engine generator control shall be microprocessor based and provide automatic starting, monitoring, protection and control functions for the unit.
- B. Automatic Starting System Sequence of Operation: When mode-selector switch on the control and monitoring panel is in the automatic position, remote-control contacts in one or more separate automatic transfer switches initiate starting and stopping of generator set. When mode-selector switch is switched to the on position, generator set starts. The off position of same switch initiates generator-set shutdown. (Switches with different configurations but equal functions are acceptable.) When generator set is running, specified system or equipment failures or derangements automatically shut down generator set and initiate alarms. Operation of the local (generator set-mounted) and/or remote emergency-stop switch also shuts down generator set.
- C. Manual Starting System Sequence of Operation: Switching on-off switch on the generator control panel to the on position starts generator set. The off position of same switch initiates generator-set shutdown. When generator set is running, specified system or equipment failures or derangements automatically shut down generator set and initiate alarms. Operation of the local (generator set-mounted) and/or remote emergency-stop switch also shuts down generator set.
- D. Configuration: Operating and safety indications, protective devices, system controls, engine gages and associated equipment shall be grouped in a common control and monitoring panel. Mounting method shall isolate the control panel from generator-set vibration. AC output power circuit breakers and other output power equipment shall not be mounted in the control enclosure.
- E. Indicating and Protective Devices and Controls: As required by NFPA 110 for Level 1 system, and the following:
 - 1. AC voltmeter (3-phase, line to line and line to neutral values).
 - 2. AC ammeter (3-phases).
 - 3. AC frequency meter.
 - 4. AC kVA output (total and for each phase). Display shall indicate power flow direction.
 - 5. Ammeter-voltmeter displays shall simultaneously display conditions for all three phases.
 - 6. Emergency Stop Switch: Switch shall be a red "mushroom head" pushbutton device complete with lock-out/tag-out provisions. Depressing switch shall cause the generator set to immediately stop the generator set and prevent it from operating.
 - 7. Fault Reset Switch: Supply a dedicated control switch to reset/clear fault conditions.
 - 8. DC voltmeter (alternator battery charging).
 - 9. Engine-coolant temperature gage.
 - 10. Engine lubricating-oil pressure gage.
 - 11. Running-time meter.
 - 12. Generator-voltage and frequency digital raise/lower switches. Rheostats for these functions are not acceptable. The control shall adjustment of these parameters in a

range of plus or minus 5% of the voltage and frequency operating set point (not nominal voltage and frequency values.)

13. AC Protective Equipment: The control system shall include over/under voltage, over current, short circuit, loss of voltage reference, and over excitation shut down protection. There shall be an overload warning, and overcurrent warning alarm.
 14. Status LED indicating lamps to indicate remote start signal present at the control, existing alarm condition, not in auto, and generator set running.
 15. A graphical display panel with appropriate navigation devices shall be provided to view all information noted above, as well as all engine status and alarm/shutdown conditions (including those from an integrated engine emission control system). The display shall also include integrated provisions for adjustment of the gain and stability settings for the governing and voltage regulation systems.
 16. Panel lighting system to allow viewing and operation of the control when the generator room or enclosure is not lighted.
 17. DC control Power Monitoring: The control system shall continuously monitor DC power supply to the control, and annunciate low or high voltage conditions. It shall also provide an alarm indicating imminent failure of the battery bank based on degraded voltage recover on loading (engine cranking).
- F. Common Remote Audible Alarm: Comply with NFPA 110 requirements for Level 1 systems. Include necessary contacts and terminals in control and monitoring panel.
1. Overcrank shutdown.
 2. Coolant low-temperature alarm.
 3. Control switch not in auto position.
 4. Battery-charger malfunction alarm.
 5. Battery low-voltage alarm.
- G. Remote Emergency-Stop Switch: Flush; wall mounted, unless otherwise indicated; and labeled. Push button shall be protected from accidental operation.

2.5 GENERATOR, EXCITER, AND VOLTAGE REGULATOR

- A. Comply with NEMA MG 1.
- B. Drive: Generator shaft shall be directly connected to engine shaft. Exciter shall be rotated integrally with generator rotor.
- C. Electrical Insulation: Class H
- D. Temperature Rise: 105 / Class H environment.
- E. Construction shall prevent mechanical, electrical, and thermal damage due to vibration, over speed up to 125 percent of rating, and heat during operation at 110 percent of rated capacity.
- F. Permanent Magnet Generator (PMG) shall provide excitation power for optimum motor starting and short circuit performance.
- G. Enclosure: Drip-proof.
- H. Voltage Regulator: SCR type, Separate from exciter, providing performance as specified. The voltage regulation system shall be microprocessor-controlled, full wave rectified, and provide a pulse-width modulated signal to the exciter. No exceptions or deviations to these requirements will be permitted.
- I. The alternator shall be provided with anti-condensation heater(s) in all applications where the generator set is provided in an outdoor enclosure, or when the generator set is installed in a coastal or tropical environment.
- J. Windings: Two-thirds pitch stator winding and fully linked amortisseur winding.
- K. Subtransient Reactance: 15 percent maximum, based on the rating of the engine generator set.

2.6 OUTDOOR GENERATOR-SET ENCLOSURE

- A. Description: Sound Attenuated Level 2 Aluminum housing. Multiple panels shall be lockable and provide adequate access to components requiring maintenance. Instruments, control, and battery system shall be mounted within enclosure.
- B. Construction:
 1. Hinged Doors: With padlocking provisions. Restraint/Hold back hardware to prevent door to keep door open at 180 degrees during maintenance. Rain lips over all doors.
 2. Exhaust System:
 - a. Muffler Location: Within enclosure.

3. Hardware: All hardware and hinges shall be stainless steel.
4. Wind Rating: Wind rating shall be 150 mph
5. Mounting Base: Suitable for mounting on sub-base fuel tank or housekeeping pad.
6. A weather protective enclosure shall be provided which allows the generator set to operate at full rated load with a static pressure drop equal to or less than 0.5 inches of water.
- C. Engine Cooling Airflow through Enclosure: Housing shall provide ample airflow for engine generator operation at rated load in an ambient temperature of 50 deg C.
- D. Sound Performance: Reduce the sound level of the engine generator while operating at full rated load to a maximum of 75 dBA measured at any location 7 m from the engine generator in a free field environment.
- E. Site Provisions:
 1. Lifting: Complete assembly of engine generator, enclosure shall be designed to be lifted into place as a single unit, using spreader bars.

2.7 VIBRATION ISOLATION DEVICES

- A. Vibration Isolation: Generators installed on grade shall be provided with elastomeric isolator pads integral to the generator, unless the engine manufacturer requires use of spring isolation.

2.8 FINISHES

- A. Indoor and Outdoor Enclosures and Components: Powder-coated and baked over corrosion-resistant pretreatment and compatible primer. Manufacturer's standard color or as directed on the drawings.

2.9 SOURCE QUALITY CONTROL

- A. Prototype Testing: Factory test engine-generator set using same engine model, constructed of identical or equivalent components and equipped with identical or equivalent accessories.
 1. Tests: Comply with NFPA 110, Level 1 Energy Converters. In addition, the equipment engine, skid, cooling system, and alternator shall have been subjected to actual prototype tests to validate the capability of the design under the abnormal conditions noted in NFPA110. Calculations and testing on similar equipment which are allowed under NFPA110 are not sufficient to meet this requirement.
- B. Project-Specific Equipment Tests: Before shipment, factory test engine-generator set manufactured specifically for this Project. Perform tests at rated load and power factor. Include the following tests:
 1. Test engine generator set manufactured for this Project to demonstrate compatibility and functionality.
 2. Full load run.
 3. Maximum power.
 4. Voltage regulation.
 5. Steady-state governing.
 6. Single-step load pickup.
 7. Simulated safety shutdowns.
 8. Provide 14 days' advance notice of tests and opportunity for observation of tests by Owner's representative.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Comply with packaged engine-generator manufacturers' written installation, application, and alignment instructions and with NFPA 110.
- B. Equipment shall be installed by the contractor in accordance with final submittals and contract documents. Installation shall comply with applicable state and local codes as required by the authority having jurisdiction. Install equipment in accordance with manufacturer's instructions and instructions included in the listing or labeling of UL listed products.
- C. Installation of equipment shall include furnishing and installing all interconnecting wiring between all major equipment provided for the on-site power system. The contractor shall

- also perform interconnecting wiring between equipment sections (when required), under the supervision of the equipment supplier.
- D. Equipment shall be installed on concrete housekeeping pads. Equipment shall be permanently fastened to the pad in accordance with manufacturer's instructions and seismic requirements of the site.
 - E. Equipment shall be initially started and operated by representatives of the manufacturer. All protective settings shall be adjusted as instructed by the consulting engineer.
 - F. All equipment shall be physically inspected for damage. Scratches and other installation damage shall be repaired prior to final system testing. Equipment shall be thoroughly cleaned to remove all dirt and construction debris prior to initial operation and final testing of the system.
 - G. On completion of the installation by the electrical contractor, the generator set supplier shall conduct a site evaluation to verify that the equipment is installed per manufacturer's recommended practice.

3.2 ON-SITE ACCEPTANCE TEST

- A. The complete installation shall be tested to verify compliance with the performance requirements of this specification following completion of all site work. Testing shall be conducted by representatives of the manufacturer, with required fuel supplied by Contractor. The Engineer shall be notified in advance and shall have the option to witness the tests. The generator set manufacturer shall provide a site test specification covering the entire system. Tests shall include:
- B. Prior to start of active testing, all field connections for wiring, power conductors, and bus bar connections shall be checked for proper tightening torque.
- C. Installation acceptance tests to be conducted on site shall include a "cold start" test, a two hour full load (resistive) test, and a one-step rated load pickup test in accordance with NFPA 110. Provide a resistive load bank and make temporary connections for full load test, if necessary.
- D. Perform a power failure test on the entire installed system. This test shall be conducted by opening the power supply from the utility service, and observing proper operation of the system for at least 2 hours. Coordinate timing and obtain approval for start of test with site personnel.

3.3 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

3.4 SERVICE AND SUPPORT

- A. The generator set supplier shall maintain service parts inventory for the entire power system at a central location which is accessible to the service location 24 hours per day, 365 days per year. The inventory shall have a commercial value of \$3 million or more. The manufacturer of the generator set shall maintain a central parts inventory to support the supplier, covering all the major components of the power system, including engines, alternators, control systems, paralleling electronics, and power transfer equipment.
- B. The generator set shall be serviced by a local service organization that is trained and factory certified in generator set service. The supplier shall maintain an inventory of critical power system replacement parts in the local service location. Service vehicles shall be stocked with critical replacement parts. The service organization shall be on call 24 hours per day, 365 days per year. The service organization shall be physically located within 200 miles of the site.
- C. The manufacturer shall maintain model and serial number records of each generator set provided for at least 20 years.

END OF SECTION

**SECTION 26 36 00
AUTOMATIC TRANSFER SWITCHES**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes transfer switches rated 600 V and less, including the following:
 - 1. Automatic transfer switches

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated. Include rated capacities, weights, operating characteristics, furnished specialties, and accessories.
 - 1. Technical data on all major components of all transfer switches and other products described in this section. Data is required for the transfer switch mechanism, control system, cabinet, and protective devices specifically listed for use with each transfer switch. Include steady state and fault current ratings, weights, operating characteristics, and furnished specialties and accessories.
 - 2. Single Line Diagram: Show connections between transfer switch, power sources and load
- B. Shop Drawings: Dimensioned plans, elevations, sections, and details showing minimum clearances, conductor entry provisions, gutter space, installed features and devices, and material lists for each switch specified.
 - 1. Dimensioned outline drawings of assembly, including elevations, sections, and details including minimal clearances, conductor entry provisions, gutter space, installed features and devices and material lists for each switch specified.
 - 2. Internal electrical wiring and control drawings.
 - 3. Interconnection wiring diagrams, showing recommended conduit runs and point-to-point terminal connections to generator set.
 - 4. Installation and mounting instructions, including information for proper installation of equipment to meet seismic requirements.
- C. Manufacturer and Supplier Qualification Data
 - 1. The transfer switch manufacturer shall be certified to ISO 9001 International Quality Standard and shall have third party certification verifying quality assurance in design/development, production, installation, and service, in accordance with ISO 9001.
 - 2. The manufacturer of this equipment shall have produced similar equipment for a minimum period of 10 years. When requested, an acceptable list of installations with similar equipment shall be provided demonstrating compliance with this requirement.
- D. Operation and Maintenance Data: For each type of product to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 01 Section "Operation and Maintenance Data," include the following:
 - 1. Features and operating sequences, both automatic and manual.
 - 2. List of all factory settings of relays, timers and protective devices; provide setting and calibration instructions where applicable.
- E. Warranty documents demonstrating compliance with the project's contract requirements.

1.4 QUALITY ASSURANCE

- A. Manufacturer Qualifications: The equipment supplier shall maintain a service center capable of providing training, parts, maintenance and emergency repairs to equipment, including transfer switch generator sets and remote monitoring equipment (if applicable) at the site within a response period of less than (eight hours or appropriate time period designated for Project) from time of notification.
 - 1. The transfer switch shall be serviced by technicians employed by, and specially trained and certified by, the generator set supplier and the supplier shall have a service organization that is factory-certified in both generator set and transfer switch service. The supplier shall maintain an inventory of critical replacement parts at the

- local service organization, and in service vehicles. The service organization shall be on call 24 hours per day, 365 days per year.
2. Submit names, experience level, training certifications, and locations for technicians that will be responsible for servicing equipment at this site.
 3. The manufacturer shall maintain model and serial number records of each transfer switch provided for at least 20 years.
- B. Source Limitations: All transfer switches are to be obtained through one source from a single manufacturer. The generator set manufacturer shall warrant transfer switches to provide a single source of responsibility for products provided.
- C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked as suitable for use in emergency, legally required or optional standby use as appropriate for the connected load.
- D. The automatic transfer switch installation and application shall conform to the requirements of the following codes and standards:
1. Transfer switches and enclosures shall be UL 1008 listed and labeled as suitable for use in emergency, legally required, and optional standby applications.
 2. CSA 282, Emergency Electrical Power Supply for Buildings, and CSA C22.2, No. 14-M91 Industrial Control Equipment
 3. NFPA 70, National Electrical Code. Equipment shall be suitable for use in systems in compliance with Articles 700, 701 and 702.
 4. Comply with NEMA ICS 10-1993 AC Automatic Transfer Switches
 5. IEEE 446 – Recommended Practice for Emergency and Standby Power Systems for Commercial and Industrial Applications
 6. EN55011, Class B Radiated Emissions and Class B Conducted Emissions
 7. IEC 1000-4-5 (EN 61000-4-5); AC Surge Immunity
 8. IEC 1000-4-4 (EN 61000-4-4) Fast Transients Immunity
 9. IEC 1000-4-2 (EN 61000-4-2) Electrostatic Discharge Immunity
 10. IEC 1000-4-3 (EN 61000-4-3) Radiated Field Immunity
 11. IEC 1000-4-6 Conducted Field Immunity
 12. IEC 1000-4-11 Voltage Dip Immunity
 13. IEEE 62.41, AC Voltage Surge Immunity
 14. IEEE 62.45, AC Voltage Surge Testing
- E. Comply with NFPA 99 – Essential Electrical Systems for Healthcare Facilities
- F. Comply with NFPA 110 – Emergency and Standby Power Systems. The transfer switch shall meet all requirements for Level 1 systems, regardless of the actual circuit level.
- G. The manufacturer shall warrant the material and workmanship of the transfer switch equipment for a minimum of two (2) year from registered commissioning and start-up, or eighteen (18) months from date of shipment.
- H. The warranty shall be comprehensive. No deductibles shall be allowed for travel time, service hours, repair parts cost, and etc. during the minimum noted warranty period described above.

1.5 COORDINATION

- A. Size and location of concrete bases and anchor bolt inserts shall be coordinated. Concrete, reinforcement and formwork must meet the requirements specified in Division 03. See section "INSTALLATION" for additional information on installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Cummins Power Generation OTEC is the basis of design
 2. Generac Industrial, Caterpillar, Thomson, and Kohler are acceptable equivalent manufacturers.
- B. Equipment specifications for this Project are based on automatic transfer switches manufactured by Cummins Power Generation. Switches manufactured by other manufacturers that meet the requirement of this specification are acceptable, if approved not less than two weeks before the scheduled bid date. Proposals must include a line-by-line compliance statement based on this specification.

- C. Transfer switches utilizing molded case circuit breakers do not meet the requirements of this specification and will not be accepted.

2.2 GENERAL TRANSFER-SWITCH PRODUCT REQUIREMENTS

- A. Provide transfer switches in the number and ratings that are shown on the drawings.
- B. Indicated Current Ratings: Apply as defined in UL 1008 for continuous loading and total system transfer.
- C. Fault-Current Closing and Withstand Ratings: UL 1008 WCR ratings must be specifically listed as meeting the requirements for use with protective devices at installation locations, under specified fault conditions. Withstand and closing ratings shall be based on use of the same set of contacts for the withstand test and the closing test.
- D. Solid-State Controls: All settings should be accurate to +/- 2% or better over an operating temperature range of - 40 to + 60 degrees C (- 40 to + 140 degrees F).
- E. Resistance to Damage by Voltage Transients: Components shall meet or exceed voltage-surge withstand capability requirements when tested according to IEEE C62.41. Components shall meet or exceed voltage-impulse withstand test of NEMA ICS 1.
- F. Electrical Operation: Accomplished by a non-fused, momentarily energized solenoid or electric motor operator mechanism, mechanically and electrically interlocked in both directions (except that mechanical interlock is not required for closed transition switches).
- G. Switch Characteristics: Designed for continuous-duty repetitive transfer of full-rated current between active power sources.
 - 1. Switches using molded-case switches or circuit breakers, or insulated case circuit breaker components are not acceptable.
 - 2. Transfer switches shall be double-throw, electrically and mechanically interlocked, and mechanically held in the Source 1 and Source 2 positions.
 - 3. Main switch contacts shall be high pressure silver alloy. Contact assemblies shall have arc chutes for positive arc extinguishing. Arc chutes shall have insulating covers to prevent inter-phase flashover.
 - 4. Contacts shall be operated by a high-speed electrical mechanism that causes contacts to open or close within three electrical cycles from signal.
 - 5. Transfer switch shall be provided with flame retardant transparent covers to allow viewing of switch contact operation but prevent direct contact with components that could be operating at line voltage levels.
 - 6. The transfer switch shall include the mechanical and control provisions necessary to allow the device to be field-configured for operating speed. Transfer switch operation with motor loads shall be as is recommended in NEMA MG1.
 - a. Phase angle monitoring/timing equipment is not an acceptable substitute for this functionality
 - 7. Transfer switches designated on the drawings as "3-pole" shall have a full current-rated neutral bar with lugs.
- H. Control: Transfer switch control shall be capable of communicating with the genset control, other switches and remote programming devices over a high-speed network interface.
- I. Factory wiring: Transfer switch internal wiring shall be composed of pre-manufactured harnesses that are permanently marked for source and destination. Harnesses shall be connected to the control system by means of locking disconnect plug(s), to allow the control system to be easily disconnected and serviced without disconnecting power from the transfer switch mechanism
- J. Terminals: Terminals shall be pressure type and appropriate for all field wiring. Control wiring shall be equipped with suitable lugs, for connection to terminal strips.
- K. Enclosures: All enclosures shall be third-party certified for compliance to NEMA ICS 6 and UL 508, unless otherwise indicated:
 - 1. The enclosure shall provide wire bend space in compliance to the latest version of NFPA70, regardless of the direction from which the conduit enters the enclosure.
 - 2. Exterior cabinet doors shall provide complete protection for the system's internal components. Doors must have permanently mounted key-type latches. Bolted covers or doors are not acceptable.
 - 3. Transfer switches shall be provided in enclosures that are third party certified for their intended environment per NEMA requirements.

2.3 AUTOMATIC TRANSFER SWITCHES

- A. Comply with requirements for Level 1 equipment according to NFPA 110.
- B. Indicated current ratings:
 - 1. Refer to the Project drawings for specifications on the sizes and types of transfer switch equipment, withstand and closing ratings, number of poles, voltage and ampere ratings, enclosure type, and accessories.
 - 2. Main contacts shall be rated for 600 VAC minimum.
 - 3. Transfer switches shall be rated to carry 100% of rated current continuously in the enclosure supplied, in ambient temperatures of -40 to +60 degrees C (-40 to +140 degrees F), relative humidity up to 95% (non-condensing), and altitudes up to 10,000 feet (3000 meters).
- C. Relay Signal: Control shall include provisions for addition of a pre-transfer relay signal, adjustable from 0 to 60 seconds, to be provided if necessary for elevator operation, based on equipment provided for the project.
- D. Control: Transfer switch control shall be provided with necessary equipment and software to communicate with the genset control, other transfer switches, remote annunciation equipment, and other devices over a high speed control network.
- E. Transfer switches that are designated on the drawings as 3-pole shall be provided with a neutral bus and lugs. The neutral bus shall be sized to carry 100% of the current designated on the switch rating.
- F. Automatic Transfer Switch Control Features
 - 1. The transfer switch control system shall be configurable in the field for any operating voltage level up to 600 VAC. Voltage sensing shall be monitored based on the normal voltage at the site. Systems that utilize voltage monitoring based on standard voltage conditions that are not field configurable are not acceptable.
 - 2. All transfer switch sensing shall be configurable from an operator panel or from a Windows XP or later PC-based service tool. Designs utilizing DIP switches or other electromechanical devices are not acceptable.
 - 3. The transfer switch shall provide a relay contact signal prior to transfer or re-transfer. The time period before and after transfer shall be adjustable in a range of 0 to 60 seconds.
 - 4. The control system shall be designed and prototype tested for operation in ambient temperatures from - 40 degrees C to + 60 degrees C (- 40 to +140 degrees F). It shall be designed and tested to comply with the requirements of the noted voltage and RFI/EMI standards.
 - 5. The control shall have optically isolated logic inputs, high isolation transformers for AC inputs and relays on all outputs, to provide optimum protection from line voltage surges, RFI and EMI.
 - 6. The transfer switch network monitoring equipment, when supplied, shall be provided with a battery-based auxiliary power supply to allow monitoring of the transfer switch when both AC power sources are non-operational.
 - 7. The indicator panel LEDs shall display:
 - a. Which source the load is connected to (Source 1 or Source 2)
 - b. Which source or sources are available
 - c. When switch is not set for automatic operation, the control is disabled
 - d. When the switch is in test/exercise mode
 - 8. The indicator shall have pushbuttons that allow the operator to activate the following functions:
 - a. Activate pre-programmed test sequence
 - b. Override programmed delays, and immediately go to the next operation
- G. Transfer Switch Control Panel: The transfer switch shall have a microprocessor-based control with a sealed membrane panel incorporating pushbuttons for operator-controlled functions, and LED lamps for system status indicators. Panel display and indicating lamps shall include permanent labels.
- H. Control Functions: Functions managed by the control shall include:
 - a. Engine start (prevents nuisance genset starts in the event of momentary power fluctuation): 0 to 10 seconds (default 3 sec)
 - b. Transfer normal to emergency (allows genset to stabilize before load is transferred): 0 to 300 seconds (default 5 sec)

- c. Re-transfer emergency to normal (allows utility to stabilize before load is transferred from genset): 0 to 30 minutes (default 10 min)
 - d. Engine cooldown: 0 to 30 minutes (default 10 min)
 - e. Programmed transition: 0 to 60 seconds (default 0 sec)
 - 2. Under frequency sensing (emergency side):
 - a. Pickup: 90% of nominal frequency
 - b. Dropout: 85% of nominal frequency
- I. Control features shall include:
 - 1. Programmable genset exerciser: A field-programmable control shall periodically start and run the generator with or without transferring the load for a preset time period, then re-transfer and shut down the generator after a preset cool-down period.
 - 2. In event of a loss of power to the control, all control settings and the engine start-time delay setting will be retained.
- J. Control Interface
 - 1. Provide one set Form C auxiliary contacts on both sides, operated by transfer switch position, rated 10 amps 250 VAC.
 - 2. Unassigned Auxiliary Contacts: Two normally open, 1-pole, double-throw contacts for each switch position, rated 10A at 240 VAC.
- K. Engine Starting Contacts
 - 1. One isolated and normally closed pair of contacts rated 8A at 30 VDC minimum.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Design each fastener and support to carry load indicated by seismic requirements and according to seismic-restraint details. See Division 26 Section "Vibration and Seismic Controls for Electrical Systems."
- B. Floor-Mounting Switch: Anchor to floor by bolting.
 - 1. Floor-mounted transfer switches (except drawout switches supported by wheeled carriages, which must be rolled out at floor level) shall be mounted on concrete bases complying with the following requirements:
 - a. Concrete Bases: 4 inches (100 mm) high, reinforced, with chamfered edges. Extend base no more than 4 inches (100 mm) in all directions beyond the maximum dimensions of switch, unless otherwise indicated or unless required for seismic support. Construct concrete bases according to Division 26 Section "Hangers and Supports for Electrical Systems."
- C. Annunciator Panel Mounting: Flush in wall, unless otherwise indicated.
- D. Identify components according to Division 26 Section "Identification for Electrical Systems."
- E. Set field-adjustable intervals and delays, relays, and engine exerciser clock.

3.2 CONNECTIONS

- A. Wiring to Remote Components: Match type and number of cables and conductors to control and communication requirements of transfer switches as recommended by manufacturer. Increase raceway sizes at no additional cost to Owner if necessary to accommodate required wiring.
- B. Field control connections shall be made on a common terminal block that is clearly and permanently labeled.
- C. Transfer switch shall be provided with AL/CU mechanical lugs sized to accept the full output rating of the switch. Lugs shall be suitable for the number and size of conductors shown on the drawings.
- D. Ground equipment according to Division 26 Section "Grounding and Bonding for Electrical Systems."
- E. Connect wiring according to Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

3.3 SOURCE QUALITY CONTROL

- A. Prior to shipping, factory shall test and inspect components, assembled switches, and associated equipment to ensure proper operation.
- B. Factory shall check transfer time and voltage, frequency, and time-delay settings for compliance with specified requirements.

- C. Factory shall perform dielectric strength test complying with NEMA ICS 1.

3.4 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: The supplier of the transfer switch(es) and associated equipment shall inspect, test, and adjust components, assemblies, and equipment installations, including connections, and report results in writing.
- B. Manufacturer's representative shall perform tests and inspections and prepare test reports.
- C. After installing equipment and after electrical circuitry has been energized, installer shall test for compliance with requirements.
 - 1. Perform recommended installation tests as recommended in manufacturer's installation and service manuals.
 - 2. After energizing circuits, demonstrate interlocking sequence and operational function for each switch.
 - a. Simulate power failures of normal source to automatic transfer switches and of emergency source with normal source available.
 - b. Verify time-delay settings.
 - c. Verify proper sequence and correct timing of automatic engine starting, transfer time delay, retransfer time delay on restoration of normal power, and engine cool-down and shutdown.
 - 3. Instrument: Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.

3.5 DEMONSTRATION

- A. After generator set installation, the generator and transfer switch supplier shall conduct a complete operation, basic maintenance, and emergency service seminar covering generator set and transfer switch equipment, for up to 10 people employed by the Owner.
 - 1. The seminar shall include instruction on operation of the transfer equipment, normal testing and exercise, adjustments to the control system, and emergency operation procedures.
 - 2. The class duration shall be at least 8 hours in length, and include practical operation with the installed equipment.

END OF SECTION

**SECTION 26 43 00
SURGE PROTECTIVE DEVICE (SPD)**

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes: Surge Protective Devices (SPD) formerly known as Transient Voltage Surge Suppression (TVSS) for Service Entrance applications.

1.02 REFERENCES

- A. ANSI/IEEE C.62.41 and C62.45
- B. UL 1449 – Most Recent Edition
- C. UL 1283
- D. NEC – NFPA 70
- E. NFPA
- F. OSHA
- G. IEEE Std. 1100

1.03 SUBMITTALS

- A. Shop Drawings: Provide Shop Drawings with wiring diagrams, installation information, testing and maintenance procedures, and operational information for the transient protection system. Shop Drawings shall be submitted to Engineer for approval before starting actual fabrication.
- B. Submittals for Approval: Provide the following test data submittals:
 - 1. Manufacturer will provide UL-1449, ULiQ data showing the Voltage Protection Rating (VPR) and “Engineering Considerations” for the specific catalog number submitted.
 - 2. Per the requirements of NEC Article 285.6, the devices shall be marked with the short circuit current rating. This rating shall meet or exceed the available fault current. Test data shall be provided to demonstrate the short circuit current rating has been tested on a complete device.
 - 3. Submit test report data clearly demonstrating the maximum surge current rating has been tested on a COMPLETE SPD unit including all necessary fusing/overcurrent protection, thermal disconnects, integral disconnects and monitoring systems. Manufacturers who cannot provide this data will not be approved.
 - 4. Submit data demonstrating that the SPD unit is capable of surviving the specified minimum repetitive surge current rating. The rating is based on surviving a specified number of ANSI/IEEE C62.41, Category C3 (10kA) impulses without failure or degradation in performance characteristics of more than 10%.
 - 5. Written detailed response to each paragraph of the specification indicating that the proposed product meets or exceeds this specification. If specific paragraphs are not met, provide written explanation as to why not.

PART 2 - SERVICE ENTRANCE

2.01 ENVIRONMENTAL

- A. General Requirements:
 - 1. No audible noise shall be generated.
 - 2. No appreciable magnetic fields shall be generated. System shall be capable of use directly in computer rooms in any location without danger to disc units, disk packs, or tapes.
 - 3. Operating Conditions:
 - a. 30 – 130 Degrees F
 - b. 15 – 85 Percent Humidity Non-Condensing

4. Enclosure: The unit shall have a heavy duty NEMA 12 (minimum) dust-tight, drip-tight enclosure unless specified otherwise.

2.02 GENERAL REQUIREMENTS

- A. The manufacturer shall provide a surge protective device that is classified by UL-1449 as a Type 2 device intended for installation on the load side of the main disconnect. The unit shall also be tested and listed to be installed as 1-port (parallel) or 2-port device (In-line/Kelvin).
- B. SPD shall be rated for 480Y/277 volt or 208Y/120 volt, 60 Hertz, 3-phase, 4-wire system and shall be connected in parallel with the main service disconnect panelboard.
- C. Nominal Current Discharge Level (In): The peak value of surge current through the SPD, having a current wave-shape of $8 \times 20 \mu s$ where the SPD remains functional after 15 surges shall be 20kA per mode.
- D. Impulse Current (Iimp): The service entrance device shall be capable of surviving direct strike transient ($10 \times 350 \mu s$) without failure or degradation of performance. Provide 3rd party test data confirming this, using minimum 12.5kA Iimp.
- E. Temporary Overvoltage (TOV) Survivability: The units shall be able to at a minimum survive 60 cycles (1s) of varying TOV levels.
- F. Quality: The manufacturer shall be ISO 9001:2000 certified, demonstrating world-class quality systems for the design and manufacture of the SPD units.
- G. Unit shall be UL 1449, Most Recent Edition Listed. A SPD that is a UL "Recognized" component will not be accepted.
- H. The system shall be constructed using multiple surge current diversion modules utilizing a single metal oxide varistor (MOV) and high capacity thermal electrode ensuring max surge current capacity can pass through the SPD without degradation or failure. Use of gas tubes, silicon avalanche diodes (SADs), or selenium cells are unacceptable.
- I. Unit shall include solid-state, long-life externally mounted LED visual status indicators that indicate the on-line status and operational integrity of each phase of the unit.
- J. Unit shall have a Form C summary alarm output contact rated for at least 1 amp at 120VAC for remote annunciation of SPD status.
- K. Unit shall have optional advanced monitoring, displayed through an integrated color LCD display, that includes real time measurements for voltage, current, frequency, power factor, kW, kVAR, kVA. The monitor should also include an event counter with time & date stamp, user settable alarm thresholds and an embedded web page for remote monitoring.

2.03 PRODUCT REQUIREMENTS

- A. Acceptable Manufacturers: Subject to compliance with requirements of the Contract Documents, acceptable manufacturers are as follows, no substitutions:
 1. Raycap: Rayvoss Series
- B. Unit shall provide maximum UL 1449, Voltage Protection Rating (VPR) for 208Y/120 Volt systems as follows:
 1. L-N = 1200V
 2. L-G = 700V
 3. N-G = 700V
 4. L-L = 1200V
- C. Unit shall provide maximum UL 1449, 4th Edition Voltage Protection Rating (VPR) for 480Y/277 Volt systems as follows:
 1. L-N = 1500V
 2. L-G = 1500V
 3. N-G = 1500V
 4. L-L = 2500V

- D. The SPD will be modular in design. Separate and replaceable suppression modules will protect each mode (L-N, L-G, and N-G).
- E. The service entrance SPD will be capable of surviving 600 IEC, 10x350 μ s waveforms of 5kA impulses without failure or degradation of original performance characteristics of more than 5%.
- F. Unit shall have a maximum surge current rating of 140,000 amperes L-N, 140,000 amperes L-G, and 140,000 amperes N-G, based on ANSI/IEEE C62.41 standard 8 by 20 microsecond current waveform.
- G. Advanced Monitoring: The units shall be equipped with a power quality monitor including the following features:
 - 1. Integral touch screen color LCD display providing real-time system RMS voltage, current, frequency, power factor, kW, kVAR, and kVA.
 - 2. Event count with time & date stamp showing surges, sags, swells, outages, and over/under frequency.
 - 3. User settable alarms and thresholds.
 - 4. Embedded webpage for remote monitoring capable of charting and downloading reports.
- H. Warranty: Manufacturer shall provide a product warranty for a period of not less than 10 years from date of installation. Warranty shall cover unlimited replacement of system protection modules during warranty period.

PART 3 EXECUTION

3.01 INSTALLATION

- A. General Requirements:
 - 1. Contractor shall install surge suppression system immediately next to or on top of service equipment where so approved by the Engineer:
 - 2. Conductors between surge suppressor and point of attachment to service equipment shall be sized in accordance with manufacturer's Shop Drawings and conductor lengths shall be as short as possible, preferably not exceeding 24".
- B. Grounding: Suppressor ground shall be bonded to the equipment grounding conductor back to the service entrance ground.

END OF SECTION

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SECTION 31 00 00

EARTHWORK

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes:
 - 1. Excavating, shaping, and grading surface
 - 2. Excavating and backfilling for pipe trenches
 - 3. Placing fill and embankments
 - 4. Salvaging and stockpiling select material
 - 5. Disposal of surplus or unsuitable material
 - 6. Other earthwork indicated on the plans for site modification or placement of structures.

1.02 QUALITY ASSURANCES

- A. Materials:
 - 1. All materials used as fill or sub-base shall be approved by the Engineer.
 - 2. Determine gradation in accordance with ASTM C-136.
 - 3. Determine percent loss by washing in accordance with ASTM C-117.
- B. Compaction:
 - 1. Determine maximum density using the Modified Proctor Method, ASTM D-1557.
 - 2. Engineer may approve other field determinations of maximum density, such as Michigan Cone.
 - 3. Field determination of in place density shall be by Nuclear Density Method, ASTM D-2922, or other approved method.
- C. Except as modified by this Section, perform earthwork in accordance with Division 2, MDOT Standard Specifications.

1.03 REFERENCED STANDARDS

Unless otherwise specified, the work for this Section shall conform to the applicable portions of the following Standard Specifications:

ASTM - American Society for Testing and Materials
MDOT - Michigan Department of Transportation
OSHA - Occupational Health and Safety Association

PART 2 PRODUCTS

2.01 MATERIALS

- A. General:
 - 1. All fill material shall be approved by the Engineer prior to placement.
 - 2. Fill material shall be free from clay, organic matter, roots, debris, and frozen soil.
 - 3. Obtain fill material from on-site excavations, or from an approved borrow area.
 - 4. Provide Testing Laboratory with access to material source.
- B. Class II and III backfill:
Granular material meeting requirements of Section 8.02.06 of the MDOT Standard Specifications for construction.

- C. Pipe Bedding:
Granular material meeting requirements of ASTM D2321
- D. Topsoil:
Dark brown or black loam, clay loam, or sandy loam, of a fertile, humus soil origin.

PART 3 EXECUTION

3.01 DUST CONTROL

- A. Control dust at the Work area at all times to prevent dust from becoming a nuisance to the public, neighbors, or the work of others on the site.
- B. Provide moisture or otherwise treat surfaces to control dust.

3.02 TOPSOIL

- A. Removal:
 - 1. Remove all topsoil from areas to be occupied by structures, improved surfaces, or where new grades are to be established.
 - 2. Stockpile topsoil for future use in finish grading at a site approved by the Engineer.
- B. Application:
 - 1. Provide topsoil over all disturbed areas not occupied by structures or improved surfaces.
 - 2. Spread the stockpiled topsoil over the prepared rough grade to a minimum depth of 4 inches.
 - 3. Provide additional topsoil as required to complete the Work.
 - 4. Finish grade, and rake the topsoil to remove all stones, sticks, roots, and debris in preparation for seeding.
 - 5. Excess topsoil may be used for fill in non critical areas.

3.03 EXCAVATING-GENERAL

- A. Excavate to the lines and grades shown on the plans.
- B. Provide safe excavation slopes in accordance with OSHA Regulation 54 FR 45894.
- C. Protect excavation bottoms from frost.
- D. Dispose of excess excavated material off site or on site at a location approved by the Engineer.
- E. Enlarge excavations laterally to provide adequate room for construction or provide shoring and bracing in accordance with Section 31 40 00, as necessary.

3.04 EXCAVATING, BACKFILLING, AND COMPACTING FOR STRUCTURES

- A. Over-excavation:
 - 1. In the event clay or stone is encountered at the bottom of the excavation, undercut bottom a minimum of 12 inches.
 - 2. If muck or other deleterious material is encountered, remove this material to a depth where suitable subgrade soil is encountered, unless otherwise instructed by the Engineer.
 - 3. Backfill to proposed subgrade elevation with Class II material.
 - 4. Compact backfill in lifts not exceeding 9 inches to 95% Modified Proctor density.

- B. Backfilling:
 - 1. Remove all debris from excavation prior to backfilling.
 - 2. Compact excavation bottom to 95 % Modified Proctor density to a depth of 2 feet prior to placing backfill.
 - 3. Backfill material shall be Class II sand.
 - 4. Do not backfill against cast in place structures until approved by the Engineer.
 - 5. Do not backfill on only one side of a vertical wall unless the walls are adequately shored or the permanent structure is in place.
 - 6. Compact backfill in lifts not exceeding 9 inches to 95% Modified Proctor density.

3.05 EXCAVATING, BACKFILLING, AND COMPACTING FOR ROAD SUBGRADE, PAVED SURFACES AND APPURTENANCES

- A. Subgrade undercutting:
 - 1. Remove all peat, muck, topsoil and other organic matter from the roadway subgrade.
 - 2. Remove all soils other than granular materials within 15 inches of the proposed subgrade elevation.
 - 3. Place Class II sand and compact to 95% Modified Proctor density to proposed subgrade elevation.
 - 4. Extend undercutting of unsuitable materials to the limit of a 1 on 1 slope spreading outward from the grade and location of the outside edge of the finished pavement, curb, or other improved surface.
- B. Backfilling around curbs, sidewalks, and appurtenances:
 - 1. Remove all debris from excavation prior to backfilling.
 - 2. Compact excavation bottom to 95 % Modified Proctor density to a depth of 2 feet prior to placing backfill.
 - 3. Backfill material shall be Class II sand.
 - 4. Do not backfill against cast in place structures until approved by the Engineer.
 - 5. Compact backfill in lifts not exceeding 9 inches to 95% Modified Proctor density.

3.06 EXCAVATING, BACKFILLING, AND COMPACTING FOR UTILITIES

- A. Trench excavation:
 - 1. Conduct excavation in a safe and orderly manner at all times, in compliance with all applicable safety regulations.
 - 2. Use hand tools where mechanical equipment will cause damage to adjacent trees, structures, or utilities.
 - 3. Excavate trench to the cross-section shown on the trench detail.
 - 4. Do not excavate the trench ahead of the pipe laying operation more than the Contractor can reasonably expect to backfill by the end of the work day.
 - 5. Support and protect all existing utilities encountered within the trench.
 - 6. Place excavated material where it will not obstruct sidewalks, driveways, roadways, or the work of others.
 - 7. Undercutting
 - a. In the event clay or stone is encountered at the bottom of the excavation, undercut the bottom a minimum of 6 inches.
 - b. Undercut the trench a minimum of 6 inches for plastic water main or sanitary sewers in all soils.
 - c. If muck or other deleterious material is encountered, remove this material suitable soil, unless modified by the Engineer.
 - d. Backfill to proposed pipe grade with material meeting ASTM D2321 compacted to 95% Modified Proctor density.

- B. Pipe bedding:
 - 1. Grade trench bottom to provide uniform, firm, and stable surface, free from rocks and other unsuitable materials.
 - 2. Provide a tamped sand bedding for the full length of the pipe barrel, with recesses excavated for the joints.
 - 3. Bedding material shall meet requirements of ASTM D2321.
 - 4. Place bedding simultaneously on each side of the pipe for the full width of the trench, to a depth of 1 foot above the pipe.
 - 5. Place bedding in 9 inch layers and compact to 95% Modified Proctor Density, being careful not to displace the pipe laterally.
- C. Trench backfill, critical areas:
 - 1. Class II material in areas under or within 10 feet of structures or improved surfaces.
 - 2. Place in layers not exceeding 9 inches and compact each layer, by mechanical means, to 95% Modified Proctor density.
 - 3. If trench settles greater than 1 inch within the one year following Owner's acceptance of project, the Contractor shall bring the trench back to grade and restore the surface at no additional cost to the Owner.
- D. Trench backfill, non-critical areas:
 - 1. Class III material approved by the Engineer, free from frozen soil, vegetation, and debris.
 - 2. Place in layers not exceeding 12 inches and compact each layer by mechanical means to a minimum of 90% Modified Proctor density.
- E. Pipe protection:
 - 1. Mound and compact additional granular backfill over pipe, if required, to provide a minimum cover depth of 3 feet to protect pipe while construction equipment is operating on site.
 - 2. Remove additional backfill when grading to achieve finished grade.

3.07 CONTROLLED FILLS AND EMBANKMENTS

- A. General:
 - 1. All filling under or within a 1:1 slope from the outer edge of buildings, structures, or improved surfaces shall be controlled fill.
 - 2. Material: Class II granular material, unless otherwise specified by the Engineer.
- B. Placing fill:
 - 1. Remove topsoil roots and stumps to a depth of 12 inches prior to placing fill.
 - 2. Compact existing ground to 95% Modified Proctor density prior to placing fill.
 - 3. Spread fill in uniform layers not exceeding 9 inches and compact to 95% Modified Proctor density.
- C. Compaction:
 - 1. Compacting equipment shall be heavy duty, rolling drum, vibrating type (if approved by Village Manager).
 - 2. Use pneumatic tire rollers in predominantly granular soils.
 - 3. Use sheepsfoot type roller in predominantly clay soils.
 - 4. Use hand operated vibrating sled for compaction around structures.
 - 5. Other methods of producing equivalent results will be allowed when approved by the Engineer.
 - 6. Density in areas under or adjacent to structures or improved surfaces shall be to 95% Modified Proctor density.
 - 7. Density in other locations shall be to 90% Modified Proctor density.

- D. Moisture:
If material is too wet or dry for satisfactory compaction, adjust moisture content as required.

3.08 GRADING

- A. Conform to lines, contours, and spot elevations shown on the plans.
- B. Perform finish grading on ground surfaces to an accuracy of plus or minus 0.1 feet.
- C. Perform finish grading on improved surfaces to an accuracy of plus or minus 0.05 feet.

END OF SECTION

SECTION 31 10 00

SITE CLEARING

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. Clearing site of trees, roots, stumps, brush, and other vegetation.
 - 2. Removing rocks, boulders, and other debris.
 - 3. Removal and disposal of existing improvements.
- B. Related Sections:
 - Section 01 20 00 - PRICE AND PAYMENT PROCEDURE

1.02 UNIT PRICES

All work under this section shall be considered incidental to construction, unless specifically indicated on the BID SCHEDULE and referred to in Section 01 20 00 - PRICE AND PAYMENT PROCEDURE.

PART 2 PRODUCTS - Not Used

PART 3 EXECUTION

3.01 SITE CLEARING

- A. General:
 - 1. Clear areas as approved by owner for performance of the work.
 - 2. Remove designated trees, stumps, roots, brush, and rocks.
 - 3. Work carefully around trees and overhanging branches.
 - 4. Trees and branches shall not be removed without permission of owner.

3.02 REMOVAL OF EXISTING IMPROVEMENTS

- A. Curb and gutter:
 - 1. Curb and gutter shall be removed only within the limits indicated on the plans and where damaged by the Contractor.
 - 2. The curb shall be saw cut full depth at the locations noted or at the nearest joint.
 - 3. Curbs, catch basins, and other structures to remain shall be protected from damage.
- B. Pavement:
 - 1. Concrete pavement:
 - a. Concrete pavement to be removed shall be saw cut or removed at the nearest joint.
 - b. Saw cuts shall be made by cutting concrete full depth in a straight line.
 - c. Concrete pavement not scheduled for removal that is damaged by the Contractor shall be saw cut in a location determined by the Engineer and removed.
 - 2. Bituminous pavement:
 - a. Pavement damaged by Contractor shall be sawcut, removed, and replaced at no cost to owner.
 - b. Any additional pavement damaged by the contractor shall be sawcut in a location determined by the Engineer and removed.
- C. Concrete sidewalk:
 - 1. Existing sidewalks indicated for removal shall be saw cut full depth or removed at the

- nearest joint.
- 2. Sidewalk damaged by Contractor shall be sawcut in a location determined by the Engineer, and replaced at no cost to owner.

3.03 DISPOSAL OF MATERIALS

- A. All concrete, trees, asphalt, gravel, etc. resulting from removal shall become the property of the Contractor.
- B. All removed materials shall be removed from the project site and disposed of properly.
- C. Burning is not permitted without permission from the owner.

END OF SECTION

SECTION 31 23 00
EXCAVATION AND FILL

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes:
 - 1. Excavating, shaping, and grading surface
 - 2. Excavating and backfilling for pipe trenches
 - 3. Placing fill and embankments
 - 4. Salvaging and stockpiling select material
 - 5. Disposal of surplus or unsuitable material
 - 6. Other earthwork indicated on the plans for site modification or placement of structures.
- B. Related Sections
 - 01 20 00 PRICE AND PAYMENT PROCEDURES
 - 31 23 19 DEWATERING

1.02 QUALITY ASSURANCES

- A. Materials:
 - 1. All materials used as fill or sub-base shall be approved by the Engineer.
 - 2. Determine gradation in accordance with ASTM C-136.
 - 3. Determine percent loss by washing in accordance with ASTM C-117.
- B. Compaction:
 - 1. Determine maximum density using the Modified Proctor Method, ASTM D-1557.
 - 2. Engineer may approve other field determinations of maximum density, such as Michigan Cone.
 - 3. Field determination of in place density shall be by Nuclear Density Method, ASTM D-2922, or other approved method.
- C. Except as modified by this Section, perform earthwork in accordance with Division 2, MDOT Standard Specifications.
- D. Testing:
 - 1. See Section 01 40 00.

1.03 SITE CONDITIONS

- A. Soil Borings
 - 1. Soil borings were conducted at the site. Results and report available separately.
- B. Borrow Area
 - 1. General:

In the event that a sufficient volume of suitable soils is not available within the proposed work limits to meet all of the proposed grades, additional material may be borrowed from areas on site.
 - 2. Contractor shall prepare and submit a site grading and restoration plan for the borrow area.
 - 3. Finished slopes shall not exceed 3:1.
 - 4. Soil erosion control and restoration requirements are similar to those for the remainder of the project.
 - 5. Submit plan in accordance with Section 01 30 00 – ADMINISTRATIVE REQUIREMENTS.
 - 6. Contractor's plan shall be approved by Owner and Engineer prior to performing work in this area.

C. Excess Excavation Disposal

1. General:

In the event that excess clean granular material remains following earthwork operations, this material may be disposed of off site.

1.04 PAYMENT

All work performed under this section shall be included as part of the BID for this project and subject to Section 01 20 00 PRICE AND PAYMENT PROCEDURES.

1.05 REFERENCED STANDARDS

Unless otherwise specified, the work for this Section shall conform to the applicable portions of the following Standard Specifications:

ASTM - American Society for Testing and Materials

MDOT - Michigan Department of Transportation

OSHA - Occupational Health and Safety Association

PART 2 PRODUCTS

2.01 MATERIALS

A. General:

1. All fill material shall be approved by the Engineer prior to placement.
2. Fill material shall be free from clay, organic matter, roots, debris, and frozen soil.
3. Obtain fill material from on-site excavations, or from an approved borrow area.
4. Provide Testing Laboratory with access to material source.

B. Class II and III backfill:

Granular material meeting requirements of Section 902.08 of the MDOT Standard Specifications for construction.

C. Pipe Bedding:

Granular material meeting requirements of ASTM D2321

D. Topsoil:

Dark brown or black loam, clay loam, or sandy loam, of a fertile, humus soil origin.

PART 3 EXECUTION

3.01 DUST CONTROL

A. Control dust at the Work area at all times to prevent dust from becoming a nuisance to the public, neighbors, or the work of others on the site.

B. Provide moisture or otherwise treat surfaces to control dust.

3.02 TOPSOIL

A. Removal:

1. Remove all topsoil from areas to be occupied by structures, improved surfaces, or where new grades are to be established.
2. Stockpile topsoil for future use in finish grading at a site approved by the Engineer.

B. Application:

1. Provide topsoil over all disturbed areas not occupied by structures or improved surfaces.
2. Spread the stockpiled topsoil over the prepared rough grade to a minimum depth of 4

- inches.
- 3. Provide additional topsoil as required to complete the Work.
- 4. Finish grade, and rake the topsoil to remove all stones, sticks, roots, and debris in preparation for seeding.
- 5. Excess topsoil may be used for fill in non critical areas.

3.03 EXCAVATING-GENERAL

- A. Excavate to the lines and grades shown on the plans.
- B. Provide safe excavation slopes in accordance with OSHA Regulation 54 FR 45894.
- C. Protect excavation bottoms from frost.
- D. Dispose of excess excavated material off site or on site at a location approved by the Engineer.
- E. Provide dewatering in accordance with Section 31 23 19 as required.
- F. Enlarge excavations laterally to provide adequate room for construction or provide shoring and bracing in accordance with Section 31 01 50, as necessary.

3.04 EXCAVATING, BACKFILLING, AND COMPACTING FOR STRUCTURES

- A. Over-excavation:
 - 1. In the event clay or stone is encountered at the bottom of the excavation, undercut bottom a minimum of 12 inches.
 - 2. If muck or other deleterious material is encountered, remove this material to a depth where suitable subgrade soil is encountered, unless otherwise instructed by the Engineer.
 - 3. Backfill to proposed subgrade elevation with Class II material.
 - 4. Compact backfill in lifts not exceeding 9 inches to 95% Modified Proctor density.
- B. Backfilling:
 - 1. Remove all debris from excavation prior to backfilling.
 - 2. Compact excavation bottom to 95 % Modified Proctor density to a depth of 2 feet prior to placing backfill.
 - 3. Backfill material shall be Class II sand.
 - 4. Do not backfill against cast in place structures until approved by the Engineer.
 - 5. Do not backfill on only one side of a vertical wall unless the walls are adequately shored or the permanent structure is in place.
 - 6. Compact backfill in lifts not exceeding 9 inches to 95% Modified Proctor density.

3.05 FILL AT SPECIFIC LOCATIONS

- A. Under Interior Slabs-On-Grade:
 - 1. Use general fill.
 - 2. Compact to 95 percent of maximum dry density.
 - 3. Cover with sand.
 - a. Depth: 4 inches.
 - b. Compact to 95 percent of maximum dry density.
- B. At Footings:
 - 1. Use general fill.
 - 2. Fill up to subgrade elevation in lifts not exceeding 9 inches.
 - 3. Compact each lift to 95 percent of maximum dry density.
 - 4. Do not backfill against unsupported foundation walls.
 - 5. Backfill simultaneously on each side of unsupported foundation walls until supports are

in place.

3.06 EXCAVATING, BACKFILLING, AND COMPACTING FOR ROAD SUBGRADE, PAVED SURFACES AND APPURTENANCES

- A. Subgrade undercutting:
 - 1. Remove all peat, muck, topsoil and other organic matter from the roadway subgrade.
 - 2. Remove all soils other than granular materials within 15 inches of the proposed subgrade elevation.
 - 3. Place Class II sand and compact to 95% Modified Proctor density to proposed subgrade elevation.
 - 4. Extend undercutting of unsuitable materials to the limit of a 1 on 1 slope spreading outward from the grade and location of the outside edge of the finished pavement, curb, or other improved surface.
- B. Backfilling around curbs, sidewalks, and appurtenances:
 - 1. Remove all debris from excavation prior to backfilling.
 - 2. Compact excavation bottom to 95 % Modified Proctor density to a depth of 2 feet prior to placing backfill.
 - 3. Backfill material shall be Class II sand.
 - 4. Do not backfill against cast in place structures until approved by the Engineer.
 - 5. Compact backfill in lifts not exceeding 9 inches to 95% Modified Proctor density.

3.07 EXCAVATING, BACKFILLING, AND COMPACTING FOR UTILITIES

- A. Trench excavation:
 - 1. Conduct excavation in a safe and orderly manner at all times, in compliance with all applicable safety regulations.
 - 2. Use hand tools where mechanical equipment will cause damage to adjacent trees, structures, or utilities.
 - 3. Excavate trench to the cross-section shown on the trench detail.
 - 4. Do not excavate the trench ahead of the pipe laying operation more than the Contractor can reasonably expect to backfill by the end of the work day.
 - 5. Support and protect all existing utilities encountered within the trench.
 - 6. Place excavated material where it will not obstruct sidewalks, driveways, roadways, or the work of others.
 - 7. Undercutting
 - a. In the event clay or stone is encountered at the bottom of the excavation, undercut the bottom a minimum of 6 inches.
 - b. Undercut the trench a minimum of 6 inches for plastic water main or sanitary sewers in all soils.
 - c. If muck or other deleterious material is encountered, remove this material suitable soil, unless modified by the Engineer.
 - d. Backfill to proposed pipe grade with material meeting ASTM D2321 compacted to 95% Modified Proctor density.
- B. Pipe bedding:
 - 1. Grade trench bottom to provide uniform, firm, and stable surface, free from rocks and other unsuitable materials.
 - 2. Provide a tamped sand bedding for the full length of the pipe barrel, with recesses excavated for the joints.
 - 3. Bedding material shall meet requirements of ASTM D2321.
 - 4. Place bedding simultaneously on each side of the pipe for the full width of the trench, to a depth of 1 foot above the pipe.
 - 5. Place bedding in 9 inch layers and compact to 95% Modified Proctor Density, being careful not to displace the pipe laterally.

- C. Trench backfill, critical areas:
 - 1. Class II material in areas under or within 10 feet of structures or improved surfaces.
 - 2. Place in layers not exceeding 9 inches and compact each layer, by mechanical means, to 95% Modified Proctor density.
 - 3. If trench settles greater than 1 inch within the one year following Owner's acceptance of project, the Contractor shall bring the trench back to grade and restore the surface at no additional cost to the Owner.
- D. Trench backfill, non-critical areas:
 - 1. Class III material approved by the Engineer, free from frozen soil, vegetation, and debris.
 - 2. Place in layers not exceeding 12 inches and compact each layer by mechanical means to a minimum of 90% Modified Proctor density.
- E. Pipe protection:
 - 1. Mound and compact additional granular backfill over pipe, if required, to provide a minimum cover depth of 3 feet to protect pipe while construction equipment is operating on site.
 - 2. Remove additional backfill when grading to achieve finished grade.

3.08 CONTROLLED FILLS AND EMBANKMENTS

- A. General:
 - 1. All filling under or within a 1:1 slope from the outer edge of buildings, structures, or improved surfaces shall be controlled fill.
 - 2. Material: Class II granular material, unless otherwise specified by the Engineer.
- B. Placing fill:
 - 1. Remove topsoil roots and stumps to a depth of 12 inches prior to placing fill.
 - 2. Compact existing ground to 95% Modified Proctor density prior to placing fill.
 - 3. Spread fill in uniform layers not exceeding 9 inches and compact to 95% Modified Proctor density.
- C. Compaction:
 - 1. Compacting equipment shall be heavy duty, rolling drum, vibrating type.
 - 2. Use pneumatic tire rollers in predominantly granular soils.
 - 3. Use sheepsfoot type roller in predominantly clay soils.
 - 4. Use hand operated vibrating sled for compaction around structures.
 - 5. Other methods of producing equivalent results will be allowed when approved by the Engineer.
 - 6. Density in areas under or adjacent to structures or improved surfaces shall be to 95% Modified Proctor density.
 - 7. Density in other locations shall be to 90% Modified Proctor density.
- D. Moisture:

If material is too wet or dry for satisfactory compaction, adjust moisture content as required.

3.09 GRADING

- A. Conform to lines, contours, and spot elevations shown on the plans.
- B. Perform finish grading on ground surfaces to an accuracy of plus or minus 0.1 feet.
- C. Perform finish grading on improved surfaces to an accuracy of plus or minus 0.05 feet.

END OF SECTION

SECTION 31 23 19

DEWATERING

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes providing and maintaining dewatering equipment to dispose of surface water and ground water from all excavations and trenches.

1.02 UNIT PRICES

Dewatering will be considered incidental to the construction, unless specifically indicated on the BID SCHEDULE and referred to in Section 01 20 00 PRICE AND PAYMENT PROCEDURE.

1.03 SUBMITTALS

- A. Submit a description of the proposed system to the Engineer prior to installation.
- B. Description shall include the number, size, and length of wells, pumping equipment, temporary underdrain location, discharge location, and sedimentation control measures.

1.04 QUALITY ASSURANCE

- A. Design of the dewatering method shall be the responsibility of the Contractor.
- B. Comply with the Soil Erosion and Sedimentation Control Act, and other state and local codes that govern dewatering activities.

1.05 DESIGN REQUIREMENTS

- A. Dewatering system shall be capable of lowering the static water table a minimum of 12 inches below all excavations.

PART 2 PRODUCTS - Not Used

PART 3 EXECUTION

3.01 PERFORMANCE REQUIREMENTS

- A. Duration of dewatering:
 - 1. Continuously until the structure or pipe is installed.
 - 2. Prevent damage from hydrostatic pressure, flotation, or other causes.
- B. Reliability:
 - 1. Monitor the dewatering system at frequent intervals to insure proper operation.
 - 2. Provide stand-by equipment as necessary to avoid equipment or power failure.
- C. Discharge:
 - 1. Prevent sand and silt from discharging into sewer drains or natural waterways.
 - 2. Provide silt fencing, sediment traps, or other methods to protect surface water discharges.
 - 3. Remove all sediment deposits created as a result of the dewatering process.
 - 4. Do not interfere with the rights of the public, owners of private property, pedestrians, vehicular traffic, or the work of other Contractors.
- D. Surface water runoff:
 - 1. Divert surface water from entering excavated areas or trenches.

2. Protect adjacent property from damage.
 3. Repair any damage from dewatering activities at no additional cost to the Owner.
- E. Remove all dewatering wells and equipment after project completion.

END OF SECTION

SECTION 31 25 00
EROSION CONTROL

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes, work necessary for effective temporary and permanent soil erosion and sedimentation control.
- B. Related Sections:
 - 1. Section 01 20 00 PRICE AND PAYMENT PROCEDURE
 - 2. Section 31 00 00 EARTHWORK
 - 3. Section 32 90 00 PLANTINGS

1.02 UNIT PRICES

Temporary and permanent erosion control measures will be considered incidental to the construction, unless specifically indicated on the BID SCHEDULE and referred to in Section 01 20 00 PRICE AND PAYMENT PROCEDURE.

1.03 QUALITY ASSURANCES

Perform all Work in accordance with the Michigan Soil Erosion and Sedimentation Control Act, Part 91 of Act 451, P.A. 1994, and with the requirements of the local agencies having jurisdiction over the Work.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Seed, fertilizer, and mulch: Provide as specified in Section 32 90 00 - PLANTING.
- B. Provide temporary and permanent structures and materials in accordance with the Michigan Department of management and Budget Keying System. See Figure 1 at the end of this section.
- C. Mulch blanket:
 - 1. Materials: 100% straw sewn into a lightweight, photo degradable netting.
 - 2. Model: S75.
 - 3. Straw content: 0.5 pounds per square yard.
 - 4. Manufacturer: North American Green.
- D. Geotextile filter fabric:
 - 1. Materials: Mechanically bonded, non-woven geotextile.
 - 2. Manufacturer: Amoco
 - 3. Model: CEF 4553
 - 4. Tensile strength: 203 lbs. (ASTM D-4632).
 - 5. Tensile elongation: 50% min. (ASTM D-4632).
 - 6. Tear strength: 80 lbs. (ASTM D-4533).
 - 7. Puncture strength: 130 lbs. (ASTM D-4833).

8. Apparent opening size: 100 sieve (ASTM D-4751).
- E. Rip rap stone: (4-6")
 1. Material: native fieldstone from local gravel pits, exhibiting sound structure and strength for the intended use.
 2. Size: 1" to 6" stone.
 3. Gradation:
 - a. $D_{100} = 6$ inch
 - b. $D_{50} = 4$ inch
 - c. $D_{10} = 2$ inch
- F. Rip rap stone: (10-12")
 1. Material: native fieldstone from local gravel pits, exhibiting sound structure and strength for the intended use.
 2. Size: 6" to 12" stone.
 3. Gradation:
 - a. $D_{100} = 12$ inch
 - b. $D_{50} = 10$ inch
 - c. $D_{10} = 8$ inch
- G. Silt fence:
 1. Conforming to Michigan Department of Transportation Standard Specifications.

PART 3 EXECUTION

3.01 GENERAL

Conduct site evaluation with the Engineer and the soil erosion control officer prior to starting work.

3.02 TEMPORARY EROSION CONTROL

- A. Minimize the area of earth disturbed at any one time.
- B. Provide berms or ditches to divert storm runoff from the construction area when steep slopes or highly erodible soils are present.
- C. Contain all sedimentation on site by using straw bales, filter fence, or sedimentation basins.

3.03 PERMANENT EROSION CONTROL

- A. When final grades have been established, provide topsoil, seed, fertilizer, and mulch.
- B. Water all seeded areas as necessary to establish proper vegetative cover.
- C. Should erosion occur within the guarantee period, regrade and reseed the disturbed area at no additional cost to the Owner.

3.04 MULCH BLANKET

- A. Provide mulch blanket on all slopes 3:1 or steeper, that are disturbed during construction or as indicated on the plans.

- B. Prepare soil prior to placing mulch blanket with topsoil, seed and fertilizer.
- C. Place mulch blanket from top of slope down so overlap seams run parallel to slope.
- D. Overlap seams a minimum of 2" on parallel seams, and six inches, shingle style, on perpendicular splices.

END OF SECTION



MICHIGAN DEPARTMENT OF MANAGEMENT AND BUDGET

S-E-S-C KEYING SYSTEM

KEY	BEST MANAGEMENT PRACTICES	SYMBOL	WHERE USED
EROSION CONTROLS			
E1	SELECTIVE GRADING AND SHAPING		To reduce steep slopes and erosive velocities.
E2	GRUBBING OMITTED		For use on steep slopes to prevent rilling, gullyng, and reduce sheet flow velocity or where clear vision corridors are necessary.
E3	SLOPE ROUGHENING AND SCARIFICATION		Where created grades cause increased erosive velocities. Promotes infiltration and reduces runoff velocity.
E4	TERRACES		On relatively long slopes up to 8% grades with fairly stable soils.
E5	DUST CONTROL		For use on construction sites, unpaved roads, etc. to reduce dust and sedimentation from wind and construction activities.
E6	MULCH		For use in areas subject to erosive surface flows or severe wind or on newly seeded areas.
E7	TEMPORARY SEEDING		Stabilization method utilized on construction sites where earth change has been initiated but not completed within a 2 week period.
E8	PERMANENT SEEDING		Stabilization method utilized on sites where earth change has been completed (final grading attained).
E9	MULCH BLANKETS		On exposed slopes, newly seeded areas, new ditch bottoms, or areas subject to erosion.
E10	SODDING		On areas and slopes where immediate stabilization is required.
E11	VEGETATED CHANNELS		For use in created stormwater channels. Vegetation is used to slow water velocity and reduce erosion within the channel.
E12	RIPRAP		Use along shorelines, waterways, or where concentrated flows occur. Slows velocity, reduces sediment load, and reduces erosion.
E13	GABION WALLS		On newly created or denuded stream banks to reduce velocity until permanent stabilization is achieved or on existing banks to retard erosive velocities.
E14	ENERGY DISSIPATOR		Where the energy transmitted from a concentrated flow of surface runoff is sufficient to erode receiving area or watercourse.
E15	TEMPORARY SLOPE DRAIN		Where surface runoff temporarily accumulates or sheet flows over the top of a slope and must be conveyed down a slope in order to prevent erosion.
E16	SLOPE DRAIN		Where concentrated flow of surface runoff must be permanently conveyed down a slope in order to prevent erosion.

B = BIOENGINEERING



MICHIGAN DEPARTMENT OF MANAGEMENT AND BUDGET

S-E-S-C KEYING SYSTEM

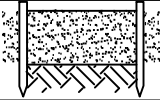




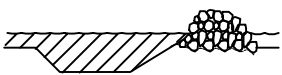
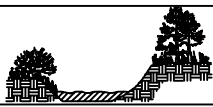


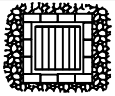
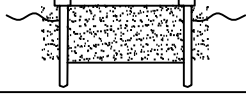
KEY	BEST MANAGEMENT PRACTICES	SYMBOL	WHERE USED
E17	CELLULAR CONFINEMENT SYSTEMS		Used on steep slopes and high velocity channels.
E18	PLASTIC SHEETS		Used on exposed slopes, seeded areas, new ditch bottoms, and areas subject to surface runoff and erosion. Used as a liner in temporary channels and to stabilize stockpiles.
E19	TEMPORARY DRAINAGEWAY/ STREAM CROSSING		Use on construction sites where stream/drainageway crossings are required.
E20	TEMPORARY BYPASS CHANNEL		Use within existing stream corridors when existing flow cannot be interrupted, and at culvert and bridge repair sites
E21	LIVE STAKING		In areas requiring protection of slopes against surface erosion and shallow mass wasting.
EROSION / SEDIMENT CONTROLS			
ES31	CHECK DAM		Used to reduce surface flow velocities within constructed and existing flow corridors.
ES32	STONE FILTER BERM		Use primarily in areas where sheet or rill flow occurs and to accommodate dewatering flow.
ES33	FILTER ROLLS		In areas requiring immediate protection of slopes against surface erosion and gully formation and for perimeter sediment control.
ES34	SAND FENCE		For use in areas susceptible to wind erosion, especially where the ground has not yet been stabilized by other means.
ES35	DEWATERING		Use where construction activities are limited by the presence of water and dry work is required.
ES36	DIVERSION DIKE/BERM		Within existing flow corridors to address or prevent erosion and sedimentation, or on disturbed or unstable slopes subject to erosive surface water velocities.
ES37	DIVERSION DITCH		In conjunction with a diversion dike, or where diversion of upslope runoff is necessary to prevent damage to unstabilized or disturbed construction areas.
ES38	COFFERDAM/SHEET PILINGS		Constructed along or within water corridor or waterbody to provide dry construction area.
ES39	STREAMBANK BIOSTABILIZATION		For use along banks where stream and riparian zones may have difficulty recovering from the long-term effects of erosion.
ES40	POLYMERS		To minimize soil erosion and reduce sedimentation in water bodies by increasing soil particle size.
ES41	WATTLES		In areas requiring protection of slopes against surface erosion and gully formation.

B = BIOENGINEERING



MICHIGAN DEPARTMENT OF MANAGEMENT AND BUDGET

S-E-S-C KEYING SYSTEM

KEY	BEST MANAGEMENT PRACTICES	SYMBOL	WHERE USED
SEDIMENT CONTROLS			
S51	SILT FENCE		Use adjacent to critical areas, to prevent sediment laden sheet flow from entering these areas.
S52	CATCH BASIN SEDIMENT GUARD		Use in or at stormwater inlets, especially at construction sites.
S53	STABILIZED CONSTRUCTION ACCESS		Used at every point where construction traffic enters or leaves a construction site.
S54	TIRE WASH		For use on construction sites where vehicular traffic requires sediment removed from its tires in highly erosive areas.
S55	SEDIMENT BASIN		At the outlet of disturbed areas and at the location of a permanent detention basin.
S56	SEDIMENT TRAP		In small drainage areas, along construction site perimeters, and above check dams or drain inlets.
S57	VEGETATED BUFFER/FILTER STRIP		Use along shorelines, waterways, or other sensitive areas. Slows velocity, reduces sediment load, and reduces erosion in areas of sheet flow.
S58	INLET PROTECTION FABRIC DROP		Use at stormwater inlets, especially at construction sites.
S59	INLET PROTECTION FABRIC FENCE		Use at stormwater inlets, especially at construction sites.
S60	INLET PROTECTION STONE		Use around urban stormwater inlets.
S61	TURBIDITY CURTAIN		Use during construction adjacent to a water source, to contain sediment within the work area when other BMP's cannot be used.

B = BIOENGINEERING

SECTION 31 40 00
SHORING AND BRACING

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes, all materials and labor to install and maintain sheeting, shoring, bracing, and trench boxes as required to support the sides of the excavation.
- B. Prevent movement of earth that would damage the Work or existing structures, or cause injury to workmen.
- C. Related Sections:
 - 1. Section 01 20 00 PRICE AND PAYMENT PROCEDURE

1.02 UNIT PRICES

Sheeting, shoring and bracing will be considered incidental to the performance of the work, unless specifically indicated on the BID SCHEDULE and referred to in Section 01 20 00 PRICE AND PAYMENT PROCEDURE.

1.04 QUALITY ASSURANCES

Comply with all standards set forth in the Federal and State Occupational Safety and Health Act.

PART 2 PRODUCTS - Not used.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Provide sheeting, shoring, trench box, or bracing to prevent caving or sliding, and to protect workmen and adjacent structures and facilities.
- B. Fill and compact voids outside the sheeting.
- C. Prevent concentrated loads on any structure or pipe within the excavation.

3.02 REMOVAL

- A. Remove sheeting without damage to the installed structure or pipe, and adjacent utilities or structures.
- B. Fill all voids caused by withdrawal of sheeting with clean compacted sand.

3.03 SHEETING LEFT IN PLACE

Sheeting may be left in place with the permission of the Owner.

END OF SECTION

SECTION 32 12 16

ASPHALT PAVING

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes all labor, materials, tools and equipment necessary for complete construction of bituminous surfaces.
- B. Related Sections:
 - 1. Section 01 20 00 PRICE AND PAYMENT PROCEDURE
 - 2. Section 31 00 00 EARTHWORK

1.02 UNIT PRICES

Refer to Section 01 20 00 PRICE AND PAYMENT PROCEDURE

1.03 QUALITY ASSURANCES

- A. Provide and place in accordance with Division 4.0 of the MDOT Standard Specifications.
- B. Testing:
 - 1. Provide material for bituminous extractions and aggregate analysis as requested by the Engineer.
 - 2. Determine pavement density by Nuclear Gage Method using the test strip method.
 - 3. All materials used as fill or sub-base shall be approved by the Engineer.
 - 4. Determine gradation in accordance with ASTM C-136.
 - 5. Determine percent loss by washing in accordance with ASTM C-117.
- C. Base compaction:
 - 1. Determine maximum density using the Modified Proctor Method, ASTM D-1557 or other engineer approved method.
 - 2. Field determination of in place density shall be by Nuclear Density Method, ASTM D-2922, or other engineer approved method.
- D. Furnish weight slips for all bituminous material.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Base material: MDOT 22A Aggregate.
- B. Leveling course: MDOT 4E1
- C. Wearing course: MDOT 4E1
- D. Bond Coat: MDOT SS-1h.

PART 3 EXECUTION

3.01 AGGREGATE PAVING BASE

- A. Place a minimum depth of 6 inches compacted in place.
- B. Extend paving base to the width required for gravel shoulders. Provide a minimum depth of 8 inches compacted in place for gravel shoulders.
- C. Compact to 98% maximum density.
- D. Adjust moisture content as required to achieve compaction.
- E. Grading:
 - 1. Finish grade base to the elevations and cross sections shown on the Drawings.
 - 2. Do not place paving until the Engineer has approved the base.

3.02 BITUMINOUS SURFACE

- A. Apply bituminous paving in 2 course(s) of 1.5 inches and 1.5 inches.
- B. Compact by rolling to 95% maximum density.
- C. Apply bond coat at a rate of 0.10 gal/syd between each pavement course.
- D. Paver shall not lay pavement faster than 110 feet per minute.
- E. Vibratory rollers must be approved by Village DPW Superintendent before use.

3.03 PRESERVATION OR REMOVAL OF PAVEMENT SURFACES

- A. Minimize the amount of existing pavement which must be removed.
- B. Protect pavement outside of the payment limits.
- C. Repair any damage to pavement surfaces outside of the payment limits at no cost to the Owner.
- D. Saw cut pavement to full depth at removal limits.

3.04 TEMPERATURE AND SEASONAL LIMITATIONS

According to MDOT Specifications 2012 Section 501.03:

- A. Weather Limitations
 - a. Do not pave when moisture content prevents the bituminous from properly curing.
 - b. Paving may occur if the surface temperature of the ground is at least 35°F and there is no presence of frost on paving section or nearby.
 - c. Place greater than 200 pounds per square yard if temperature is above 35°F.
 - d. Place greater than 120 pounds per square yard if temperature is above 40°F.
 - e. Place any amount if temperature is above 50°F.
- B. Seasonal Limitations
Paving may occur from May 15 to November 1 unless otherwise approved by Engineer in writing.

3.05 PAVEMENT PATCHING

- A. Trench preparation: Place and compact backfill as specified in Section 31 00 00 EARTHWORK.
- B. Joint preparation:
 - 1. Saw cut pavement a minimum of 1 foot beyond the damaged area.
 - 2. Sweep adjacent road surfaces clean of all dirt and debris.
 - 3. Apply a bond coat at a rate of 0.10 gal/syd on all saw cut edges of the existing pavement.
 - 4. Butt joint new pavement to existing pavement.
- C. Payment limits:
 - 1. Trench crossing road:
 - a. A distance equal to the excavation depth plus the diameter of the pipe; measured perpendicular to and extending to both sides of the pipe line.
 - 2. Trench longitudinal to road:
 - a. $\frac{1}{4}$ of pavement width to be replaced if less than $\frac{1}{4}$ is removed.
 - b. $\frac{1}{2}$ of pavement width to be replaced if more than $\frac{1}{4}$ but less than $\frac{1}{2}$ is removed.
 - c. full width to be replaced if more than $\frac{1}{2}$ of pavement is removed.
- D. Place aggregate paving base and bituminous surface as specified in paragraph 3.01 and 3.02.

3.06 BITUMINOUS RATES

	<u>Base</u>	<u>Top</u>
Residential, Local Access and Commercial:	165	165
Industrial, Collector and Arterial:	165	165

3.07 TESTING FREQUENCY

<u>Subgrade:</u>	One Density Test every 500 feet, per lane (95% max. modified proctor)
<u>Subbase:</u>	One Gradation Test every 10,000 cubic yards – Class II material One Density Test every 500 feet, per lane (95% max. modified proctor)
<u>Base:</u>	One Gradation Test every 3,000 cubic yards – Class II material One Density Test every 500 feet, per lane (95% max. modified proctor)
<u>Asphalt:</u>	One Gradation Test every 1,000 tons – 22A material Three Cores per 1,000 tons (per course) Minimum Core Density 92% TMD Maximum Core Density 97% TMD Air Voids +/- 1.0% VMA +/- 1.2% Maximum Specific Gravity +/- 0.19 Asphalt Content +/- 0.5% Crushed +/- 15%

END OF SECTION

SECTION 32 13 13
CONCRETE PAVING

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes, all materials, labor, tools, and equipment necessary for the construction of concrete surfaces, including sidewalks and curb and gutter.
- B. Related Sections:
 - 1. Section 01 20 00 PRICE AND PAYMENT PROCEDURE
 - 2. Section 31 00 00 EARTHWORK

1.02 UNIT PRICES

Refer to Section 01 20 00 PRICE AND PAYMENT PROCEDURE.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Concrete reinforcement:
 - 1. Conform to MDOT Section 905.
- B. Concrete:
 - 1. Conform to MDOT Table 601-2.
 - 2. MDOT Grade P1, 3500 psi concrete mix.
- C. Joint filler:
 - 1. Fiber joint filler conforming to ASTM D-1751.
- D. Sand base:
 - 1. Provide compacted sand base as specified in Section 31 00 00, EARTHWORK.
- E. Mix Design:
 - 1. Mix design shall be submitted to Engineer.

PART 3 EXECUTION

3.01 EARTHWORK

- A. Perform all earthwork necessary to conform to the finish grades shown on the Plans.
- B. Prepare base as specified in Section 31 00 00, EARTHWORK.
- C. Backfill and compact all voids remaining after forms are removed.

3.02 CONCRETE PAVEMENT

- A. Construct concrete pavement as shown on plans in conformance with Section 602 of the MDOT Standard Specifications and Section 801 for Concrete Driveways.

B. Dimensions:

1. Length: As required to replace existing, or as shown on Plans.
2. Width: Meet existing, or as shown on Plans.
3. Thickness: 9" minimum or greater if required to meet existing.
4. Slope: Meet existing, slope to drain.

C. Joints:

1. Concrete pavement joints shall be placed in a pattern as shown in MDOT Standard Plan II-42 series, Sheet 5 of 6, "Joints for Concrete Pavement Widening".
2. Transverse construction joints, Symbol C, shall be placed to match joints in the existing pavement.

D. Reinforcement:

1. Wire fabric reinforcement shall be placed in all concrete pavement in accordance with MDOT Standard Plan II-45 series.

E. Finish: Finish surface in accordance with MDOT Specification 602.

END OF SECTION

SECTION 32 15 00
AGGREGATE SURFACES

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes all labor, materials, tools, and equipment necessary for the complete installation of aggregate surfaces, including roadways, driveways, and parking areas. Also includes providing, shaping and grading the sand base.
- B. Related sections:
 - 1. Section 01 20 00 PRICE AND PAYMENT PROCEDURE
 - 2. Section 01 45 29 TESTING LABORATORY SERVICES

1.02 UNIT PRICES

Aggregate surfaces will be considered incidental to the performance of the work, unless specifically indicated on the BID SCHEDULE and in Section 1 20 00 PRICE AND PAYMENT PROCEDURE.

1.03 QUALITY ASSURANCES

- A. Testing:
 - 1. Test in accordance with Section 01 45 29, TESTING LABORATORY SERVICES.
 - 2. All materials used as fill or sub-base shall be approved by the Engineer.
 - 3. Determine gradation in accordance with ASTM D-136.
 - 4. Determine percent loss by washing in accordance with ASTM D-117.
- B. Compaction:
 - 1. Determine maximum density using the Modified Proctor Method, ASTM D-1557. Engineer may approve other field determinations of maximum density, such as Michigan Cone.
 - 2. Field determination of in place density shall be by Nuclear Density Method, ASTM D-2922, or other approved method.

PART 2 PRODUCTS

2.01 MATERIALS

Aggregate Surface Material: MDOT 23A Aggregate

PART 3 EXECUTION

3.01 AGGREGATE SURFACES

- A. Place a minimum depth of 6 inches compacted in place.
- B. Compact to 98% maximum density.
- C. Adjust moisture content as required to achieve compaction.
- D. Grading:
 - 1. Finish surface grade to conform to the elevations and cross sections shown on Plans.
 - 2. Contractor is responsible for verifying proper finish grades.

END OF SECTION

SECTION 32 16 13
CURBS AND GUTTERS

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes, all materials, labor, tools, and equipment necessary for the construction of concrete surfaces, including sidewalks and curb and gutter.
- B. Related Sections:
 - 1. Section 01 20 00 PRICE AND PAYMENT PROCEDURE
 - 2. Section 31 00 00 EARTHWORK

1.02 UNIT PRICES

Refer to Section 01 20 00 PRICE AND PAYMENT PROCEDURE

PART 2 PRODUCTS

2.01 MATERIALS

- A. Concrete reinforcement:
 - 1. Conform to MDOT Section 905.
- B. Concrete:
 - 1. Conform to MDOT Table 601-2.
 - 2. MDOT Grade P1, 3500 psi concrete mix.
- C. Joint filler:
 - 1. Fiber joint filler conforming to ASTM D-1751.
- D. Sand base:
 - 1. Provide compacted sand base as specified in Section 31 00 00, EARTHWORK.
- E. Mix Design:
 - 1. Mix design shall be submitted to Engineer.

PART 3 EXECUTION

3.01 EARTHWORK

- A. Perform all earthwork necessary to conform to the finish grades shown on the Plans.
- B. Prepare base as specified in Section 31 00 00, EARTHWORK.
- C. Backfill and compact all voids remaining after forms are removed.

3.02 CURB AND GUTTER

- A. Construct curb and gutter in accordance with Section 802 of the MDOT Standard Specifications.
- B. All new curb and gutter shall be the Type, shown on the Plans.

CURBS AND GUTTERS

- C. Curb openings as detailed on Plans, installed at existing driveways at the location of existing curb openings shall be constructed in accordance with MDOT R-29 Series.
- D. Depressed curbs to 1" height at sidewalk ramps and driveway openings.
- E. Joints:
 - 1. Provide 1" expansion joints at:
 - a. Saw cut curb ends.
 - b. Curb radius spring points.
 - c. Approximately 10 feet each side of all catch basins.
 - 2. Provide contraction joints at:
 - a. Opposite all transverse contraction joints in concrete pavement.
 - b. At 40 foot maximum intervals.
 - 3. Joints shall conform with MDOT Standard Plan II-30 series.
- F. Finish: Finish surface in accordance with MDOT Specification 803.

END OF SECTION

SECTION 32 16 23
SIDEWALKS

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes, all materials, labor, tools, and equipment necessary for the construction of concrete surfaces, including sidewalks and curb and gutter.
- B. Related Sections:
 - 1. Section 01 20 00 PRICE AND PAYMENT PROCEDURE
 - 2. Section 31 00 00 EARTHWORK
 - 3. Section 01 33 23 SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES

1.02 UNIT PRICES

Refer to Section 01 20 00 PRICE AND PAYMENT PROCEDURE

PART 2 PRODUCTS

2.01 MATERIALS

- A. Concrete reinforcement:
 - 1. Conform to MDOT Section 905.
- B. Concrete:
 - 1. Conform to MDOT Table 601-2.
 - 2. MDOT Grade P1, 3500 psi concrete mix.
- C. Joint filler:
 - 1. Fiber joint filler conforming to ASTM D-1751.
- D. Sand base:
 - 1. Provide compacted sand base as specified in Section 31 00 00, EARTHWORK.
- E. Mix Design:
 - 1. Mix design shall be submitted to Engineer.

PART 3 EXECUTION

3.01 EARTHWORK

- A. Perform all earthwork necessary to conform to the finish grades shown on the Plans.
- B. Prepare base as specified in Section 31 00 00, EARTHWORK.
- C. Backfill and compact all voids remaining after forms are removed.

3.02 SIDEWALKS

- A. Construct in conformance with Section 803 of the MDOT Standard Specifications.
- B. Dimensions:

1. Length: As shown on the Plans.
 2. Width: As noted on Plans or a minimum of 5'.
 3. Thickness:
 - a. 4" except where thickened at drive approaches.
 - b. 6" at drive approaches as detailed on plans.
 4. Slope: $\frac{1}{4}$ " per foot toward curb.
- C. Joints:
1. Expansion joints:
 - a. Provide $\frac{1}{2}$ " expansion joints as shown on the Plans and as follows:
 - i. At ends of thickened sidewalk.
 - ii. At a maximum spacing of 50 feet.
 - iii. Around permanent structures in sidewalk.
 - iv. Between back of curb and sidewalk.
 - v. Sidewalk ramps meet back of curb.
 2. Plane of weakness joints:
 - a. At intervals equal to the sidewalk width, or at a maximum 10 feet.
 - b. In thickened sidewalk at outer edges of driveways.
 - c. Where permanent structures are located in sidewalk.
- D. Finish: Finish surface in accordance with MDOT Specification 803.

3.03 SIDEWALK RAMPS

- A. Construct MDOT ADA sidewalk ramps with detectable warning strips (tactile strips) at all locations where new sidewalks meet curbs. Submit detectable warning strip and other sidewalk appurtenance materials in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES
- B. Construct in accordance with MDOT Special Detail R-28-F and Section 803 of the MDOT Standard Specifications.
- C. Dimensions:
1. Length: As shown on the Plans.
 2. Width: 4 feet, unless noted otherwise.
 3. Thickness:
 - a. 6" unless otherwise noted on Plans.
 - b. Special thickness requirements are noted on the Plans.
- D. Joints:
1. Provide control joints at 5 feet on center.
 2. Provide expansion joints at intervals not exceeding 50 feet and between all abutting buildings and structures.
- E. Finish: Finish surface in accordance with MDOT Standard Specification Section 803.

END OF SECTION

SECTION 32 17 23

PAVEMENT MARKING

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes:
 - 1. Removal of existing pavement markings.
 - 2. Application of new pavement markings.
- B. Related Sections:
 - 1. Section 01 20 00 PRICE AND PAYMENT PROCEDURE
 - 2. Section 01 56 00 TEMPORARY BARRIERS AND ENCLOSURES
 - 3. Section 01 56 23 TRAFFIC REGULATION

1.02 UNIT PRICES

Refer to Section 01 20 00, PRICE AND PAYMENT PROCEDURE

1.03 REFERENCED STANDARDS

- A. Unless otherwise specified, the work for this section shall conform to all state and national laws, ordinances, rules, and regulations pertaining to the kind, including but not limited to the following standard specifications.
 - 1. Michigan Manual of Uniform Traffic Control Devices (MMUTCD)
 - 2. ASTM - American Society for Testing and Materials
 - 3. Michigan Department of Transportation (MDOT) Standard Specifications

PART 2 PRODUCTS

2.01 MATERIALS

MDOT approved and selected from the qualified products list.

2.02 SUBMITTALS

- A. Certification from the manufacturer that the materials comply with MDOT requirements.
- B. Material Safety Data Sheets (MSDS)

PART 3 EXECUTION

3.01 GENERAL

- A. Apply pavement markings in accordance with the MMUTCD and MDOT Standard Specifications. Pavement shall be swept clean prior to application of pavement markings.
- B. Remove and reapply improperly located markings at the Contractor's expense in a manner consistent with specifications and approved by the OWNER.

3.02 WEATHER AND SEASONAL LIMITATIONS

- A. Do not apply markings to a damp surface.
- B. Do not apply markings when the surface temperature is less than 40°F.

3.03 PROTECTION OF PAVEMENT MARKINGS

- A. Keep traffic moving at all times and perform striping in a manner to prevent traffic from crossing the uncured markings.
- B. The Contractor may furnish a pavement marking convoy of three vehicles as indicated on the PAVEMENT MARKING CONVOY illustration sheets (if included) to protect the wet paint.
- C. Markings obliterated by traffic shall be retraced at the contractor's expense.

END OF SECTION

SECTION 32 20 00
CONCRETE SURFACES

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes, all materials, labor, tools, and equipment necessary for the construction of concrete surfaces, including sidewalks and curb and gutter.
- B. Related Sections:
 - Section 01 20 00 PRICE AND PAYMENT PROCEDURES
 - Section 31 23 00 EXCAVATION AND FILL

1.02 PAYMENT

All work performed under this section shall be included as part of the BID for this project and subject to Section 01 20 00 PRICE AND PAYMENT PROCEDURES.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Concrete reinforcement:
 - 1. Conform to MDOT Section 905.
- B. Concrete:
 - 1. Conform to MDOT Table 601-2.
 - 2. MDOT Grade P1, 3500 psi concrete mix.
- C. Joint filler:
 - 1. Fiber joint filler conforming to ASTM D-1751.
- D. Sand base:
 - 1. Provide compacted sand base as specified in Section 31 23 00 EXCAVATION AND FILL.

PART 3 EXECUTION

3.01 EARTHWORK

- A. Perform all earthwork necessary to conform to the finish grades shown on the Plans.
- B. Prepare base as specified in Section 31 23 00 EXCAVATION AND FILL.
- C. Backfill and compact all voids remaining after forms are removed.

3.02 CONCRETE PAVEMENT

- A. Construct concrete pavement as shown on plans in conformance with Section 602 of the MDOT Standard Specifications for concrete pavement and section 801 for concrete driveways.
- B. Dimensions:
 - 1. Length: As required to replace existing, or as shown on Plans.
 - 2. Width: Meet existing, or as shown on Plans.

3. Thickness: 9" minimum or greater if required to meet existing.
4. Slope: Meet existing, slope to drain.
- C. Joints:
 1. Concrete pavement joints shall be placed in a pattern as shown in MDOT Standard Plan II-42 series, Sheet 5 of 6, "Joints for Concrete Pavement Widening".
 2. Transverse construction joints, Symbol C, shall be placed to match joints in the existing pavement.
- D. Reinforcement:
 1. Wire fabric reinforcement shall be placed in all concrete pavement in accordance with MDOT Standard Plan II-45 series.
- E. Finish: Finish surface in accordance with MDOT Specification 4.50.

3.03 SIDEWALKS & COURTYARDS

- A. Construct in conformance with Section 803 of the MDOT Standard Specifications.
- B. Dimensions:
 1. Length: As shown on the Plans.
 2. Width: As noted on Plans.
 3. Thickness:
 - a. 4" except where shown 6" on plan.
 - b. 6" at locations shown on plans.
 4. Slope: As noted on plans or 1/4" per foot toward curb.
- C. Joints:
 1. Expansion joints:
 - a. Provide 1/2" expansion joints as shown on the Plans and as follows:
 - i. At ends of thickened sidewalk.
 - ii. At a maximum spacing of 50 feet.
 - iii. Around permanent structures in sidewalk.
 - iv. Between back of curb and sidewalk.
 - v. Sidewalk ramps meet back of curb.
 2. Plane of weakness joints:
 - a. At intervals equal to the sidewalk width, or at a maximum 10 feet.
 - b. In thickened sidewalk at outer edges of driveways.
 - c. Where permanent structures are located in sidewalk.
 - d. Cut joints to at least 1/4 the thickness of the sidewalk or concrete surface.
 - e. Finished joints shall be smooth and true to line.
- D. Finish: Finish surface in accordance with MDOT Specification 803.

3.04 CURB AND GUTTER

- A. Construct curb and gutter in accordance with Section 802 of the MDOT Standard Specifications.
- B. All new curb and gutter shall be the Type, shown on the Plans.
- C. Curb openings as detailed on Plans, installed at existing driveways at the location of existing curb openings.
- D. Depressed curbs to 1" height at sidewalk ramps and driveway openings.
- E. Joints:
 1. Provide 1" expansion joints at:
 - a. Saw cut curb ends.
 - b. Curb radius spring points.
 - c. Approximately 10 feet each side of all catch basins.
 2. Provide contraction joints at:

- a. Opposite all transverse contraction joints in concrete pavement.
- b. At 40 foot maximum intervals.
3. Joints shall conform with MDOT Standard Plan II-30 series.

F. Finish: Finish surface in accordance with MDOT Specification 803.

3.05 SIDEWALK RAMPS

- A. Construct MDOT ADA sidewalk ramps with detectable warning strips (tactile strips) at locations where shown on the plans.
- B. Construct in accordance with MDOT Special Detail R-28-F and Section 803 of the MDOT Standard Specifications.
- C. Dimensions:
 1. Length: As shown on the Plans.
 2. Width: 4 feet, unless noted otherwise.
 3. Thickness:
 - a. 6" unless otherwise noted on Plans.
 - b. Special thickness requirements are noted on the Plans.
- D. Joints:
 1. Provide control joints at 5 feet on center.
 2. Provide expansion joints at intervals not exceeding 50 feet and between all abutting buildings and structures.
- E. Finish: Finish surface in accordance with MDOT Standard Specification Section 803.

END OF SECTION

SECTION 32 31 13

GALVANIZED CHAIN LINK FENCE AND GATES

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. DIVISION 01 - GENERAL REQUIREMENTS: Drawings, quality, product and performance requirements, general and supplemental conditions apply as applicable to the project and project documents.

1.2 SUMMARY

- A. This Section includes industrial/commercial chain link fence and gates specifications:
 - 1. Galvanized steel coated chain link fabric
 - 2. Galvanized steel framework and fittings
 - 3. Gates: swing and cantilever slide
 - 4. Barbed wire
 - 5. Installation
- B. Related Sections:
 - 1. 01 33 23 - SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES
 - 2. 03 30 53 - MISCELLANEOUS CAST IN PLACE CONCRETE
 - 3. 31 00 00 - EARTHWORK 31 22 19

1.3 REFERENCES

- A. ASTM A392 Specification for Zinc-Coated Steel Chain-Link Fence Fabric
- B. ASTM A780 Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings
- C. ASTM F552 Standard Terminology Relating to Chain Link Fencing
- F. ASTM F567 Standard Practice for Installation of Chain Link Fence
- G. ASTM F626 Specification for Fence Fittings
- H. ASTM F1043 Specification for Strength and Protective Coatings of Steel Industrial Chain Link Fence Framework
- I. ASTM F1083 Specification for Pipe, Steel, Hot-Dipped Zinc-Coated (Galvanized) Welded, for Fence Structures
- J. ASTM F1184 Specification for Industrial and Commercial Horizontal Slide Gates

1.4 SUBMITTALS

- A. Shop drawings: Site plan showing layout of fence location with dimensions, location of gates and opening size, cleared area, elevation of fence, gates, footings and details of attachments. Comply with the provisions of Section 01 33 23.
- B. Material samples: When required, provide representative samples of chain link fabric, framework and fittings. 1 square foot, 1 sample total
- C. Specification Changes: May not be made after the date of bid.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

- A. Framework, posts, rails, fabric, and fittings for chain link fence system Merchant Metals or equal.

2.2 CHAIN LINK FABRIC

- A. Steel Chain Link Fabric: Height indicated on drawings, 2" mesh, 9 gauge, zinc coated steel, top selvage twist, bottom selvage knuckle.

2.3 ROUND STEEL PIPE FENCE FRAMEWORK

- A. Round steel pipe and rail: Schedule 40 standard weight pipe, in accordance with ASTM F1083, 1.8 oz/ ft² hot dip galvanized zinc exterior and 1.8 oz/ft² hot dip galvanized zinc interior coating.

High Strength Grade: Minimum yield strength 50,000 psi

Specify Grade: High Strength

1. Line post: 1 7/8" OD x 0.65"
2. End, Corner, Pull post: 2 3/8" OD x 0.042
3. Top, brace, bottom and intermediate rails, 1.660 in. OD

- B.. Typical post and rail size for normal Commercial / Industrial applications

Item	Fence Height	Outside Diameter Inches	*F1083 Schedule 40 Weight lb/ft	F1043-IC (LG-40) Weight lb/ft
Line post	up to 6 ft.	1.900	2.72	2.28
	over 6 to 8 ft.	2.375	3.65	3.12
	over 8 to 12 ft.	2.875	5.79	4.64
	over 12 to 16 ft.	4.000	9.11	6.56
Terminal post	up to 6 ft.	2.375	3.65	3.12
	over 6 to 8 ft.	2.875	5.79	4.64
	over 8 to 12 ft.	4.000	9.11	6.56
	over 12 to 16 ft.	6.625	18.97	Not available
		8.625	28.58	Not available
Rails		1.660	2.27	1.84

*Regular Grade F1083 Schedule 40

2.4 TENSION WIRE

- A. Metallic Coated Steel Marcellled Tension Wire: 7 gauge core marcellled wire complying with ASTM A824 Match coating type to that of the chain link fabric

1. Type II Zinc-Coated, ASTM A817 Class 4 - 1.2 oz/ft²
2. Type II Zinc-Coated, ASTM A817 Class 5 - 2.0 oz/ft²

2.5 FITTINGS

- A. Tension and Brace Bands: Galvanized pressed steel complying with ASTM F626, minimum steel thickness of 12 gauge, minimum width of 3/4 in. and minimum zinc coating of 1.20 oz/ft². Secure bands with 5/16 in. galvanized steel carriage bolts.
- B. Terminal Post Caps, Line Post Loop Tops, Rail and Brace Ends, Boulevard Clamps, Rail Sleeves: In compliance to ASTM F626, pressed steel galvanized after fabrication having a minimum zinc coating of 1.20 oz/ft².
- C. Truss Rod Assembly: In compliance with ASTM F626, 3/8 in. or 5/16" diameter steel truss rod with a pressed steel tightener, minimum zinc coating of 1.2 oz/ft², assembly capable of withstanding a tension of 2,000 lbs.
- D. Tension Bars: In compliance with ASTM F626. Galvanized steel one-piece length 2 in. less than the fabric height. Minimum zinc coating 1.2 oz. /ft².
*Bars for 2 in. and 1 ¾ in. mesh shall have a minimum cross section of 3/16 in. by 3/4 in.

2.6 TIE WIRE and HOG RINGS

- A. Basic commercial / industrial applications - specify 9 gauge core aluminum alloy ties and hog rings per ASTM F626.

2.7 HORIZONTAL SLIDE GATES

- A. Cantilever Slide Gates: Made in accordance with ASTM F 1184 Type II Class 2, and in compliance with UL-325, and ASTM 2200. (No substitution) Gate to be made of Aluminum Alloy 6005A-T61. All square members are 2" sq. weighing 0.94 lb/FT. Complete frame welded to top one piece track and 4" x 2" bottom rail weighing 1.71 lbs./ft. Supply 2 truck assemblies that are swivel type having lubricated and scaled ball bearing wheels that will align in the track during all normal operations of the gate.

Standard Opening	Standard Support Overhang
11'-0" through 14'-0"	7'-6"
15'-0" through 22'-0"	10'-0"
23'-0" through 30'-0"	12'-0"
31'-0" through 40'-0"	16'-0"

Gates 31'0" through 40'0" dual top tracks and two additional truck assemblies.

- B. Chain Link 2" Fabric: Galvanized After Weaving
- C. Finish: Natural Aluminum horizontal slide gates and posts shall match the coating type and color as that specified for the fence framework.
- D. Gateposts, 4" O.D. schedule 40 weighing 9.11 lb/ft. Single gates with single tracks require 3 gate posts. (1 latch post and 2 support posts) Single gates with dual tracks require 5 gate posts. (1 latch and 2 dual support posts) Double gates require twice the number of support posts but do not have a latch post.

2.11 CONCRETE

Concrete for post footings shall have a 28-day compressive strength of 2,500 psi..

PART 3 EXECUTION

3.1 CLEARING FENCE LINE

Clearing: Surveying, clearing, grubbing, grading and removal of debris for the fence line or any required clear areas adjacent to the fence is included in the earthwork contractor's contract under the provisions of Division 31 - Earthwork. The contract drawings indicate the extent of the area to be cleared and grubbed.

3.2 FRAMEWORK INSTALLATION

- A. Posts: Posts shall be set plumb in concrete footings in accordance with ASTM F567. Minimum footing depth, 24 in. plus an additional 3 in. depth for each 1 ft. increase in the fence height over 4 ft. Minimum footing diameter four times the largest cross section of the post up to a 4.00" dimension and three times the largest cross section of post greater than a 4.00" dimension. Top of concrete footing to be at grade crowned to shed water away from the post. Line posts installed at intervals not exceeding 10 ft. on center.
- B. Top rail: When specified, install 21 ft. lengths of rail continuous thru the line post or barb arm loop top. Splice rail using top rail sleeves minimum 6 in. long. Rail shall be secured to the terminal post by a brace band and rail end. Bottom rail or intermediate rail shall be field cut and secured to the line posts using boulevard clamps or brace band with rail end. Fences 12 feet high or higher require mid rail.
- C. Terminal posts: End, corner, pull and gate posts shall be braced and trussed for fence 6 ft. and higher and for fences 5 ft. in height not having a top rail. The horizontal brace rail and diagonal truss rod shall be installed in accordance with ASTM F567.
- D. Tension wire: Shall be installed 4 in. up from the bottom of the fabric. Fences without top rail shall have a tension wire installed 4 in. down from the top of the fabric. Tension wire to be stretched taut, independently and prior to the fabric, between the terminal posts and secured to the terminal post using a brace band. Secure the tension wire to each line post with a tie wire.

3.3 CHAIN LINK FABRIC INSTALLATION

- A. Chain Link Fabric: Install fabric to outside of the framework maintaining a ground clearance of no more than 2 inches. Attach fabric to the terminal post by threading the tension bar through the fabric; secure the tension bar to the terminal post with tension bands and 5/16 in. carriage bolts spaced no greater than 12 inches on center. Chain link fabric to be stretched taut free of sag. Fabric to be secured to the line post with tie wires spaced no greater than 12 inches on center and to horizontal rail spaced no greater than 18 inches on center. Preformed 9 gauge power-fastened wire ties shall be installed following ASTM F626: Wrap the tie a full 360° around the post or rail and fabric wire picket, using a variable speed drill, twist the two ends together three full turns, cut off any excess wire and bend over to prevent injury. Secure the fabric to the tension wire by crimping hogs rings around a fabric wire picket and tension wire.

3.4 GATE INSTALLATION

- A. Horizontal Slide Gates: Install according to manufacturer's instructions and in accordance with ASTM F567. Gates shall be plum in the closed position, installed to slide with an initial pull force no greater than 40 lbs.. Double gate drop bar receivers to be installed in a concrete footing as required by site conditions and codes. Ground clearance shall be 3 in., grade permitting.

3.6 NUTS AND BOLTS

Bolts: Carriage bolts used for fittings shall be installed with the head on the secure side of the fence. All bolts shall be peened over to prevent removal of the nut.

3.7 ELECTRICAL GROUNDING

Grounding: Grounding of the fence and gates is not the responsibility of the fence contractor and not included in the fencing scope of work for this contract. Grounding, when required, shall be specified and included in Contract Section 33 79 00 Site Grounding. A licensed electrical contractor shall install grounding when required.

3.8 CLEAN UP

Clean Up: The area of the fence line shall be left neat and free of any debris caused by the installation of the fence.

END OF SECTION

SECTION 32 90 00
PLANTING

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes:
 - 1. Work necessary to restore all disturbed surfaces and facilities to equal or better condition.
 - 2. Provide, establish, and maintain seed, fertilizer, mulch, and erosion control materials.
- B. Related Sections
 - 1. Section 01 20 00 PRICE AND PAYMENT PROCEDURE
 - 2. Section 31 00 00 EARTHWORK
 - 3. Section 31 25 00 EROSION CONTROL

1.02 UNIT PRICES

All work under this Section shall be considered incidental to the work unless specifically indicated on the BID SCHEDULE and referred to in Section 01 20 00, PRICE AND PAYMENT PROCEDURE.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Topsoil: Provide topsoil as specified in Section 31 00 00, EARTHWORK.
- B. Seed: Provide seed mixture composed of the following proportion by weight:

Creeping Red Fescue	35%
Kentucky Blue Grass	15%
Perennial Rye Grass	50%
- C. Fertilizer:
 - 1. Provide chemical fertilizer with a 12-12-12 mixture of Nitrogen (N), Phosphoric Acid (P_2O_5), and Potash (K_2O).
 - 2. Provide net weight of contents and guaranteed analysis.
- D. Mulching: Provide straw, hay, or other material conforming to MDOT Specification 8.21.11, as approved by the Engineer.

PART 3 EXECUTION

3.01 TOPSOIL PREPARATION

- A. General:
 - 1. Prepare topsoil after finish grading of surfaces.
 - 2. Prepare soil to a friable condition by discing, harrowing, or otherwise loosening the soil to a depth of 3 inches.
 - 3. Break up all lumps of soil.
 - 4. Rake out all rocks and debris.

3.02 FERTILIZING

- A. Apply evenly on the prepared surface at a rate of 240 pounds per acre.
- B. Drill or broadcast method, placed no deeper than 1 inch.

3.03 SOWING

- A. Sow grass at a minimum rate of 100 pounds per acre.
- B. Method:
 - 1. Sow the seed following or in conjunction with the fertilizer.
 - 2. Sow only while soil is in a friable condition.
 - 3. Do not sow through mulch.
 - 4. Sow seed mixture by drill or broadcast method.
 - 5. Float seed sown by broadcast method so that 50% of the seed is mixed with the top 2 inch of the soil.
- C. Hydroseeding:
 - 1. Apply seed, fertilizer, and mulch in one application.
 - 2. Mulch shall be a wood fiber material.
 - 3. Apply at a rate of 1440 pounds per acre.
- D. Watering:
 - 1. Water all seeded areas to establish a smooth and full vegetative cover.
 - 2. Should erosion occur or the seed not grow within the guarantee period, regrade and reseed the disturbed area at no additional cost.
- E. Erosion control:
 - 1. Provide measures necessary to establish well rooted vegetation on slopes and ditch bottoms.
 - 2. Protect seeded slopes with netted mulch blankets or other suitable methods.
- F. Seasonal limitations:
 - 1. Apply seed between May 1 and October 1.
 - 2. Dormant seeding:
 - a. Permitted in limited areas to complete a project.
 - b. Apply after November 1, but not on frozen ground.
- G. Maintenance:
 - 1. Mow areas in the ROW to facilitate growth as directed by the engineer until substantial completion is achieved.

3.04 MULCHING

- A. Apply at a rate of 2 bales per 1000 square feet.
- B. Method:
 - 1. Apply immediately after seeding.
 - 2. Apply evenly and loose enough to allow sunlight and air to penetrate, but thick enough to reduce the rate of evaporation and erosion.
 - 3. Apply mulch adhesive as necessary at a rate of 150 gallons per acre.

END OF SECTION

SECTION 33 01 10.57

DISINFECTION OF WATER SUPPLY WELLS

PART I GENERAL

1.01 SUMMARY

Section includes well disinfection procedures which are in accordance with AWWA Standards for disinfection of wells, ANSI/AWWA C654-03.

1.02 GENERAL

- A. Every new or reconditioned well, pump installation or well facility which is opened for maintenance or inspection shall be cleaned, pumped to waste, and disinfected in accordance with AWWA Standards for deep wells A-100-97.
- B. All wells providing water to a water supply system shall be disinfected.

1.03 UNIT PRICES

Disinfection supplies and equipment:

Payment for disinfection of water well shall be considered incidental to the performance of the work.

PART 2 PRODUCTS

2.01 CHLORINE

Concentration of chlorine shall be at least 50 mg/L.

PART 3 EXECUTION

3.01 GENERAL

Interior of well:

1. Interior of well shall first be cleaned to remove foreign substances, oil, grease, or joint compound before disinfecting well.
2. Chlorine solution shall be applied to all parts of well.
3. A contact time of 24 hours in all parts of the well shall be used.

3.02 DISINFECTION

- A. Non-flowing wells: The method of disinfection shall be approved by the Engineer where practicable.

1. Method "A".
 - a. A chlorine solution of 50 mg/L shall be prepared in a container having a volume equal to twice the volume of water contained in the well.
 - b. Solution shall be rapidly discharged into well flushing walls above water well.
2. Method "B".

A chlorine solution of 15,000 mg/L shall be added to a continuous flow of water to provide a chlorine concentration of 50 mg/L.

3. Method "C".
 - a. When methods "A" and "B" are not practicable, a chlorine solution shall be added to the well at different levels to provide 50 mg/L in the water contained in the well.
 - b. The well shall be agitated with a bit or bailer to distribute the chlorine solution throughout the water.
 - B. Artesian wells:
 1. Chlorine solution shall be applied for one (1) hour at a point at or below the formation producing the artesian condition.
 2. Chlorine solution shall be of sufficient concentration to provide 50 mg/L in the flowing water.
 - C. Well equipment and materials:
 1. All well equipment shall be dusted with a powdered chlorine compound before placing into a disinfected well.
 2. At start of operation of pump, the discharge shall be regulated to return some of the chlorinated water to well.
 - a. When using test pump, place pump far enough above the casing to return discharge.
 - b. When permanent pump is used, apply solution through casing vent or air line opening.
- 3.03 CHLORINATED SOLUTION DISPOSAL
- A. Contractor shall be responsible for the disposal of the chlorinated solution.
 - B. Contractor shall notify the appropriate departments having authority on the removal of the solution.
 - C. Wastes eventually discharged to surface waters are regulated by the Water Resources Commission, Act 245, P.A. 1929, as amended. Do not discharge chlorinated water to storm sewers.
- 3.04 BACTERIOLOGICAL TESTING
- A. Flush the well following the 24 hour chlorine contact period until the chlorine residual is 0.5 parts per million, or less.
 - B. Collect samples and submit to a laboratory approved by the Michigan Department of Environmental Quality and the Engineer for bacteriological analysis.
 - C. The well will be considered bacteriologically safe after two consecutive samples, taken at 24 hour intervals, show an absence of coliform, atypical, or overgrowth organisms.
 - D. The Engineer may, at his discretion, collect samples for bacteriological testing.
 - E. Submit all test and laboratory results to the Engineer.

END OF SECTION

SECTION 33 09 10
INSTRUMENTATION AND CONTROLS

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Work included:
 - 1. Furnish and install control equipment and instrumentation.
 - 2. Coordinate and develop hardware systems and software systems for supervisory control and data acquisition (SCADA) system.
 - 3. Include all components necessary to achieve the functional intent indicated in these Specifications.
- B. Basic equipment:
 - 1. Pressure switches.
 - 2. Flow meters.
 - 3. Instrumentation panels.
 - 4. Flow indicators, recorders and totalizers.
 - 5. Alarm system.
 - 6. Switches.
 - 7. Timers.
 - 8. PLC.
 - 9. Cellular Telemetry.
 - 10. Control system integration using MISSION Communications / SCADA.
- C. Related Sections:
 - 1. 01 33 23 - SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES
 - 2. All pertinent sections of Division 26 - Electrical.

1.02 SUBMITTALS

- A. General:

Make all submittals in accordance with 01 33 23 - SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Shop drawings:

Submit Shop Drawings showing dimensions and details of construction and installation for all control and instrumentation equipment.
- C. D. Schematics:
 - 1. Submit detailed system schematics for all the work of this Section.
 - 2. Schematics shall illustrate instrumentation and control equipment along with electrical connections to mechanical equipment furnished under other Sections.
 - 3. Submit detailed schematic of instrumentation panels including all required process equipment.
- E. Manufacturer's literature:
 - 1. Submit descriptive data of all instrumentation and control equipment.
 - 2. Submit descriptive data of installation methods and procedures.
 - 3. Submit standard drawings of materials and equipment installation.
 - 4. Submit internal wiring schematic drawings for all panels.
- F. Operation and maintenance manuals:
 - 1. Submit four (4) copies of operation and maintenance manuals for all process control equipment.
 - 2. Submit complete final system documentation including:
 - a. Complete product instruction manuals
 - b. "as-built" wiring diagram with tag identifications
 - c. Written description of the control
 - d. "as-built" PID diagram

G. Alternatives:

1. Submit alternatives in accordance with the contract documents.

1.03 INSTRUMENTATION AND CONTROL EQUIPMENT SUPPLIERS

A. Supplier:

All instrumentation and control equipment described in this Section shall be provided by one instrumentation supplier who shall be responsible for the compatibility and proper functioning of the entire system.

1. All instrumentation and control components of the same type shall be the product of the same manufacturer.
2. The instrumentation and control supplier or contractor shall coordinate his work with the work of the electrical contractor.
3. The system supplier and integrator shall be Topline Electric, West Michigan Instrumentation Systems Inc., Windemuller or Engineer approved equal. Bidders may list alternate system suppliers in accordance with the "Base Bid" provisions of the Bid Form.
4. Alternate suppliers shall meet the following minimum qualifications:
 - a. Regularly engaged in the business of designing and installing instrumentation and control systems for water facilities.
 - b. Provide qualifications and experience of technical and field staff prior to bidding.
 - c. Demonstrate the ability, equipment, and manpower to fabricate and field install all equipment.
 - d. Located in close proximity, acceptable to the owner, to provide prompt service.
 - e. Demonstrate 5 years' experience, including references and project experience descriptions.

1.04 INSTRUMENTATION AND CONTROL EQUIPMENT START UP

A. General:

Provide the services of an engineer, or field technician, of the manufacturer to check out the instrumentation and control system after it has been installed and to instruct owner's personnel in the proper operation and maintenance of the equipment installed under this Section.

B. Schedules and duration:

1. Test operate all system components
2. Provide start-up assistance and training on-site with the Owner's personnel.
3. Provide a minimum of 5 full days for start up and training, or as needed to provide a working system.

1.05 FUNCTIONAL INTENT - DESCRIPTION OF CONTROL

A. General:

1. The equipment for instrumentation and process control shall be provided as indicated in the written scope.
2. Provide a pump control system to operate and monitor the existing utilizing the Mission Communications system. Cellular telemetry shall be used to transmit data to and from all existing and proposed well houses back to the data hosting service provider.
3. General Control for the Haring Township Water System:
 - a. The Haring Township water tower level will be used as the control to trigger the pump cycles. Backup low pressure switches shall be used to trigger pump cycles at each well house in the event of communication loss to the water tower.
 - b. The Proposed Haring Township Well No. 3 and 4 wellhouse and the existing well house wells will work as an integrated system with all wells able to be set as

- LEAD, LAG, LAG-2, etc., with the ability to have automatic alternation of these settings. **The existing wells will be set to operate as emergency backup only.**
- c. The system will have two modes of operation: Summer and Winter. In winter mode, the level set points will be tighter to increase pump cycle times. Summer mode will have greater level set points. When the tank is offline for maintenance, the well pump VFD speed will be set to maintain an operator set pressure value.
 - d. The wellhouse will have its own Main Control Panel (MCP) with its own Programmable Logic Controller (PLC) and 10-inch Human Interface (HMI). The PLC will control the operation of the well pumps and the chemical feed pumps while monitoring each well's flow rate and the chemical use via the proposed scales. The proposed scales shall have a 4-20mA analog output for recording weight of chemical. The chemical feed pumps will plug into a switched outlet where the top outlet will allow the operator to operate the pump manually and the bottom outlet will use the analog output from the PLC for variable flow pacing relative to the pump flow.
 - e. All alarms will have an Audible alarm (Sonalert) and silence push button. This will allow the alarms during the day to be acknowledged without sending an alarm communication to the operator.
 - f. Lightning protection will be installed on the cellular antenna wire and ethernet radio cable. This does not guarantee lightning protection but minimizes damage from storms.
 - g. Well Pump Control:
 - 1. Provide a control system to operate the well pumps.
 - 2. Provide connections from new VFDs to PLC.
 - 3. Provide PLC and control logic to control pump speed.
 - 4. Interface the control system with the VFD motor controllers.
 - 5. The functional intent of the control system includes:
 - 1. Provide ability to operate each pump as a lead, lag-1, lag-2, standby-1, or standby-2.
 - 2. Provide H-O-A capability for hand or automatic operation. Pump speed in the hand mode shall be set manually at the variable frequency drive controller. Provide maximum pump run time before alternation.
 - 3. Provide separate control system for each pump.
 - 4. Pump speed can be variable or constant based on an operator set point of a percentage of maximum pump capacity flow or a desired flow rate.
 - h. Provide an operator interface for a timed setpoint to ensure that the lead pump required to be energized comes on based on water tank level or system pressure. If a pump does not energize and the level in the tank continues to decrease or system pressure decreases to a certain pressure, the next pump in line, if not already operating, will be energized for operation.
- 4. Transmit flow signal to the main control panel for the following functions:
 - a. Ratio station input.
 - b. Flow totalizer (Daily, Monthly, Annually)
 - c. Flow summer/winter.
 - d. High and low flow alarms.
 - 5. Provide status indication to the SCADA system:
 - a. Pump run indication and run time total for each pump and trending
 - b. Pump H-O-A selector
 - c. Set point for constant speed operation – hand position
 - d. Set point for level control operation – auto position
 - e. Set point for total time before alternation of lead pump – auto position

- f. Pump speed status for each pump, ramp up/down setpoint times
- g. Totalized pump hours for each pump (Daily, Annually)
- h. Pump flow rate in gallons per minute (gpm)
- i. Operator flow rate set point for each pump (gpm)
- j. Discharge pressure (psi) and trending
- k. Totalized Flow: Daily, Weekly, Monthly, Annual (operator selectable units)
- l. Tank level set points for Summer Operation: On/Off
- m. Tank level set points for Winter Operation: On/Off
- n. Tank level operator setpoint for level control
- o. Tank level indication and level trending
- p. Display all indicated alarms
- q. All wellhouse alarms to be sent to Haring Township MCP
- r. Wellhouse control panel will have an audible alarm with a reset
- s. Tank High/Low Level Alarm
- t. Pump failure
- u. Pump failed to turn on
- v. Power failure
- w. Run status for generator
- x. Generator failure
- y. ATS status

1.06 SCADA and Operator Interface System (OIS)

- A. Provide PLC and software system to display and monitor the control operations of the facility.
- B. Integrate the OIS with PLC's from other manufacturer's PLC's.
- C. The control system shall be capable of monitoring, trend graphing, and recording systems operation data.
- D. All recorded data shall be easily transferred to spreadsheet files for data processing in a format suitable for reporting and for internal use by the operator.
- E. All operator adjustable variables shall be easily accessible and intuitive.
- F. All alarm conditions shall be monitored and reported.
- G. All motor run conditions shall be indicated and elapsed run times totalized.
- H. Provide all the system functionality as specified in the functional intent descriptions.
- I. Provide an automated dial out or similar system capable of calling a predetermined list of phone numbers to report alarm conditions.
- J. System shall be capable of adding up to 10% more analog and digital inputs and outputs.
- K. Display pictorial graphics of all equipment:
 - i. Pumps shall change color when running
 - ii. Valves shall change color when open
 - iii. Provide text readout for each device showing "ON", "OFF", "OPEN", or "CLOSED".
 - iv. Provide trend charts for all recorded data
 - v. Provide acknowledge buttons for alarm conditions
 - vi. Provide "pop up" screen for all operator input variables
- L. Provide password protection with a minimum of 2 levels of protection which allow access to set points, do file transfers, and program termination.
- M. Provide a real-time clock and display current time and date.
- N. System shall be capable of producing menu selectable reports.
- O. Data storage:
 - i. Cloud based service provider by Mission Communications SCADA.

1.07 Wellhouse Flow Metering

- A. Finished Water Meter:
 - a. Magnetic Flow Meter

B. Include the equipment and wiring necessary to meter and transmit a flow signal to the local transmitter and control panel, and provide the following functions:

- a. Flow indicator and totalizer.
- b. Record and trend flow.

1.08 Sodium Hypochlorite Feed System:

- A. Provide a control system to operate the sodium hypochlorite feed pumps and monitor drum levels. Two items **must** occur before the feed pumps are activated: a well motor is "On", and the water flow meter has flow indication.
- B. Provide ratio station to control sodium hypochlorite feed pump speed.
- C. From existing or new hypochlorite scale transmitter, provide drum weight and approximate (calculated) weight of product left in the drum.
- D. The functional intent of the control system includes:
 1. Provide Hand-Off-Auto selector for feed pump operation:
 - i. In Hand mode, speed are set manually at the pump
 2. In Auto mode, speed is adjusted to pace to magnetic flow meter flow
- E. Provide status indication to the system SCADA system:
 1. Pump run indication and run time total for pump and trending. Chemical feed pump "On" when two conditions are met: Well Pump Motor On & Flow through flow meter confirmed
 2. Calculated drum level indication based on leftover level/weight in drum
 3. Feed rate from pump speed rate – gallons per day
 4. Select "Constant Flow" or "% of Well Flow" method for automatic control
 5. Constant flow setpoint, % speed
 6. Percent of Well flow setpoint, %

1.09 TELEMETRY SYSTEM

- A. General:
 1. Integrate all wellhouses to Mission Communications SCADA system.

1.10 SELECTOR SWITCHES

- A. General:
 1. Provide selector switches for the control panels as necessary for manual operation and herein specified.
 2. Oil-tight type designed for panel mounting.
 3. Rated at 6 amps on 120 Vac.

1.11 CONTROL PANELS

- A. Panel fabrication:
 1. Housed in NEMA 12(indoor) panel enclosures manufactured by Hoffman or equal.
 2. Provide adequate braces and stiffeners to securely support the panels and all equipment or instrumentation mounted on or in the panels.
 3. Ground smooth, prime and paint all openings cut in the panel or projections to match the panel.
 4. Finish paint coating: Color selected by the Owner from the manufacturer's standard colors.
 5. Install all piping and wiring in a workmanlike manner, grouped, bundled, supported, and routed horizontally and vertically to provide a neat appearance.
 6. Provide slide guide mounting traps for equipment mounted on front of panel with adequate extra mounting spaces.
 7. Furnish filler plates for all spare mounting spaces.

8. Control power for the panel shall require a 120/240 volt, single phase, 30 ampere, 3 wire power supply.
 9. All wiring entering or leaving the panel shall pass through labeled terminal blocks.
 10. Label all wires at both ends.
 11. Furnish engraved nameplates for all front panel mounted instrumentation.
 12. Provide U.L. listing on all preassembled panels to evidence compliance with NEC Article 90-6, 100, and 110-3.
 13. Labels:
 - a) Each alarm, control and instrumentation function or device:
Labeled as shown on the plans or as described herein.
 - b) Bonded plastic laminate type.
 - c) Label background: White with black block lettering shell.
 - d) Securely fastened to each panel in the appropriate locations.
 - e) Block lettering of the appropriate size to be easily legible by an operator standing 2 to 4 feet in front of the panel.
 - f) Each switch on the motor starters or control panels:
 - g) Legend plate indicating the various functions of each position of the switch.
- B. Functional intent:
1. Control panels: Front access designed to house the controllers, indicators, recorders, totalizers, HOA switches, and any other instrumentation required to achieve the functional intent of the specifications.
 2. Control panel: Vertical flat type shape, designed for front access.
 3. The complete panel shall be factory tested prior to shipment and field installation shall consist only of setting the panel in place and making the required electrical connections.
 4. Height of control panels shall not exceed 78 inches.

2.11 PROGRAMMABLE LOGIC CONTROLLERS

- A. General:
1. Manufacturer: Allen Bradley
 2. PLC system to include processor, power supply, SD memory, input/output modules, and expansion style chassis.
- B. Components:
1. Processor: CompactLogix 5069 series with minimum 2MB memory.
 2. I/O cards: Provide the minimum number of digital and analog I/O cards to satisfy the PID and functional intent of the control system. Model 5069. Analog modules are to be isolated.
 3. Power Supply: Minimum of 2 Allen Bradley power supplies properly sized with a minimum 25% wattage above calculated load and separate for the PLC's MOD and SA power bus.
 4. PanelView Plus 7 performance Color Operator Interface
 5. RSLogix, Allen Bradley Software supporting the selected PLC.

1.11 ALARM DIALER

- A. General:
1. Manufacturer: Sensaphone
 2. Model: Sentinel Pro

- B. Components:
 - 1. Power: 120 Volt
 - 2. Backup Power: 8 hour battery backup with integral charger
 - 3. Contacts: 12 channel digital inputs
 - 4. Up to 65 configurable MODBUS alarms from PLC
 - 5. Phone: Cellular (confirm provider with Owner)

PART 3 - EXECUTION

3.01 INSTALLATION

- A. General:

Install all process control equipment in strict accordance with the manufacturer's recommendations as approved by the Engineer, as herein specified.
- B. Electrical work: In accordance with local electrical codes.
- C. Provide, fabricate and install any required mounting brackets and devices as required.
- D. Instrumentation and control devices: Install, wire, calibrate and successfully test operate after installation.
- E. Install panels in each wellhouse.
- F. Low power DC control signal wires shall be shielded and installed in a separate steel raceway. No AC power or control wires are allowed in the same raceway. The shielded control wires shall be sized to be compatible with the distances involved and the equipment selected.
- H. AC control wires shall be in a separate conduit and sized to keep voltage drop within acceptable limits. The minimum size acceptable is #14 AWG.
- I. Before any circuits are energized, all internal and external electrical and mechanical clearances shall be checked to assure that all installed equipment will function safely and properly.
- J. Cellular panels, if necessary, shall be shimmed level and grouted. Panels shall bear evenly over the full length and be installed plumb. Panel structure shall be accurately leveled such that panel structure will not be distorted and all doors shall operate without binding.

3.02 TESTING

- A. General:
 - 1. Control panels: Completely assembled and factory tested prior to shipment.
 - 2. Any defects detected at this time shall be corrected in the factory or fab shop.
 - 3. Field installation:
 - a. Set the panel in place
 - b. Make the necessary electrical and piping connections
 - c. Test all functions of the panels.

3.03 CHECK OUT

- A. As soon as practical after installation, the instrumentation and controls supplier's engineer shall:
 - 1. Check out the work of this Section.
 - 2. Promptly make all changes and additions as required for the approval.

3.04 INSTRUCTIONS

- A. When all required approvals of this portion of the work have been obtained, and at a time designated by the Owner, the supplier's engineer shall thoroughly demonstrate to the owner's personnel the operation and maintenance of all items installed under the work of this Section and demonstrate the contents of the manual submitted under Article 1.02 of this Section.

3.05 CLEANING

- A. Prior to acceptance of the work of this Section, thoroughly clean all installed materials, equipment and related areas.

END OF SECTION

SECTION 33 11 11

TEST WELLS

PART I GENERAL

1.01 SUMMARY

- A. Section Includes
 - a. Drill and develop one 5" observation well; one 5-inch well is existing, and two 16-inch wells are existing.
 - b. Providing, setting-up, operating and dismantling equipment to conduct well pumping tests.
 - c. 6 hour pump test on the two 5" observation wells.
 - d. 24 hour pump test on the 16" test well.
- B. Related sections:
 - 1. 01025 – MEASUREMENT AND PAYMENT
 - 2. 01300 - SUBMITTALS
 - 3. 01700 - CONTRACT CLOSEOUT
 - 4. 02900 – SITE RESTORATION

1.02 UNIT PRICES

Refer to Section 01025 - MEASUREMENT AND PAYMENT.

1.04 COORDINATION

Coordinate the following items with the Owner and Engineer:

- 1. Discharge location.
- 2. Time tests are conducted.
- 3. Pump test schedule.

1.05 DESCRIPTION OF WORK

- A. Location of work: Haring Township
- B. Observation Well No. 3:
 - 1. Drill and develop 5" Observation Well No. 3.
 - 2. Install casing, screen, and gravel pack.
 - 5. Grout casing.
 - 6. Develop well
 - 7. Perform 24 hour aquifer test on existing 16-inch well as described in Part 3.
 - 8. Install temporary well cap
 - 10. Upon authorization by Owner, abandon the well observation wells.
 - 11. Restore disturbed surfaces

1.04 SUBMITTALS

- A. Submit casing, screen, gravel pack, and well cap manufacturer's information for the test well.
- B. Submit well logs and as specified in 13 33 23.

1.06 QUALITY ASSURANCE

- A. Materials:
All well materials shall be approved by the Engineer for well construction and shall comply with AWWA A-100-2020.
- B. Methods:
All methods for well construction shall be approved by the Engineer and shall comply with AWWA A-100-2020.
- C. License:
Maintain a valid well driller's license throughout the life of the contract.

1.07 SITE CONDITIONS

- A. Geologic conditions:
 - 1. Available Well Logs for the existing wells are included in Appendix B.
 - 2. The logs are provided for informational purposes only and do not necessarily represent conditions at the proposed drilling site.
- B. Terrain and vegetation:
 - 1. The Contractor shall make a personal investigation of the site to satisfy himself about local conditions.
 - 2. Site clearing is required to access the drilling location(s).

PART 2 PRODUCTS

2.01 OBSERATION WELLS

- A. Casing:
 - 1. Five inch PVC pipe approved by the Engineer.
 - 2. Minimum wall thickness shall be SDR-21 for depths of 200 feet or less.
 - 3. Minimum wall thickness shall be SDR-17 for depths in excess of 200 feet.
 - 4. Joints shall be solvent welded.
- B. Screen:
 - 1. Nominal five inch diameter.
 - 2. Stainless steel continuous slot.
 - 3. Slot size determined by the effective size and uniformity coefficient of the aquifer material.
 - 4. Design shall be approved by the Engineer.
 - 5. Submit shop drawings in accordance with Section 01300 - SUBMITTALS.
 - 6. Screen fittings shall tightly seal the screen to the casing and close the bottom of the screen.
 - 7. Screen length shall be 20 feet.
- C. Well cap:
 - 1. Design approved by the Engineer.
 - 2. Cap shall have sufficient pressure capacity to allow flowing well to be shut off for static water level measurements for aquifer tests.
 - 3. Provide threaded tap in cap for sealed well level measuring cable.
- D. Drive shoe (if required):
Design selected by the Contractor.
- E. Drilling fluids:
 - 1. Bentonite or other materials approved by the Engineer.

2. The use of "Revert" is prohibited.

- F. Grout:
Neat cement.

- G. Casing Drain:
1. Tapping saddle: Bronze double strap, required with PVC casing only.
 2. Discharge piping:
 - a. Galvanized, schedule 40.
 - b. PVC, ASTM C1785, schedule 40
 - c. Install temporary gate valve to shut off overflow for aquifer testing.

2.02 PRODUCTION WELL

- A. Casing Drain:
1. Discharge piping:
 - a. Galvanized, Schedule 40.
 - b. PVC, ASTM C1785, schedule 40
 - c. Install temporary gate valve to shut off overflow for aquifer testing.

2.03 DISCHARGE PIPING FOR TESTING

- A. Piping shall be any material capable of discharging water at the required pumping rate to the discharge point.
- B. Install throttling valve on discharge line to control flow rate.
- C. Install accurate flow meter on discharge line.

2.04 WATER LEVEL MEASUREMENT TUBE FOR TESTING

Furnish and install 3/4" diameter pipe inside casing of wells to be pumped, from top of casing to pump, to facilitate water level measurements.

2.05 WATER LEVEL MEASURING EQUIPMENT FOR TESTING

- A. Provide water level probes for pumping well and both observation wells.
- B. Install water tight sealed well cable fitting through well cap to allow probe to measure piezometric water level. Existing wells are flowing with static water level considerably higher than ground elevation.

2.06 TEST PUMP

Install submersible pump capable of producing the required test pumping yield.

PART 3 EXECUTION

3.01 PREPARATION

- A. Ingress and egress: Clear limits for access drive, future well house, and future water main as shown on the plans.

3.02 DRILLING

- A. Methods:

Rotary drilling. Cable tool drilling may be permitted if special construction techniques are approved by EGLE and the Engineer.

- B. Borehole shall be minimum 2 7/8-inches larger than the nominal casing diameter and drilled to depths as directed by the Engineer.
- C. Take all needed steps to prevent contamination of the well by fuels or chemicals during construction.
- D. Field samples:
 - 1. Take soil samples every 10 feet of drilling and at every change of geologic conditions.
 - 2. Samples shall be large enough so that a grain size analysis of the sample can be performed.
 - 3. Store samples in containers that can be sealed, label the depth of the sample and deliver samples to the Engineer.

3.03 LOGGING

- A. Gamma ray:
 - 1. Continuous log or at intervals not greater than five feet for the entire depth of the drilled hole.
 - 2. Provide graphical results with interpretation.
- B. Electrical resistivity:
 - 1. Continuous log or at intervals not greater than five feet for the entire depth of the drilled hole.
 - 2. Provide graphical results with interpretation.
- C. Well log:
Submit log on a standard well log forms.

3.04 WELL CONSTRUCTION

- A. Place test well screen at the depth determined by the Engineer based on data from driller's log and geophysical logs.
- B. Seal off formations that have undesirable characteristics.
- C. Finish casings on all wells at or above a minimum of 24 inches above grade.
- D. Construct well so the only opening to the well is through the formation from which water is produced.
- E. Grout annulus around the entire length of the casing.
- F. Well development:
 - 1. Furnish necessary pumps, bailers, plungers, compressors, or other approved equipment and methods to develop the well.
 - 2. Develop the well to obtain the maximum yield of water per foot of drawdown.
 - 3. Continue development until maximum yield is reached and is approved by Engineer.
 - 4. Provide a well, free from sand and turbidity. Turbidity shall be less than 5 mg/l as determined by Standard Methods for the Examination of Water and Wastewater.
- G. Temporary capping:
Install a temporary cap at all times during the work to prevent tampering or the entry of foreign material.
- H. Permanent capping:

Install cap on well following completion of pump test.

3.05 TESTING

A. PROTECTION

1. Protect all property during the construction, operation and dismantling of the temporary discharge lines.
2. Repair or replace, to the satisfaction of the property owner, all damage done by construction, operation and dismantling of the temporary discharge line on private property.

B. DISCHARGE OF TEST WATER

1. The discharge point shall be in a location that is acceptable to the Owner and Engineer.
2. Discharge point shall be in a location where no property damage or erosion will result.
3. Contractor shall visit site and familiarize himself with land use and terrain.

C. TESTING FOR YIELD AND DRAWDOWN

1. General:
 - a. Contractor shall furnish all materials and equipment, including but not limited to the following:
 - i. Test pumps
 - ii. Discharge piping and appurtenances as specified in 2.01.
 - iii. Generator and fuel.
 - iv. Suitable water level measuring devices, one each for pumping well, each observation well.
 - b. Contractor shall conduct test, and collect data, and prepare report.
 - c. Conduct tests in accordance with best practices. Contractor shall note the following requirements:
 - i. Water level measurements to be taken to nearest 0.01 feet.
 - ii. Well test period shall be a minimum of 6 hours for the 5" observation well and 24 hours for the 16" test well.
 - d. Close valves on casing drains prior to starting static water level measurements. Valves shall remain closed until testing is completed.
 - e. Measure and record pumping rate at least once per hour.
2. Pump Test – 5" Observation Well
 - a. Test setup:
 - i. Install test pump and water level measurement tube in the 5 inch observation well.
 - ii. Assemble discharge piping.
 - b. Pump 5" well at approximately 40 gpm or greater for 6 hours.
 - c. Prepare and submit report as described in 3.05.
3. Pump Test – 16" Test Well
 - a. Test setup:
 - i. Install test pump and water level measurement tube in the 16 inch test well.
 - ii. Install water level measuring devices in both 5" observation wells.
 - iii. Assemble discharge piping.
 - b. Pump the 16" well at approximately 800 gpm or its highest sustainable pumping rate that will allow water level measurements for at least 24 hours.
 - c. Obtain measurements in both wells as required in 3.03A.3.
 - d. Prepare and submit report as described in 3.05.D

D. WATER QUALITY TESTING

1. Near the end of each the pump test, sample the discharge water using sampling bottles specifically intended for water quality analysis.
2. Deliver the samples to a water quality laboratory that is approved by the Engineer within the laboratory's allowable timeframe for storage of water samples.
3. Test the water from the 5" observation well pump test for the following parameters:
 - a. Fluoride
 - b. Nitrate
 - c. Nitrite
 - d. Total Nitrate/Nitrate
 - e. Sulfate
 - f. Iron
 - g. Manganese
 - h. Copper
 - i. Zinc
4. Test the water from the 16" test well for the parameters required by the Engineer, EGLE, and included in Appendix C. The Contractor shall pay for all water quality laboratory and shipping costs.

E. REPORT OF FINDINGS

1. Following pump test, prepare and submit report of findings to Owner and Engineer.
2. Report shall include the following:
 - a. Well logs
 - b. Geophysical logs
 - c. Grain size analysis of aquifer material with recommendations for filter pack and screen slot size, if applicable.
 - d. Pump test field data, including:
 - i. Distance between pumping well, observation wells and existing well.
 - ii. Time of each measurement along with depth to water from top of casing and drawdown.
 - iii. Flow rate measurements with time of measurement.
 - e. Semi-log plots of drawdown and recovery curves.
 - f. Data analysis, including:
 - i. Transmissivity
 - ii. Storage coefficient
 - iii. Well losses
 - iv. 100 day drawdown projection
 - v. Maximum available yield
 - vi. Recommended production well pump

3.06 WELL CAPS

- A. Following well tests, install temporary well caps on all wells.
- B. Plug sealed probe cable taps.
- B. Well caps shall remain in place until wells are abandoned.

3.07 WELL ABANDONMENT

- A. Upon written authorization of the Engineer and after the well test, abandon the observation well.
- B. Abandon any well that does not, in the opinion of the Engineer, produce a satisfactory yield.
- C. Methods:
 - 1. Remove equipment from the well.
 - 2. Remove casing if possible.
 - 2. Fill drill hole with a mixture of bentonite and cement in accordance with AWWA requirements. Wells within 200-feet of the new production well shall be plugged with neat cement.
 - 3. Cut off casing a minimum of 2 feet below grade if casing cannot be removed.
 - 4. Regrade to original contours.
 - 5. Remove all salvaged materials from the site.

3.08 CLEAN-UP

- A. Remove all materials and rubbish from the site.
- B. Fill any pits or excavations.
- C. Grade the site.
- D. Restore surfaces in accordance with Section 02900 – SITE RESTORATION.

END OF SECTION

SECTION 33 11 13

POTABLE WATER SUPPLY WELLS

PART 1 GENERAL

1.01 DESCRIPTION

- A. Work included:
 - 1. Provide all equipment, materials, parts, labor, testing, and start up services necessary for a production pump and appurtenances for the water supply wells.
 - 2. The equipment includes the following items:
 - a. Submersible well pump
 - b. Check valve
 - c. Drop pipe
 - d. Pitless adapter
 - d. Electric cable
- B. Well pump selection:
 - 1. The pump specified is based on pumping heads determined from the drawdown testing. Bid prices shall be based on the specified pump.
- C. Related sections:
 - 1. 01 33 23 - SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES
 - 2. 01 75 16 - STARTUP SERVICES
 - 3. 33 01 10.57 DISINFECTION OF WATER SUPPLY WELLS

1.02 SUBMITTALS

- A. Make submittals in accordance with Section 01 33 23 - SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Provide shop drawings for the following equipment:
Well pump and motor
- C. Provide operation and maintenance manuals for all equipment.
- D. Provide written guarantee for all equipment.
- E. Provide well pump installation reports.

1.03 START UP SERVICES

- A. Provide start up services as specified in section 01 75 16 - STARTUP SERVICES, for all equipment provided.

1.04 WARRANTY

All pumps, motors, check valves, pipes and related equipment shall be warranted against defects in materials or workmanship for a period of one year from the date of installation.

PART 2 PRODUCTS

2.01 WELL PUMP AND APPURTENANCES

- A. All materials, equipment, and methods for the well cap, pitless adaptor unit, and well pump shall comply with the Michigan Water Well Construction and Pump Installation Code, latest revision, and NSF 61
- B. Submersible pump:
 - 1. Motor: Submersible, 60 horsepower, 3525 rpm, 460/380 volt, three phase.
 - 2. Pump: Submersible, capable of supplying 800 gpm at 240 feet TDH.
 - 3. With adequate size and length of downhole wiring.
- C. Check valve:
 - 1. 8 inch check valve capable of preventing water from backflowing.
 - 2. Provide 1 check valve for every 100 feet of drop pipe.
- D. Drop pipe:
 - 1. Well No. 3: 8 inch galvanized pipe with threaded couplings.
- E. Pitless adapter unit – 16" Well
 - 1. One unit including adapter, upper casing, and well cap.
 - 2. Flowing well pitless adapter unit with spool and cable seals to prevent water from entering upper casing.
 - 3. Unit sized to fit the casing, drop pipe, and supply line.
 - 4. Bury depth 7 feet, or as necessary to provide 6 feet of cover over pipe with top of casing 2 feet above grade.
 - 5. Unit shall provide adequate venting to the well casing. Install check valve in tap provided in top of spool to prevent pump from drawing vacuum. Check valve shall be capable of being installed in the annular space between the lift out pipe and upper casing, Simmons Model 503SB or equal.
 - 6. Unit must be threaded or welded to casing; clamp on units will not be acceptable.
 - 7. Adapter unit make and model shall be included on the EGLE "Water Well Equipment Approval List" which can be found at <https://www.michigan.gov/egle/-/media/Project/Websites/egle/Documents/Forms/DWEHD/Water-Well-Construction/EQP2272-Water-Well-Equipment-Approved-List.pdf?rev=0aa686c8baf44baeb33ae7038479c711&hash=8B8A33EB34AE67AFA6E56FB8A9B301F5>
 - 8. Well cap: Slashproof casing top seal permitting adequate casing ventilation and connection of the electrical conduit.
 - 9. Pitless unit shall terminate a minimum of 24 inches above grade.

PART 3 EXECUTION

3.01 WELL PUMP INSTALLATION

- A. Install pump and appurtenances in accordance with manufacturer's recommendations.
- B. Set as follows:
 - 1. Pitless adapter bury depth: 6 feet.
 - 2. Estimated drop pipe length:
Well No. 3: 230 feet.
 - 3. Install check valve a minimum distance of a full length of drop pipe above the pump but below the pumped water level.

3.02 DISINFECTION

Refer to Section 33 01 10.57 DISINFECTION OF WATER SUPPLY WELLS.

END OF SECTION

SECTION 33 14 13
PUBLIC WATER UTILITY DISTRIBUTION PIPING WATER DISTRIBUTION

PART 1 GENERAL

1.01 SUMMARY

- A Section includes: all labor, tools, equipment, and testing necessary for the installation of all water main and appurtenances and related sections.
- B. Related sections:
 - 1. Section 01 20 00 PRICE AND PAYMENT PROCEDURE
 - 2. Section 01 33 23 SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES
 - 3. Section 31 00 00 EARTHWORK

1.02 UNIT PRICES

Refer to Section 01 20 00, PRICE AND PAYMENT PROCEDURE

1.03 REFERENCED STANDARDS

Unless otherwise specified, the work for this Section shall conform to the applicable portions of the following Standard Specification:

- ANSI - American National Standards Institute
- ASTM - American Society for Testing and Materials
- AWWA - American Water Works Association
- NSF - National Sanitation Foundation

1.04 SUBMITTALS

Submit complete sets of shop drawings and product data to the ENGINEER for review and approval, prior to ordering any material.

1.05 DELIVERY, STORAGE AND HANDLING

- A. Piping shall not be stacked higher than four feet. Suitable racks, chairs and other supports shall be provided to protect pipe mating surfaces from damage. Store bottom tiers off the ground, alternate tiers and chock tier ends.
- B. All pipe and other materials subject to ultraviolet or ozone attack shall be protected from the sunlight, atmosphere and weather and stored in suitable enclosures until ready for installation.
- C. Store all hydrants, valves and other materials off the ground, drained and kept free of water to protect against damage from freezing.

PART 2 PRODUCTS

2.01 DUCTILE IRON WATER MAIN

- A. Design standard: AWWA C151
- B. Thickness: AWWA C150, Class 52

- C. Exterior coating: AWWA C151
- D. Interior coating: AWWA C104
- E. Joints: AWWA C111
- F. Pipe marking:
 - 1. All pipe shall be marked as required by AWWA C151.
 - 2. All pipe shall be stamped NSF- pw to indicate compliance with NSF Standard 61 for potable water.
 - 3. All pipe shall have 6.0 feet of minimum cover.

2.02 PVC WATER MAIN

- A. Design standard: AWWA C900
- B. Pressure rating: 150 psi
- C. Thickness: DR18
- D. Joints: ASTM D3139
- E. Pipe marking:
 - 1. All pipe shall be marked as required by AWWA C900.
 - 2. All pipe shall be stamped to indicate compliance with NSF Standard 61.

2.03 HDPE WATER MAIN

- A. Design standard: AWWA C901, C906
- B. Pressure rating: 200 psi
- C. Thickness: DR-11
- D. Joints: Butt-fused, restrained-mechanical or electro-fused per industry standards
- E. Pipe marking:
 - 1. All pipe shall be marked as required by AWWA C900 latest edition.
 - 2. All pipe shall be stamped to indicate compliance with NSF Standard pw.
 - 3. All pipe shall have 6.0 feet of minimum cover.

2.04 FITTINGS

- A. Material: Ductile Iron, Class 350
- B. Design standards: AWWA C110, C153
- C. Exterior coating: Bituminous, AWWA C151, 518.1
- D. Interior coating: AWWA C104
- E. Joints: AWWA C111, Mechanical Joint

2.05 RESTRAINED JOINTS

- A. Ductile iron pipe:
 - 1. Push-on joint:
 - a. Design standard: AWWA C111
 - b. Thickness: AWWA C151, Class 52
 - c. Manufacturers:
 - i. Clow: SuperLock
 - ii. U.S. Pipe: TR FLEX
 - iii. Or Engineer approved equal
 - 2. Mechanical joint:
 - a. Retainer gland safety factor: 2:1
 - b. Design requirement: Twist-off nuts to assure actuating restraint
 - c. Manufacturers:
 - i. EBAA Iron: MEGALUG, Series 1100
 - ii. Standard International
 - iii. Or Engineer approved equal
 - 3. Ball joint:
 - a. Design standard: AWWA C151
 - b. Thickness: AWWA C150, Class 54
 - c. Exterior coating: Bituminous, AWWA C151, 518.1
 - d. Interior coating: AWWA C104
 - e. Joints: AWWA C110
 - f. Manufacturers:
 - i. U.S. Pipe: USIFLEX Pipe
 - ii. Clow: Ball and Socket Pipe
 - iii. Or Engineer approved equal
- B. PVC pipe:
 - 1. Design standard: AWWA C900 and AWWA C605.
 - 2. Gland design standard: ASTM A536
 - 3. Retainer gland safety factor: 2:1
 - 4. Design requirement: Twist-off nuts to assure actuating restraint
 - 5. Manufacturers: EBAA Iron: MEGALUG, Series 1100 on all fittings greater than 22.5°, valves, hydrants & joints or Engineer approved equal

2.06 GATE VALVE AND BOX

- A. Gate valves:
 - 1. Design standard: AWWA C515, Resilient Wedge
 - 2. Opening: Counterclockwise
 - 3. Nonrising stem with 2" square operating nut
 - 4. Joint: AWWA C111, mechanical joint
 - 5. Interior coating: AWWA C550
 - 6. Exterior coating: AWWA C151, 518.1
 - 7. Manufacturer: EJ Flowmaster or Engineer approved equal
- B. Box:
 - 1. Cast iron three-piece screw type, adjustable box
 - 2. Cover marked "WATER"
 - 3. Shaft: 5¼" internal diameter
- C. Gate Valve Adaptor
 - 1. Manufacturer: Adaptor Inc. or Engineer approved equal
 - 2. ¼" steel with UV Polyurethane Protective Coating
 - 3. ¾" rubber gasket attached to the Gate Valve Adaptor

2.07 HYDRANTS

- A. Design standard: AWWA C502
- B. Manufacturer: East Jordan or Engineer approved equal
- C. Model: 5-BR250, Traffic Model
- D. Features:
 - 1. Nozzles;
 - a. 2 - 2½ inch hose, N.S. Threads
 - b. 1 - 4½ inch pumper, N.S. Threads
 - 2. 24" Snow Barrel
 - 3. Operating nut: pentagon, 1 ½" inch point to flat
 - 4. Opening: Clockwise
 - 5. Inlet: 6" Mechanical Joint
 - 6. Automatic drain: ¼" tapped and plugged
 - 7. Depth of bury: 6.0 feet, U.L. Approved
 - 8. Paint: Red

2.08 SERVICES

- A. Tapping saddles:
 - 1. Materials: ASTM B62 Brass
 - 2. Type: Double Strap
 - a. Only use Ductile Iron when services are $\geq 1 \frac{1}{2}$ "
 - 3. Manufactured and tested: AWWA C800
 - 4. Threads: AWWA taper thread
 - 5. Manufacturer: Mueller BR2S series or Engineer approved equal
 - 6. Inline tees: ≥ 3 " services
- B. Corporation stops:
 - 1. Design standard: AWWA C800
 - 2. Manufacturer: Mueller H-15000 or Engineer approved equal
 - 3. Joints: Taper thread inlet and flared copper outlet
- C. Service lines:
 - 1. Material: ASTM B88, Type K Copper
 - 2. Joints: Flared or Compression
- D. Curb stops:
 - 1. Design standard: AWWA C800
 - 2. Manufacturer: Mueller H-15204 or Engineer approved equal
 - 3. Joints: Flared copper or compression joints
- E. Curb box:
 - 1. 1" to 2" "K" Services
 - a. Cast iron
 - b. Tyler series 6500
 - c. Screw type, 2 ¼" ID
 - d. Use enlarged base w/ 2" curb stop
 - e. Use with or without stationary rod
 - f. Cover marked "Water"
 - 2. >3 " Ductile Iron Services
- F. Water meter:

1. All Meters installed inside unless approved by Village
2. Meter to match all existing Village meters

G. Meter pit:

1. High density corrugated polyethylene smooth interior pipe
2. Manufacturer: Advantage Drainage Systems or Hancor Hi-Q
3. $\frac{3}{4}$ " – 1" service, use 18" diameter pipe for pit
4. 1 $\frac{1}{2}$ " – 2" service, use 30" diameter pipe for pit

H. Meter box lids:

1. Manufacturer: Ford Meter Box Company drilled for touch read
2. Ford Wabash Double Lid Model W32 for 18" diameter meter pits
3. Ford Wabash Double Lid Model MC-30 for 30" diameter meter pits
4. Feature locking lids w/ double covers

I. Water Services:

1. 1" – 2" "K" Copper
2. > 3" Ductile Iron, HDPE or PVC

2.09 TAPPING SLEEVES & VALVES

A. Tapping valve:

1. Design standard: AWWA C509, C515
2. Opening: Counter Clockwise.
3. Non-Rising stem with a 2" square operating nut.
4. Joint: AWWA C111, Mechanical Joint.
5. Interior coating: AWWA C550
6. Exterior coating: AWWA C151, 5181

B. Tapping sleeve:

1. Joint:
 - a. AWWA C111, Mechanical Joint.
 - b. MSS SP60 Machined Face Joint to Tapping Valve.
2. Cast or ductile iron
3. Threaded and plugged port for pressure testing
4. Coatings: As specified in paragraph 2.03.

2.10 DETECTABLE UNDERGROUND MARKING TAPE

A. Minimum width of 3 inches.

B. Blue colored detectable metallic tape bearing a legend similar to "Caution Buried Waterline Below."

2.11 TRACER WIRE

- A All PVC or HDPE piping shall be installed with a continuous, insulated TW, THW, THWN, or HMWPE insulated copper, 10 gage or thicker wire for pipeline location purposes by means of an electronic line tracer.
1. The wires must be installed along the entire length of the pipe.
 2. Sections of wire shall be spliced together using approved splice caps and waterproof seals. Twisting the wires together is not acceptable.

2.12 TRACER WIRE BOX

- A. Tracer wire box shall have a cast iron cover conforming to ASTM-48 Class 25 or higher.
- B. Plastic standpipe of acrylonitrile butadiene styrene (ABS) ASTM D-1788.
- C. Manufacturer shall be VALCO Inc Mini test station, or equal.

PART 3 EXECUTION

3.01 WATER MAIN INSTALLATION

- A. Install pipe in accordance with the pipe manufacturer's recommendations including:
 - 1. Unibell PVC Pipe Association.
 - 2. Ductile Iron Pipe Research Association.
 - 3. AWWA C600, AWWA C605 and AWWA 906.
- B. Alignment and Grade:
 - 1. Lay pipe to the lines and grades established on the plans or as indicated by Engineer's stakes.
 - 2. Laying depth for water main is 6.0' of cover from top of pipe to proposed finish grade, unless shown or directed otherwise.
 - 3. Maintain a 10' horizontal separation from sewer main.
 - 4. Maintain an 18 inch minimum vertical separation from all utility crossings.
 - 5. When crossing storm or sanitary sewer, locate the water main above the sewer crossing. If the minimum cover depth cannot be met, locate the water main below the sewer crossing and position the water main section centered on the sewer.
- C. Earthwork:
Perform all trench excavation, bedding, and backfilling in accordance with Section 31 00 00 EARTHWORK.
- D. Pipe laying:
 - 1. Center the pipe within the trench with adequate clearance between the pipe and the trench sidewalls.
 - 2. Each section of pipe shall rest upon the pipe bed for the full length of its barrel, with recesses excavated to accommodate the joints.
 - 3. Thoroughly clean all foreign matter from the pipe and keep the pipe clean during the pipe laying operations by using temporary plugs.
 - 4. Pipe shall not be installed in trenches containing water or mud without the approval of the Engineer.
 - 5. All pipe ends shall be plugged with a watertight plug when construction stops for an extended period of time or overnight.
 - 6. Prevent plugged pipe from floating.
 - 7. Damage to linings and coatings shall be cause for rejection of the complete section of pipe.
 - 8. Place a detectable tape 24" above the top of the pipe.
- E. Jointing pipe:
 - 1. Thoroughly clean & lubricate bell, spigot, and gaskets.
 - 2. Only joint lubricates approved by the pipe manufacture will be permitted.
 - 3. Align the pipe & force it "Home" without damaging the joint.
 - 4. Conform to AWWA C600, AWWA C605 and AWWA C906.
- F. Joint restraint:
Install all manufactured restrained joints in conformance with the manufacturer's recommendations.
 - 1. Provide adequate joint restraint at all tees, plugs, caps, hydrants, and bends deflecting

- 22½ degrees or more.
- 2. Manufactured restrained joints:
 - a. Install only where indicated on the plans, in the specifications or where directed by the Engineer.
- 3. Tie rods:
 - a. Install only where indicated on the plans, in the specifications or where directed by the Engineer.
 - b. Install where adequate earth backing is not available.
- 4. Concrete thrust blocks:
 - a. Size and shape: As shown on the plans.
 - b. Placing pour concrete only after all connections have been made.
 - c. Location: Thrust block shall extend from the fitting to the undisturbed earth of the trench wall. Keep block behind the bell of fitting and below the hydrant drain.
 - d. Bracing: Support fittings and valves independently of the piping until the concrete has set.
- G. Connecting to existing mains:
 - 1. Provide special adapters, fittings, and pipe as required to mate the new water main with the existing water main.
 - 2. Do not connect the existing water supply system until the new water main has been pressure tested, disinfected, and approved by the engineer.
 - 3. When making the connection, swab all pipe fittings with a 4% chlorine solution.
 - 4. Provide adequate notice to owner about connections or excavations near water mains.
- H. Future connections:
 - 1. Provide thrust blocking that can be easily removed in the future.
- I. Electrical conductivity:
 - 1. Provide electrical conductivity between all ductile iron pipe, fittings and joints with the following connectors.
 - a. Brass wedges (three (3) minimum per joint)
 - b. "ElectroBond" strip connectors
 - 2. Connectors shall be capable of carrying 400 amperes for an extended period.
 - 3. Provide sufficient connectors to insure conductivity through all pipe, fittings, valves, and appurtenances.
- J. Tracer Wire and Tracer Box
 - 1. All watermain shall be laid with a 10 gage tracer wire.
 - 2. Tracer wire shall be placed 6" above watermain.
 - 3. Tracer wire shall be terminated in a tracer wire box.
 - 4. Tracer wire box shall be placed at each hydrant or approximately every 400 feet.

3.02 SETTING VALVES

- A. Set and join valves as specified for pipe sections in paragraph 3.01.
- B. Set and firmly support valve boxes over the valve. Set the box centered and plumb over the valve operating nut. Set the box lid flush with the proposed finish grade.

3.03 SETTING THE HYDRANTS

- A. Location:
 - 1. Locate as shown on the plans.

2. Set hydrant plumb to the finish grade.
 3. Set pumper nozzle pointing towards the curb or road edge.
 4. Set the hydrant height to elevations shown on plans. Use hydrant extensions as shown on plans.
- B. Shut-off valve box:
1. Install shut off valve, piping, and fittings as specified in paragraph 3.02.
- C. Restraints:
1. Anchor shut off valve to hydrant tee with tie rods.
 2. Provide thrust block at hydrant base.
 3. Prevent thrust block concrete from covering hydrant drain.

3.04 SERVICE CONNECTIONS

- A. Tapping saddles:
1. PVC main: use on all service connections
 2. Ductile iron main:
 - a. Services 1 inch to 1 inch: Not required.
 - b. Services 1½ inch to 2 inch: Use double strap tapping saddles.
 - c. 3 inch and larger: Use inline tees for service connections.
- B. Corporation stops:
Use a corporation stop for services 2 inches and smaller as specified on the plans.
- C. Service line:
1. Services 1 inch to 2 inch: Install type "K" copper tubing from corporation to curb stop.
 2. Services 3 inch and larger: Install ductile iron pipe.
- D. Curb stops:
1. Services ¾ inch to 2 inch: Set curb stop and box as shown on the plans.
 - a. Set curb box plumb over valve operating stem.
 - b. Adjust box lid to proposed finish grade.
 2. Services 3 inch and Larger: Install standard gate valve with box.
 3. Flare or compression joints
- E. Earthwork:
Perform all trench excavation, pipe bedding, and backfilling in accordance with Section 31 00 00, EARTHWORK.
- F. Cleaning:
Flush all service connections until clean.
- G. Lead Service Lines:
Report all galvanized lines or lead gooseneck piping encountered to the Engineer. Lead or galvanized services suspected of being connect to lead goosenecks will be replaced from the main to 18-inches or the first valve within the customers occupancy in accordance with PA 399.

3.05 FLUSHING

- A. General:
1. All water main shall be flushed to remove dirt and foreign matter prior to connection to the existing water supply system.
 2. Water for flushing will be the sole responsibility of the Contractor.

3. Water for flushing shall be from a potable source approved by the Engineer and the Michigan Department of Environment Great Lakes and Energy Drinking Water Division.
4. If water is available from any existing system, the Contractor shall comply with any requirements from the agency that controls the existing water system.
5. All connections to existing water supplies shall be made with a backflow prevention device in accordance with State of Michigan Act 399 and all other applicable laws of the State of Michigan.

B. Method:

1. Flush water mains using a "poly pig" supplied by the Contractor.
2. Insert the "poly pig" into the main at a location and using a method approved by the Engineer.
3. Retrieve the "poly pig" at a temporary blowoff assembly constructed by the Contractor, at a location approved by the engineer.
4. Repeat the "poly pigging" until all foreign matter is removed.

3.06 PRESSURE TESTING

A. General:

1. All water main shall be tested.
2. Conduct all testing only while the engineer is present.
3. Notify Engineer at least 24 hours prior to testing.
4. If any section of pipe fails to pass a test, the Contractor shall determine the source of the failure, repair it, and retest the section at no additional cost to the Owner.
5. The tests shall be repeated until satisfactory results are obtained.

B. Test preparation:

1. Maximum test section: 2000 feet or as approved by the Engineer.
2. Install temporary caps or pugs where necessary to test sections.
3. Brace and sufficiently backfill all parts of the pipeline to prevent movement of the pipe.
4. Water for testing shall be from a source approved by the engineer.
5. If water is available from any existing system, the contractor shall comply with any requirements from the agency that controls the existing water system.
6. Expel all air from the pipe prior to testing. If necessary to accomplish this, taps shall be made at the high points using corporation stops as specified in 2.07 B. No additional compensation will be made for taps of this type.
7. When hydrants are in the test section, test against the main valve in the hydrant.

C. Testing water main:

1. Testing equipment:
 - a. Low flow high pressure pump capable of producing 200 psi.
 - b. 0 to 200 psi gage with minimum gradations of 10 psi.
 - c. Measuring device approved by the Engineer.
2. Test method: AWWA C600 for Ductile Iron Pipe or AWWA C605 for PVC Pipe.
3. Test pressure: 150 psi, with not less than 125 psi at the highest point.
4. Test period: 2 Hours
5. Allowable leakage: Defined as the amount of water that must be supplied into the pipe to maintain the test pressure of 150 psi to within ± 5 psi during the test period. Leakage shall not exceed the rates shown below are for Ductile Iron as indicated in AWWA C600 or AWWA C605 for PVC Pipe:
 - a. 4 inch pipe: 0.66 gallons per 2 hour per 1000 feet of pipe.
 - b. 6 inch pipe: 0.99 gallons per 2 hour per 1000 feet of pipe.
 - c. 8 inch pipe: 1.32 gallons per 2 hour per 1000 feet of pipe.
 - d. 10 inch pipe: 1.66 gallons per 2 hour per 1000 feet of pipe.
 - e. 12 inch pipe: 1.99 gallons per 2 hour per 1000 feet of pipe.

6. Repair all visible leakage regardless of the amount.

D. Testing valves:

1. Test all valves in the closed position.
2. Apply a net test pressure of 125 psi for a period of 10 minutes.
3. A valve will be considered to have passed if after 10 minutes the pressure is within ± 2 psi of the net test pressure, and in the opinion of the Engineer, no appreciable amount of leakage takes place during the test period.

3.07 DISINFECTION

A. General:

1. All water main shall be disinfected.
2. All sampling must be done while the Engineer is present.
3. Notify Engineer at least 24 hours prior to testing.
4. Unless authorized by the Engineer, disinfect water main after pressure testing.
5. Conduct disinfection in accordance with AWWA C651, unless specified otherwise.

B. Disinfection procedure:

1. PolyPig and flush all water mains prior to disinfection.
2. Utilize the AWWA continuous feed method.
3. Inject the chlorine solution into the water main through a corporation stop installed at the opposite end of the discharge end of the main.
4. Fill the water main with the water and chlorine solution to produce a minimum concentration of 25 parts per million at the discharge end.
5. Valve off the water main and allow it to sit for a period of 24 hours. After 24 hours the chlorine residual must be at least 10 mg/l.
6. Dispose of heavily chlorinated water in accordance with applicable regulations.
7. If there is any possibility that the chlorinated discharge will cause damage to the environment, the contractor shall neutralize the discharge water in accordance with AWWA C651 Appendix B.

C. Bacteriological testing:

1. Collect samples from the water main at locations designated by the Engineer. As a minimum, collect samples at the inlet, mid section and discharge end of the water main.
2. Collect samples from corporation stops. Samples from fire hydrants will not be allowed.
3. Submit samples to a laboratory approved by the Michigan Department of Environment Great Lakes and Energy Drinking Water Division and the Engineer for bacteriological analysis.
4. The pipe section will have passed after two consecutive samples, taken at 24 hour intervals, shows an absence of coliform, atypical, or overgrowth organisms. Acceptable sample results are negative as otherwise defined by AWWA C651 and MDEQ requirements.
5. The Engineer may, at his discretion, collect samples for bacteriological testing.
6. Submit all test and laboratory results to the Engineer.
7. If sample fails, repeat disinfection and sample as required at no cost to the owner.
8. Acceptable results must be obtained and connection approved by Owner prior to any new watermain to the existing distribution system.

3.08 ELECTRICAL CONDUCTIVITY TESTING

A. Ductile iron pipe:

1. General:
 - a. All water main shall be tested.
 - b. Conduct all testing only while a representative of the Village is present.

- c. Notify Village at least 24 hours prior to testing.
- d. If any section of pipe fails to pass a test, the Contractor shall determine the source of the failure, repair it, and retest the section.
- e. The tests shall be repeated until satisfactory results are obtained.
- f. Test labs need to be approved by Village.
- 2. Method:
 - a. Test all water main and hydrants for electrical continuity.
 - b. Conduct test after pressure testing and while the pipe is at normal operating pressure.
 - c. Test the water main in section lengths approved by the Village.
 - d. Apply a direct current of 400 amps \pm 10% through the test section for a period of 5 minutes.
 - e. Measure current flow through the pipe continuously on a suitable ammeter. The current shall remain steady without interruption or excessive fluctuation.
 - f. The pipe section will have failed if it shows signs of insufficient current, intermediate current, or arcing, indicated by large fluctuations of the ammeter.
- B. PVC and HDPE pipe:
 - 1. Contractor shall demonstrate that the wire is continuous and unbroken through the entire run of the pipe.
 - a. Demonstration shall include full signal conductivity (including splices) when energizing for the entire run in the presence of the Owner or Engineer.
 - b. If the wire is broken, the Contractor shall repair or replace it. Pipeline installation will not be accepted until the wire passes a continuity test.

END OF SECTION

SECTION 33 40 00
STORMWATER UTILITIES

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes: all labor, materials, tools, and equipment necessary for the installation of storm sewers, drainage structures, culverts, and appurtenances as shown on the plans.
- B. Related sections:
 - 1. Section 01 20 00 PRICE AND PAYMENT PROCEDURE
 - 2. Section 01 33 23 SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES
 - 3. Section 31 00 00 EARTHWORK
 - 4. Section 31 25 00 EROSION CONTROL

1.02 UNIT PRICES

Refer to Section 01 20 00, PRICE AND PAYMENT PROCEDURE

1.03 REFERENCED STANDARDS

Unless otherwise specified, the work for this Section shall conform to the applicable portions of the following Standard Specifications:

- ASTM - American Society for Testing and Materials
- AASHTO - American Association of State Highway and Transportation Officials
- MDOT - Michigan Department of Transportation

1.04 SUBMITTALS

Submit complete sets of shop drawings and product data to the ENGINEER for review and approval, prior to ordering any material.

1.05 DELIVERY, STORAGE AND HANDLING

- A. Stack piping within manufacturer's recommended limits. Suitable racks, chairs and other supports shall be provided to protect pipe mating surfaces from damage. Store bottom tiers off the ground, alternate tiers and chock tier ends.
- B. All pipe and other materials subject to ultraviolet or ozone attack shall be protected from the sunlight, atmosphere and weather and stored in suitable enclosures until ready for installation.

PART 2 PRODUCTS

2.01 PVC PIPE

- A. Design standard: ASTM D3034
- B. Thickness: SDR 35
- C. Joints: Bell & Spigot with premium elastomeric gasket joints conforming to ASTM 3212.

2.02 HIGH DENSITY POLYETHYLENE PIPE

- A. Material: Smooth interior corrugated polyethylene pipe.
- B. Design standard:
 - 1. 3"-10" diameter: AASHTO M252
 - 2. 12"-36" diameter: AASHTO M294
 - 3. 42" and larger diameter: Meeting the performance requirements of AASHTO M294.
- C. Joints and fittings:
Conform to the corresponding pipe specification and be constructed of the same material classification as the pipe.

2.03 END SECTIONS

- A. Metal: In conformance with MDOT specification 8.08.18.
- B. Concrete: In conformance with MDOT specification 8.08.19.
- C. Protective bars, grating, etc.: As noted on plans.
- D. Rip rap: See Section 31 25 00, EROSION CONTROL.

2.04 STORM MANHOLE AND CATCH BASINS

- A. Barrel: Precast manhole riser, four foot diameter or as noted on plans, ASTM C-478 with integral base.
- B. Pipe connections:
 - 1. 8" - 48" pipe: Kor-N-Seal gasket, or equal.
 - 2. 48" - 60" pipe: A-Lock Connector, or equal.
- C. Cone: Precast eccentric cone or flat top section.
- D. Joints: ASTM C-443, rubber gasketed joints.
- E. Manhole steps: Manufacturer - MA Industries, Inc.
 - 1. PS1-PF-Precast Manhole.
 - 2. PS1-B-Block Manhole.
- F. Grade adjustment bricks: Concrete masonry units in accordance with MDOT specification 8.14.03.
- G. Casting: As noted on plans.

PART 3 EXECUTION

3.01 STORM SEWER PIPE INSTALLATION

- A. Install pipe in accordance with pipe manufacturers recommendations.
- B. Earthwork: Perform all trench excavation, pipe bedding, and backfilling in accordance with Section 31 00 00, EARTHWORK.
- C. Line and grade controls:
 - 1. Lay all pipe in a straight line between manholes and structures.
 - 2. Maintain grade by the use of laser beam.

- D. Pipe laying:
 - 1. Center the pipe within the trench with adequate clearance between the pipe and the trench sidewalls.
 - 2. Each section of pipe shall rest upon the pipe bed for the full length of its barrel, with recesses excavated to accommodate the joints.
 - 3. Thoroughly clean all foreign matter from the pipe and keep the pipe clean during the pipe laying operations by using temporary plugs.
 - 4. Pipe shall not be installed in trenches containing water or mud without the approval of the Engineer.
 - 5. All pipe ends shall be plugged with a water tight plug when construction stops for an extended period of time or overnight.
 - 6. Prevent plugged pipe from floating.
- F. Jointing pipe:
 - 1. Thoroughly clean & lubricate bell, spigot, and gaskets.
 - 2. Only joint lubricates approved by the pipe manufacture will be permitted.
 - 3. Align the pipe & force it "Home" without damaging the joint.

3.02 STORM MANHOLE AND CATCH BASIN

- A. Installation:
 - 1. Construct base sections, top cone, and castings in accordance with the details shown on the plans.
 - 2. Place base on 4 inches sand leveling base.
 - 3. Compact sand base to 95% Modified Proctor density by mechanical means.
 - 4. Manhole sections shall be set plumb.
 - 5. Seal all joints and lift holes with an approved waterproofing agent.
 - 6. Place approved backfill material around manhole in layers not exceeding 12 inches.
 - 7. Compact each backfill layer by mechanical means to 90% Modified Proctor density in non-critical areas and 95% density in critical areas, as per Section 31 00 00, EARTHWORK.
 - 8. Adjust casting to be flush with finish grade.

3.03 CONNECTING TO EXISTING DRAINAGE STRUCTURE

- A. Construct neat opening in structure wall using coring machine or hammer drill. Jackhammering or chiseling of openings will not be permitted.
- B. Seal opening around pipe with masonry and mortar to provide a leakproof seal.

3.04 ADJUSTING DRAINAGE STRUCTURE COVERS

- A. Remove existing casting, adjustment rings, bricks, etc. as required.
- B. Place bricks and/or adjustment rings as required to set casting at proper elevation.

3.05 CLEANING

- A. Clean the pipe and structures of all debris and foreign material.
- B. Remove all sediment from catch basin sumps.

END OF SECTION

SECTION 40 23 23
POTABLE WATER PROCESS PIPING

1 PART 1 GENERAL

1.01 SUMMARY

- A. This section includes the furnishing and installation of all process piping and appurtenances including water main piping (interior and below ground), and chemical feed line carrier pipe.

1.02 RELATED WORK

- A. Section 31 00 00 — EARTHWORK
- B. Section 33 14 13 — PUBLIC WATER UTILITY DISTRIBUTION
- C. Section 09 91 00 — PAINTING
- D. Section 43 32 69 — CHEMICAL FEED SYSTEMS

1.03 References

- A. NSF/ANSI 61- Drinking Water System Components – Health Effects
- B. ANSI/AWWA C110/A21.10 — Ductile Iron and Gray Iron Fittings, 3 Inch Through 48 Inch, for Water and Other Liquids
- C. ANSI/AWWA C151/A21.51 — Ductile Iron Pipe, Centrifugally Cast, for Water or Other Liquids
- D. ANSI/AWWA C509/C515 — Resilient Seat Gate Valves for Water and Sewerage Systems
- E. ANSI/AWWA C651 — Disinfecting Water Mains
- F. ASTM D1785 — Standard Specifications for Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120
- G. ASTM D2466 — Standard Specifications for Poly (Vinyl Chloride) (PVC) Plastic Fittings Schedule 40
- H. ASTM D2467 — Standard Specifications for Poly (Vinyl Chloride) (PVC) Plastic Fittings Schedule 80

1.04 SUBMITTALS

- A. Plumber's License
- B. Water Distribution
 - 1. Ductile Pipe and Fittings
 - 2. Joint Restraint
 - 3. PVC Pipe and Fittings
 - 4. Water Meter
 - 5. Strainer
 - 6. Gate Valves
 - 7. Check Valves
 - 8. Corporation Stop
 - 9. Pressure Gauge
 - 10. Hose Bibbs/Sample Taps

- A. Work covered by this section will not be accepted until testing connected with the work has been completed in accordance with the specifications.

2 PART 2 PRODUCTS

2.01 WATER DISTRIBUTION: BENEATH PUMPHOUSE

- A. Piping and Fittings
 - 1. Ductile Iron, conforming to AWWA C110 and AWWA C151 and NSF/ANSI 61
- B. Joint Restraint
 - 1. Special anchoring retainer glands equal to Megalugs, EBAA Iron Co.

2.02 WATER DISTRIBUTION: INTERIOR PUMPHOUSE

- A. Piping and Fittings
 - 1. Flanged ductile iron, conform to AWWA C110, AWWA C151, and NSF/ANSI 61
 - a Flanges: class 125, true 90° with the pipe axis, hex head stainless steel bolts and nuts
 - b Gaskets: 1/16-inch thick rubber sheet equal to Garlock No. 22.
 - c Threaded Connections: thread sealant
 - d Eccentric Reducers
- B. Water Meter
 - 1. Badger 8-inch ModMag M2000 magnetic water meter.
 - 2. Sealed transmitter reading in total gallons and flow rate in gpm.
 - 3. Capable of reading up to 1,200 gpm flows with an accuracy of 1.5%
- C. Gate Valves
 - 1. Meets or exceeds AWWA C509/C515 and UL Standard 262.
 - 2. 8-inch bronze or cast-iron body with bronze trim and stem
 - 3. Resilient-wedge, flange connections, hand wheel and non-rising stem.
 - 4. Equal to American Flow Control Series 2500.
 - 5. Exterior surface: Epoxy coated per AWWA C550
- D. Check Valves
 - 1. 8-inch silent check valve.
 - 2. Minimum 200 psi rating.
 - 3. Flange connections.
 - 4. Equal to Val-matic Series 1800 or Apco Series 600
- E. Pressure gauge
 - 1. Brass gauge cock.
 - 2. Capable of reading pressures from 0-160 within 1%
 - 3. Liquid filled.
 - 4. 4 inches in diameter
 - 5. Equal to McMaster-Carr No. 4088K5

F. Hose Bibbs and Sample Taps

1. ¾ inch bronze faucets.
2. Threaded hose bibbs.
3. Backflow prevention/vacuum breaker.

G. Sample Taps

1. ½" MIP x plain spout bronze faucet

3 PART 3 – EXECUTION

3.01 WATER MAIN AND APPURTENANCES INSTALLATION: BENEATH PUMPHOUSE

- A. Install ductile iron piping as shown on the plans.
- B. Install ductile iron water main piping from under the treatment building to 10 feet beyond the treatment building.
- C. Install thrust restraint on all fittings and appurtenances in accordance with Section 02510 — Water Distribution
- D. Install rodding from fittings above floor to fittings below floor as shown on the plans.

3.02 WATER DISTRIBUTION INSTALLATION: INTERIOR PUMPHOUSE

- A. Install piping and appurtenances in the locations shown on the plans.
 1. If a piping appurtenance conflict exists, notify the Project Engineer immediately in writing.
- B. Install pipe supports as required to support and stabilize the weight of the piping, appurtenances, and water.
 1. Install a minimum of 1 pipe support every 6 feet. More supports may be required.
- C. Install join restraints and/or rodding on piping to prevent movement.
- D. Refer to Section 33 14 13 — PUBLIC WATER UTILITY DISTRIBUTION for thrust restraint requirements.
- E. Install water meters in the location shown on the plans and in accordance with the manufacturer's recommendations. Install the strainer directly to the inlet of the Neptune 4" water meter.
- F. Install appropriate size gate valves in the locations shown on the plan.
- G. Install pressure gauge in the location shown on the plan.
- H. Install flow switches through the saddle taps on the top of the piping at the locations shown on the plans.
 1. Refer to Section 33 09 10 — INSTRUMENTATION AND CONTROLS FOR WATER UTILITIES for wiring.
- I. Install sampling taps and backflow prevention/vacuum breaker devices on the incoming lines from wells 3 and 4. Install threaded hose bibbs at other locations shown on the plans.
 1. Minimum of 8" above floor.

3.03 PRESSURE TEST

- A. Pressure test piping and appurtenances in accordance with Section 33 14 13 — PUBLIC WATER UTILITY DISTRIBUTION with pressures as follows:
 1. Water main — 150 psi
- B. Air test for drainage piping
 1. Pressure test all drainage piping in the pumphouse

2. Plug all openings.
 3. Pressurize line to 5 psi.
 4. Hold 5 psi for 15 minutes.
 - a If pressure is maintained, test passes.
 - b If pressure drops, repair pipe and retest.
 - c Repeat process until drainage piping successfully passes air test.
 - C. If any piping system fails the pressure or operational test, repair and/or replace at no cost to the owner.
 1. Repeat until all systems successfully pass the pressure, air, or operational test.
- 3.04 DISINFECTION
- A. Disinfect water piping and appurtenances in accordance with Section 33 14 13 — PUBLIC WATER UTILITY DISTRIBUTION
 - B. Test bacteriological quality in accordance with Section 33 14 13 — PUBLIC WATER UTILITY DISTRIBUTION

END OF SECTION

SECTION 40 71 13

MAGNETIC FLOW METERS

PART 1 - GENERAL

1.1 SCOPE

- A. This section describes the requirements for an electromagnetic flow meter.
- B. Under this item, the contractor shall furnish and install the flow measurement equipment and accessories as indicated on the plans and as herein specified.

1.2 QUALITY ASSURANCE

- A. Referenced Standards and Guidelines - Complies with applicable portions of ANSI/AWWA Standards and NSF/ANSI Standard 61, Annex G. There are currently no AWWA standards that specifically address electromagnetic metering.
 - 1. Flow measurement function complies with Industry Standards
 - a. ANSI B16.5 Class 150 RF
 - b. AWWA Class B
 - c. DIN EN 1092-1 (Flanges)
 - d. NEMA 4X/6P (IEC 60529 IP67)
 - e. CE

1.3 SUBMITTALS

- A. The following information shall be included in the submittal for this section:
 - 1. Data sheets and catalog literature for flow sensor
 - 2. Installation and operations manual
 - 3. List of spare parts
 - 4. Complete technical product description including a complete list of options provided
 - 5. Any portions of this specification not met must be clearly indicated or the supplier and contractor shall be liable to provide all additional components required to meet this specification

1.4 SYSTEM DESCRIPTION

- A. When looking from the end of the meter into the inside bore, the two measuring electrodes are positioned at three o'clock and nine o'clock. As a conductive fluid flows through the magnetic field, a voltage is induced across the electrodes. This voltage is proportional to the average flow velocity of the fluid and is measured by the two electrodes. This induced voltage is then amplified and processed digitally by the converter to produce an accurate analog or digital signal. The signal can then be used to indicate flow rate and totalization or to communicate to remote sensors and controllers.
- B. Electromagnetic flow meter is intended for fluid metering in industries including water, wastewater, food and beverage, pharmaceutical and chemical. Measures fluid flow of water or fluids which are highly corrosive, very viscous, contain a moderate amount of solids, or require special handling. No moving parts are in the flow stream. Amplifier can be integrally mounted to the detector or can be remote-mounted. Unit is ideally suited for measuring dynamic, non-continuous flow. In applications where a minimum and/or maximum flow rate must be tracked and monitored, the unit provides pulse signals that can be fed to dedicated batch controllers, PLCs and other more specialized instrumentation.

1.5 DEFINITIONS

- A. Amplifier – Device used for increasing the power of a signal. It does this by taking energy from a power supply and controlling the output to match the input signal shape but with larger amplitude.
- B. ANSI – (American National Standards Institute) A private non-profit organization that oversees the development of voluntary consensus standards for products, services, processes, systems, and personnel in the United States. The organization also coordinates U.S. standards with international standards so that American products can be used worldwide.
- C. AWWA – (American Water Works Association) An international non-profit professional organization founded to improve water quality and supply.

- D. Detector Coils – The coils generate a magnetic field through which a conductive medium flows.
- E. Detector Electrode – Two opposite measuring electrodes in the measuring tube conduct the induced voltage which is proportional to flow velocity to the amplifier.
- F. Modbus RTU – a serial communications protocol published by Modicon (now Schneider Electric) in 1979 for use with its programmable logic controllers (PLCs). This is used in serial communication & makes use of a compact, binary representation of the data for protocol communication.
- G. NEMA – (National Electrical Manufacturers Association) Is the 'Association of Electrical Equipment and Medical Imaging Manufacturers' in the United States. Its approximately 450 member companies manufacture products used in the generation, transmission, distribution, control, and end use of electricity. These products are used in utility, industrial, commercial, institutional, and residential applications.
- H. NSF International – An independent, accredited organization that develops standards, and tests and certifies products and systems. They provide auditing, education and risk management solutions for public health and the environment.
- I. PLCs – (Programmable Logic Controller) A digital computer used for automation of electromechanical processes, such as control of machinery on factory assembly lines, amusement rides, or light fixtures. PLCs are used in many industries and machines.
- J. PTFE – (Polytetrafluoroethylene) A synthetic fluoropolymer of tetrafluoroethylene that finds numerous applications. The best known brand name of PTFE is Teflon by DuPont Co.
- K. Serial Communications – In telecommunication and computer science, serial communication is the process of sending data one bit at a time, sequentially, over a communication channel or computer bus. This is in contrast to parallel communication, where several bits are sent as a whole, on a link with several parallel channels.

PART 2 - PRODUCTS

2.1 APPROVED MANUFACTURERS

- A. Basis-of-Design Product: Subject to compliance with specifications, provide flow measurement technology by one of the following:
 - 1. McCrometer or BABA certified equal.

2.2 OPERATING CONDITIONS

- A. System Components
 - 1. Metering Tube (Detector)
 - a. Consists of stainless steel tube lined with a non-conductive material. Energized detector coils around tube create a magnetic field across the diameter of the pipe. As a conductive fluid flows through the magnetic field, a voltage is induced across two electrodes; this voltage is proportional to the average flow velocity of the fluid.
 - 2. Signal Amplifier
 - a. Consists of unit which receives, amplifies, and processes the detector's analog signal. Signal is converted to both analog and digital signals that are used to display rate of flow and totalization. Processor controls zero-flow stability, analog and frequency outputs, serial communications and a variety of other parameters. Integrated LCD display indicates rate of flow, forward and reverse totalizers and diagnostic messages. Display guides user through programmable routines.
- B. Operational Requirements
 - 1. Electromagnetic Flow Meter
 - a. Detector Housing Material
 - 1) 304 Stainless Steel
 - b. Amplifier Housing Material
 - 1) Powder-coated aluminum die cast
 - c. Liner Material
 - 1) Hard Rubber, PFA, PTFE, ETFE
 - d. Electrodes Material
 - 1) Platinum
 - e. Grounding Rings

- 1) Stainless Steel
- f. Meter Size
 - 1) 8 inch
- g. Flow Range
 - 1) 8.4...3361 GPM (1.91...763 m³/h)
- h. Accuracy
 - 1) $\pm 0.3\%$ of reading, ± 2 mm/s
- i. Repeatability
 - 1) 0.1%
- j. Fluid Temperature
 - 1) 178° F (80° C)
- k. Ambient Temperature Range
 - 1) -4...140° F (-20...60° C)
- l. Nominal Pressure
 - 1) Up to 232 psi (16 bar)
- m. Conductivity
 - 1) Minimum 5 μ S/cm (20 μ S/cm for demineralized water)
- n. Altitude
 - 1) 2500 m
- o. Humidity
 - 1) 90% R.H. maximum
- p. Analog Output
 - 1) 0/4...20 mA
 - 2) 0...10 mA
- q. Pulse Output
 - 1) 2 open collectors
 - 2) Passive 32V DS
 - 3) 0...100 Hz 100 mA
 - 4) 100...10,000 Hz 20 mA
- r. Frequency Output
 - 1) Maximum 10 kHz (open collector)
- s. Communication
 - 1) RS232
 - 2) RS422
 - 3) RS485 Modbus RTU
- t. Empty pipe Detection
 - 1) Field-tunable for optimum performance
- u. Min-Max Flow Alarm
 - 1) Programmable outputs 1...100% of flow
- v. Low Flow Cutoff
 - 1) Programmable 0...10% of maximum flow
- w. Galvanic Separation
 - 1) Functional 500 Volts
- x. Pulse Width
 - 1) Programmable 5...2000 ms
- y. Coil Power
 - 1) Pulsed DC
- z. Power Supply
 - 1) 92...275V AC (50/60 Hz) <13 VA
 - 2) Optional 9...36V DC < 4W
 - a. Mains supply voltage fluctuations are not to exceed $\pm 10\%$ of the nominal voltage supply.
- aa. Process Connection
 - 1) Flange
 - a. DIN EN
 - b. ANSI

- c. JIS
- d. AWWA

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Follow manufacturer's recommendation for installation and conform to the guidelines provided by the Installation and Operation Manual.

3.2 MANUFACTURER'S WARRANTY

A. Terms

- 1. The manufacturer of the above specified equipment shall guarantee for two (2) years from date of installation; or two (2) years and six (6) months after the date of shipment that the equipment shall be free from defects in design, workmanship or materials.

END OF SECTION

SECTION 43 32 69
CHEMICAL FEED EQUIPMENT

1 PART 1 GENERAL

1.01 SUMMARY

- A. This section includes furnishing and installing chemical feed and safety equipment.

1.02 RELATED WORK

- A. Section 40 23 23 — POTABLE WATER PROCESS PIPING
- B. Section 26 00 00 — ELECTRICAL GENERAL PROVISIONS

1.03 SUBMITTALS

- A. Testing Equipment
- B. Chemical Injector Assembly
- C. Safety Equipment

1.04 QUALITY ASSURANCE

- A. Provide chlorination to the water system in accordance with applicable AWWA and CDC standards.

2 PART 2 PRODUCTS

- A. Compliant with NSF/ANSI 61

2.02 TESTING EQUIPMENT

- A. Hach Colorimeter for Chlorine (No. 46700-00).

2.03 HYPOCHLORINATOR

- A. Pump, two total, one installed and one for backup
 - 1. Equal to Stenner Pump Company Model 85MFH2A1S
 - a 120 VAC diaphragm metering pump
 - b Clear acrylic head.
 - c Ceramic Ball Valves
 - 2. Provide turnlock electrical plug and receptacle that is only compatible with the chemical feed outlets.
- B. Accessories
 - 1. Four function valve.
 - 2. Transparent suction tubing.
 - 3. Sinker.
 - 4. 3/8" clear NPT discharge tubing.
 - 5. Adapter Fittings.
 - 6. 3/4" NPT main connection with check valve
 - 7. Repair and preventative Maintenance Kit for selected pump
 - a Extra gaskets.
 - b Ceramic valve balls.
 - 8. 2 sets of instructions.

- 9. Manufacturer provided wall mount or aftermarket Polyethylene wall shelf for pump.
- C. Product shipped to site in labelled containers with chemical name, concentration, supplier name & address, and NSF certifications. An analysis of chemicals delivered must be conducted.

D.

2.04 CHLORINE SOLUTION

- A. Commercial grade chlorine bleach (12-15% active ingredient) meeting AWWA requirements for use in drinking water systems.
- B. Provide 2 Material Safety Data Sheets.

2.05 CHEMICAL INJECTOR ASSEMBLY (2)

- A. CPVC nozzle.
- B. ¾ inch bronze corporation stop.
- C. Diaphragm-type anti-siphon valve.
- D. Saddle and Safety chain.
- E. Equal to Stenner No. UCAK400.

2.06 SAFETY EQUIPMENT

- A. 1 pair of shoulder length neoprene gloves.
- B. 1 rubber apron.
- C. 1 half-face respirator, NIOSH approved, with a 1-year supply of filter cartridges specifically designed for chlorine handling.
- D. 1 pair of tight-fitting chemical splash safety goggles.
- E. Full face shield, 8 inch minimum
- F. 1 wall mounted fire extinguisher UL Size 3-A:40-B:C
 - 1. Equal to Buckeye 5HI SA-40 ABC.
- G. Warning signs
 - 1. Minimum dimensions: 10 inches x 14 inches.
 - 2. Material: ¼ inch thick polyethylene
 - 3. Letter Color: Red and black on a white background.
 - 4. Sign Information: DANGER WEAR PROTECTIVE SAFETY EQUIPMENT WHEN HANDLING CHEMICALS.

2.07 SECONDARY CONTAINMENT

- A. Barrel Storage - 2 two barrel / drum low profile spill containment storage units. ULINE H-4036 or equal.
- B. Barrel Ramp – 1 barrel dolly ramp. ULINE H-4038 or equal.

2.08 SCALE

- A. 1 Scaleton Industries Spill Containment Drum Scale, 4042.
- B. 1 AccuPro 5000-EK Digital Controller with one or 2 channels, encoder knob or 3 button keypad, audible alarm and 4-20 mA output signal – scale or loop powered

3 PART 3 – EXECUTION

3.01 GENERAL

- A. Integrate with a time delay and Interlock chemical feeder equipment with a duplex receptacle to operate only when well pumps are operating and flow is detected.
- B. Install duplex chemical feed outlets in chemical feed room in accordance with Section 33 09 10.
- C. Provide chlorine Material Safety Data Sheets to the water system operator.
- D. Provide safety equipment listed in Part 2 to the water system operator.

3.02 HYPOCHLORINATOR INSTALLATION

- A. Install hypochlorinator, barrel, and accessories at the location shown on the plans.
- B. Follow manufacturers instructions for accessory installation.
- C. Mount metering pump on polyethylene shelf above the solution feed barrel.
- D. Install flow indicator on suction side of liquid end.
- E. Install chlorine injector assembly with saddle and safety chain or braided stainless steel at the location shown on the plans.
 - 1. Install check valve just before injector assembly.
 - 2. CPVC nozzle shall slide through the brass corporation stop and be held in place with a compression nut.
 - 3. Install injector assembly on the lower 1/3 of the pipe cross section.

3.03 SAFETY EQUIPMENT

- A. Provide the Safety equipment defined in Part 2 of this specification.
- B. Install appropriate warning signs on the interior building wall above the chlorine feeder unit.

END OF SECTION

APPENDIX A

SOIL BORINGS



PROJECT: New Water Supply Well

PROJECT NO.: 240359

PROJECT LOCATION: Haring Township, MI

CLIENT: Haring Charter Township

DRILLING COMPANY: Gosling Czubak RIG: CME-75

DRILLER: R. Farve LOGGED BY: P. Hermstein

LOG OF BORING:

SB-1

GROUND ELEVATION: N.A. DATE: 2/19/25

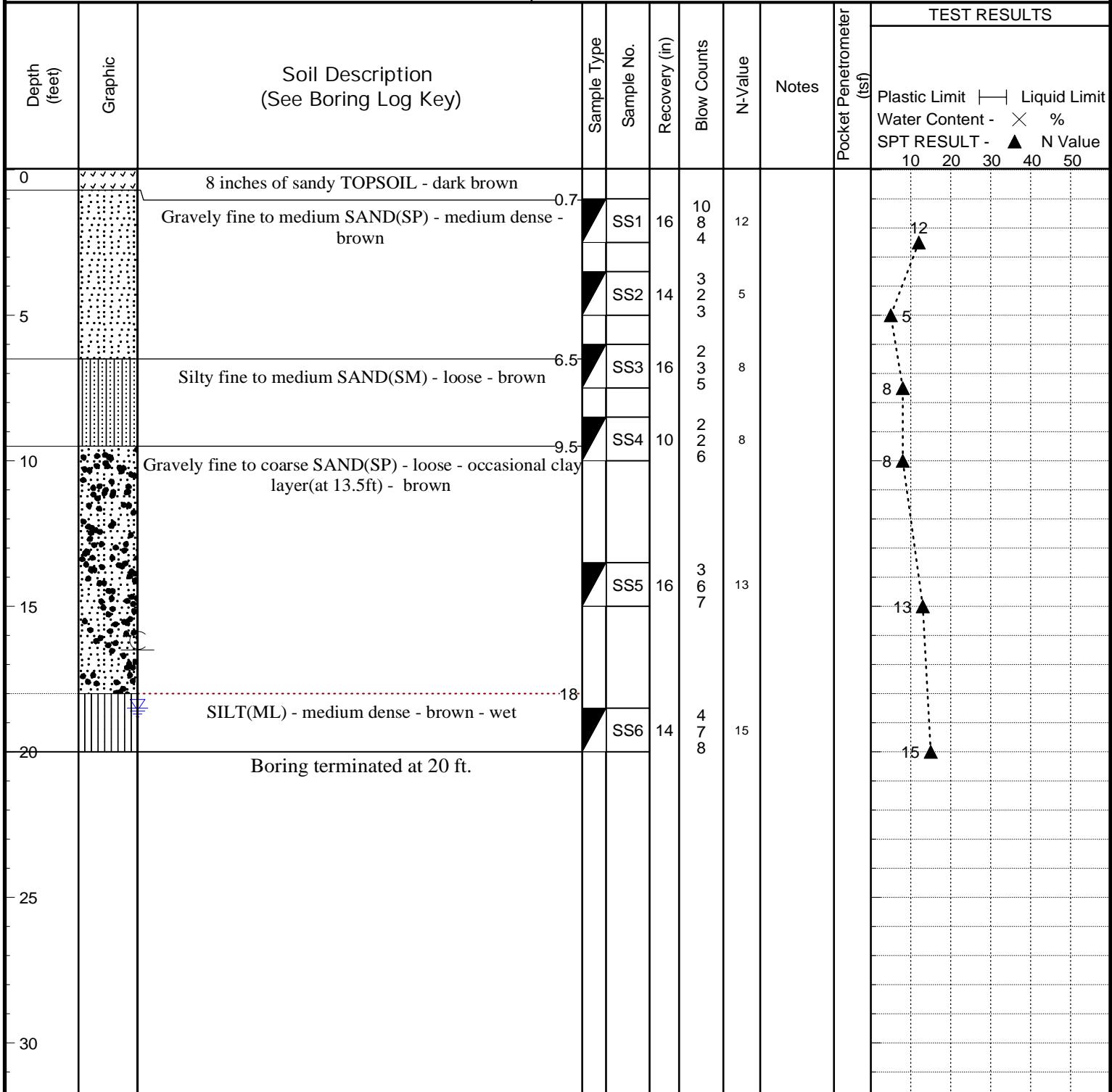
DRILLING LOCATION: Refer to Site Plan

DRILLING METHOD: 4.25-Inch (I.D.) Hollow-Stem

BOREHOLE DIAMETER (IN): 10 TOTAL DEPTH (FT): 20

STATIC WATER LEVEL: N.A. CAVING DEPTH: C 16.5ft

This information pertains only to this boring and should not be interpreted as being indicative of the site.



Backfilled with cuttings.
Soil descriptions from drillers log.



PROJECT: New Water Supply Well

PROJECT NO.: 240359

PROJECT LOCATION: Haring Township, MI

CLIENT: Haring Charter Township

DRILLING COMPANY: Gosling Czubak RIG: CME-75

DRILLER: R. Farve LOGGED BY: P. Hermstein

LOG OF BORING:

SB-2

GROUND ELEVATION: N.A. DATE: 2/19/25

DRILLING LOCATION: Refer to Site Plan

DRILLING METHOD: 4.25-Inch (I.D.) Hollow-Stem

BOREHOLE DIAMETER (IN): 10 TOTAL DEPTH (FT): 20

STATIC WATER LEVEL: N.A. CAVING DEPTH: C 13.5ft

This information pertains only to this boring and should not be interpreted as being indicative of the site.

Depth (feet)	Graphic	Soil Description (See Boring Log Key)	Sample Type	Sample No.	Recovery (in)	Blow Counts	N-Value	Notes	Pocket Penetrometer (tsf)	TEST RESULTS				
										Plastic Limit	—	Liquid Limit	Water Content -	× %
										SPT RESULT -	▲	N Value		
										10	20	30	40	50
0		6 inches of sandy TOPSOIL - brown												
		Silty fine to medium SAND(SP) - trace gravel - loose - brown		SS1	10	4 3 2	5							
				SS2	12	3 3 3	6							
5				SS3	14	3 5 5	10							
		Silty fine to medium SAND(SM) - loose - brown												
		Gravely silty fine to medium SAND(SP) - medium dense - brown		SS4	14	4 6 8	14							
10														
				SS5	14	5 10 12	22							
15		Silty fine SAND(SM) - medium dense - brown - wet												
				SS6	10	5 8 14	22							
20		Boring terminated at 20 ft.												
25														
30														

Backfilled with cuttings.
Soil descriptions from drillers log.

APPENDIX B

WELL LOGS



Water Well And Pump Record

Completion is required under authority of Part 127 Act 368 PA 1978.



Import ID:

Failure to comply is a misdemeanor.

Tax No:	Permit No:	County: Wexford		Township: Haring		
Well ID: 83000009573 Elevation: Latitude: 44.2805765 Longitude: -85.3823227 Method of Collection: GPS Std Positioning Svc SA Off		Town/Range: 22N 09W	Section: 27	Well Status: Inactive	WSSN: 3018	Source ID/Well No: Test-Production 1
		Distance and Direction from Road Intersection: 242' South of Boon Rd & 312' East of Haring Twp WWTP Dr/				
		Well Owner: Haring Charter Township				
		Well Address: 2400 block of E Boon Road Cadillac, MI 49601		Owner Address: 515 Bell Avenue Cadillac, MI 49601		

Drilling Method: Rotary Well Depth: 280.00 ft. Well Type: New Casing Type: Steel - black Casing Joint: Welded Casing Fitting: None Diameter: 16.00 in. to 240.00 ft. depth Borehole: 22.00 in. to 285.00 ft. depth	Well Use: Test well Date Completed: 2/28/2025 Height: 3.00 ft. above grade	Pump Installed: No Pressure Tank Installed: No Pressure Relief Valve Installed: No
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Static Water Level: 29.36 ft. Below Grade Well Yield Test: Pumping level 62.65 ft. after 72.00 hrs. at 800 GPM Yield Test Method: Test pump	<table border="1"><thead><tr><th>Formation Description</th><th>Thickness</th><th>Depth to Bottom</th></tr></thead><tbody><tr><td>Gravel Coarse W/Sand</td><td>30.00</td><td>30.00</td></tr><tr><td>Brown Clay W/Sand</td><td>5.00</td><td>35.00</td></tr><tr><td>Gravel Coarse W/Sand</td><td>18.00</td><td>53.00</td></tr><tr><td>Clay W/Gravel Fine</td><td>3.00</td><td>56.00</td></tr><tr><td>Gravel & Sand Fine To Coarse</td><td>44.00</td><td>100.00</td></tr><tr><td>Gravel Fine</td><td>53.00</td><td>153.00</td></tr><tr><td>Brown Clay W/Sand Fine</td><td>7.00</td><td>160.00</td></tr><tr><td>Sand Fine W/Gravel</td><td>30.00</td><td>190.00</td></tr><tr><td>Gravel & Sand Fine To Coarse</td><td>30.00</td><td>220.00</td></tr><tr><td>Gravel Broken</td><td>30.00</td><td>250.00</td></tr><tr><td>Gravel W/Sand Fine</td><td>10.00</td><td>260.00</td></tr><tr><td>Sand Fine</td><td>30.00</td><td>290.00</td></tr><tr><td> </td><td> </td><td> </td></tr><tr><td> </td><td> </td><td> </td></tr></tbody></table>	Formation Description	Thickness	Depth to Bottom	Gravel Coarse W/Sand	30.00	30.00	Brown Clay W/Sand	5.00	35.00	Gravel Coarse W/Sand	18.00	53.00	Clay W/Gravel Fine	3.00	56.00	Gravel & Sand Fine To Coarse	44.00	100.00	Gravel Fine	53.00	153.00	Brown Clay W/Sand Fine	7.00	160.00	Sand Fine W/Gravel	30.00	190.00	Gravel & Sand Fine To Coarse	30.00	220.00	Gravel Broken	30.00	250.00	Gravel W/Sand Fine	10.00	260.00	Sand Fine	30.00	290.00						
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Screen Installed: Yes Screen Diameter: 16.00 in. Screen Material Type: Stainless steel-wire wrapped Screen Installation Type: Attached Slot Length Set Between 25.00 40.00 ft. 240.00 ft. and 280.00 ft. Fittings: None	Filter Packed: Yes Blank: Well Grouted: Yes Grouting Material: Neat cement Grouting Method: Grout pipe outside casing Bags: 242.00 Additives: None Depth: 0.00 ft. to 235.00 ft.	Geology Remarks:
---	---	-------------------------

Wellhead Completion: 12 inches above grade

Nearest Source of Possible Contamination: Type Distance Direction None	Drilling Machine Operator Name: Wayne Parkhurst / Ryan Eddingt Employment: Employee
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	Contractor Type: Water Well Drilling Contractor Reg No: 19-2285 Business Name: Northern Pump and Well Business Address: 6837 W Grand River, Lansing, MI, 48906-9145
	Water Well Contractor's Certification This well and/or pump installation was performed under my registration.
	Signature of Registered Contractor Date

General Remarks:

Other Remarks:



Water Well And Pump Record



Completion is required under authority of Part 127 Act 368 PA 1978.

Failure to comply is a misdemeanor.

Import ID:

Tax No:	Permit No:	County: Wexford		Township: Haring		
Well ID: 83000009413 Elevation: Latitude: 44.28053 Longitude: -85.3833 Method of Collection: Interpolation-Map		Town/Range: 22N 09W	Section: 27	Well Status: Active	WSSN:	
		Source ID/Well No: Obs #1				
		Distance and Direction from Road Intersection: Cadillac, MI				
		Well Owner: Haring Charter Township				
		Well Address: 515 Bell Ave Cadillac, MI 49601		Owner Address: 515 Bell Ave Cadillac, MI 49601		

Drilling Method: Rotary Well Depth: 296.00 ft. Well Type: New Casing Type: PVC plastic Casing Joint: Spline joint/CertaLok Casing Fitting: None Diameter: 5.00 in. to 200.00 ft. depth SDR: 21.00 5.00 in. to 276.00 ft. depth SDR: 17.00 Borehole: 8.50 in. to 298.00 ft. depth	Well Use: Test well Date Completed: 5/7/2024 Height: 1.50 ft. above grade Pump Installed: No Pressure Tank Installed: No Pressure Relief Valve Installed: No																																										
Static Water Level: 23.00 ft. Below Grade Well Yield Test: Pumping level 33.00 ft. after 2.00 hrs. at 53 GPM Yield Test Method: Air	<table><thead><tr><th>Formation Description</th><th>Thickness</th><th>Depth to Bottom</th></tr></thead><tbody><tr><td>Sand Fine To Medium</td><td>25.00</td><td>25.00</td></tr><tr><td>Brown Clay</td><td>4.00</td><td>29.00</td></tr><tr><td>Sand Fine To Medium</td><td>21.00</td><td>50.00</td></tr><tr><td>Gray Clay</td><td>2.00</td><td>52.00</td></tr><tr><td>Sand & Gravel</td><td>80.00</td><td>132.00</td></tr><tr><td>Sand & Gravel</td><td>8.00</td><td>140.00</td></tr><tr><td>Sand Fine To Coarse</td><td>26.00</td><td>166.00</td></tr><tr><td>Gray Clay</td><td>4.00</td><td>170.00</td></tr><tr><td>Sand Fine To Coarse</td><td>48.00</td><td>218.00</td></tr><tr><td>Gray Clay</td><td>2.00</td><td>220.00</td></tr><tr><td>Sand Fine To Medium</td><td>5.00</td><td>225.00</td></tr><tr><td>Gray Clay W/Sand Layered</td><td>9.00</td><td>234.00</td></tr><tr><td>Sand Fine To Medium</td><td>64.00</td><td>298.00</td></tr></tbody></table>	Formation Description	Thickness	Depth to Bottom	Sand Fine To Medium	25.00	25.00	Brown Clay	4.00	29.00	Sand Fine To Medium	21.00	50.00	Gray Clay	2.00	52.00	Sand & Gravel	80.00	132.00	Sand & Gravel	8.00	140.00	Sand Fine To Coarse	26.00	166.00	Gray Clay	4.00	170.00	Sand Fine To Coarse	48.00	218.00	Gray Clay	2.00	220.00	Sand Fine To Medium	5.00	225.00	Gray Clay W/Sand Layered	9.00	234.00	Sand Fine To Medium	64.00	298.00
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Sand Fine To Medium	5.00	225.00																																									
Gray Clay W/Sand Layered	9.00	234.00																																									
Sand Fine To Medium	64.00	298.00																																									
Screen Installed: Yes Screen Diameter: 5.00 in. Screen Material Type: Stainless steel-wire wrapped Screen Installation Type: Attached Slot Length Set Between 20.00 5.00 ft. 276.00 ft. and 296.00 ft. Fittings: Other	Filter Packed: Yes Blank: 0.00 ft. Above Geology Remarks:																																										
Well Grouted: Yes Grouting Material: Neat cement Grouting Method: Grout pipe outside casing Bags: 50.00 Additives: None Depth: 0.00 ft. to 268.00 ft.																																											
Wellhead Completion: 12 inches above grade	Drilling Machine Operator Name: John Pearson Employment: Employee																																										
Nearest Source of Possible Contamination: Type: None Distance: Direction:	Contractor Type: Water Well Drilling Contractor Business Name: Pearson Drilling Co Business Address: 6100 W Blue Road, Lake City, MI, 49651 Reg No: 57-1943 Water Well Contractor's Certification This well and/or pump installation was performed under my registration. Signature of Registered Contractor Date																																										
General Remarks:																																											
Other Remarks: Screen Fittings:5" slip x thread																																											



Water Well And Pump Record

Completion is required under authority of Part 127 Act 368 PA 1978.



Import ID:

Failure to comply is a misdemeanor.

Tax No:	Permit No:	County: Wexford		Township: Haring		
Well ID: 83000009512 Elevation: Latitude: 44.28047 Longitude: -85.38226 Method of Collection: GPS Std Positioning Svc SA Off		Town/Range: 22N 09W	Section: 27	Well Status: Plugged	WSSN: 3018	Source ID/Well No: Test - 1
		Distance and Direction from Road Intersection: Approx 320 ft S of Caribou Trail at Boone Road				
		Well Owner: Charter Township of Haring				
		Well Address: 9400-block Boone Road Cadillac, MI 49601		Owner Address: 515 Bell Avnue Cadillac, MI 49601		

Drilling Method: Rotary Well Depth: 300.00 ft. Well Type: Boring (No Casing) Casing Type: None Casing Joint: Casing Fitting: Diameter: Borehole: 4.25 in. to 300.00 ft. depth		Well Use: Other Date Completed: 11/22/2024 Height:		Pump Installed: No Pressure Tank Installed: No Pressure Relief Valve Installed:			
Static Water Level: 0.00 ft. Below Grade Well Yield Test:		Yield Test Method:		Formation Description		Thickness	Depth to Bottom
				Gravel Coarse W/Sand		30.00	30.00
Screen Installed: No Intake:				Brown Clay W/Sand		5.00	35.00
				Gravel Coarse W/Sand		18.00	53.00
				Clay W/Gravel Fine		3.00	56.00
				Gravel & Sand Coarse Fine		44.00	100.00
				Gravel Fine		53.00	153.00
				Brown Clay W/Sand Fine		7.00	160.00
				Sand Fine W/Gravel		30.00	190.00
				Gravel & Sand Coarse Fine		30.00	220.00
				Gravel Broken		30.00	250.00
				Gravel W/Sand Fine		10.00	260.00
				Sand Fine		40.00	300.00
Well Grouted:		Geology Remarks:					
Wellhead Completion:		Drilling Machine Operator Name: Wayne Parkhurst / Ryan Eddingt Employment: Employee					
Nearest Source of Possible Contamination: Type Distance Direction		Contractor Type: Water Well Drilling Contractor Reg No: 19-2285 Business Name: Northern Pump and Well Business Address: 6837 W Grand River, Lansing, MI, 48906-9145					
Abandoned Well Plugged: No Reason Not Plugged: Other		Water Well Contractor's Certification This well and/or pump installation was performed under my registration. Signature of Registered Contractor Date					
General Remarks: Pending approval, location of eventual production well							
Other Remarks: Well Use:formation-sampling, Not Plugged Reason:See general remarks							



Water Well And Pump Record

Completion is required under authority of Part 127 Act 368 PA 1978.



Import ID:

Failure to comply is a misdemeanor.

Tax No:	Permit No:	County: Wexford	Township: Haring			
Well ID: 83000009574 Elevation: Latitude: 44.28012 Longitude: -85.3823582 Method of Collection: GPS Std Positioning Svc SA Off		Town/Range: 22N 09W	Section: 27	Well Status: Inactive	WSSN: 3018	Source ID/Well No: Test-Production 2
		Distance and Direction from Road Intersection: 372' South of Boon Rd & 312' East of Haring Twp WWTP Dr.				
		Well Owner: Haring Charter Township				
		Well Address: 2400 block of E Boon Road Cadillac, MI 49601		Owner Address: 515 Bell Avenue Cadillac, MI 49601		

Drilling Method: Rotary Well Depth: 280.00 ft. Well Type: New Casing Type: Steel - black Casing Joint: Welded Casing Fitting: None Diameter: 16.00 in. to 240.00 ft. depth Borehole: 22.00 in. to 285.00 ft. depth	Well Use: Test well Date Completed: 2/5/2025 Height: 2.00 ft. above grade	Pump Installed: No Pressure Tank Installed: No Pressure Relief Valve Installed: No
---	--	---

Static Water Level: 29.42 ft. Below Grade Well Yield Test: Pumping level 72.13 ft. at 1000 GPM Yield Test Method: Air	Formation Description	Thickness	Depth to Bottom
	Sand Fine To Medium	30.00	30.00
Screen Installed: Yes Screen Diameter: 16.00 in. Screen Material Type: Stainless steel-wire wrapped Screen Installation Type: Attached Slot Length Set Between: 25.00 40.00 ft. 240.00 ft. and 285.00 ft. Fittings: None	Gravel Coarse	6.00	36.00
	Sand W/Gravel Fine	44.00	80.00
	Gravel Coarse W/Sand	20.00	100.00
	Sand Fine	40.00	140.00
	Gravel & Sand Fine To Coarse	20.00	160.00
	Gravel & Sand Coarse	20.00	180.00
	Gravel Coarse	20.00	200.00
	Sand Coarse	35.00	235.00
	Sand Fine	15.00	250.00
	Gravel Fine To Medium W/Sand	35.00	285.00

Well Grouted: Yes Grouting Material: Neat cement Grouting Method: Grout pipe outside casing Bags: 242.00 Additives: None Depth: 0.00 ft. to 235.00 ft.	Geology Remarks:
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Wellhead Completion: 12 inches above grade

Nearest Source of Possible Contamination: Type: None Distance: Direction:	Drilling Machine Operator Name: Wayne Parkhurst / Ryan Eddingt Employment: Employee
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	Contractor Type: Water Well Drilling Contractor Business Name: Northern Pump and Well Business Address: 6837 W Grand River, Lansing, MI, 48906-9145 Reg No: 19-2285
	Water Well Contractor's Certification This well and/or pump installation was performed under my registration.
	Signature of Registered Contractor _____ Date _____

General Remarks:

Other Remarks:

APPENDIX C
NEW WELL CHEMICAL MONITORING
REQUIREMENTS FEBRUARY 2021

CHEMICAL MONITORING REQUIREMENTS FOR NEW COMMUNITY WATER SUPPLY WELLS

PARTIAL CHEMISTRY

(R, 32)*

Nitrate

Nitrite

Fluoride

Sulfate

Chloride

Sodium

WATER QUALITY PARAMETERS

(CORR, 33)*

Alkalinity

Calcium

Conductivity

pH (analyze in field)

Temperature (analyze in field)

GENERAL METALS

(CPM1, 36ME)*

Iron

Manganese

Copper

Zinc

METALS

(CMET2, 36ME)*

Arsenic

Barium

Cadmium

Chromium

Mercury

Antimony

Beryllium

Nickel

Selenium

Thallium

CYANIDE

(CCN, 36CN)*

Cyanide

VOLATILE ORGANICS (VOC)

(CXVO, 36VO)*

Benzene

Carbon Tetrachloride

o-dichlorobenzene

p-dichlorobenzene

1,2-dichloroethane

1,1-dichloroethylene

cis-1,2-dichloroethylene

trans-1,2-dichloroethylene

Dichloromethane (methylene chloride)

1,2-dichloropropane

Ethylbenzene

Monochlorobenzene

Styrene

Tetrachloroethylene

Toluene

1,2,4-trichlorobenzene

1,1,1-trichloroethane

1,1,2-trichloroethane

Trichloroethylene

Xylenes (total)

Vinyl Chloride

SYNTHETIC ORGANICS (SOC)

Pesticides

(CXPT, 36PT)*

Alachlor

Atrazine

Benzo(a)pyrene

Chlordane

Di(2-ethylhexyl) adipate

Di(2-ethylhexyl) phthalate

Endrin

Heptachlor

Heptachlor Epoxide

Hexachlorobenzene

Hexachlorocyclopentadiene

Lindane

Methoxychlor

Polychlorinated Biphenols

Simazine

Toxaphene

SOC (cont.)

Herbicides

(CXHB, 36HB)*

Dinoseb

Pentachlorophenol

Picloram

2,4-D

2,4,5-TP (Silvex)

Carbamates

(CXLP, 36LP)*

Aldicarb

Aldicarb Sulfoxide

Aldicarb Sulfone

Carbofuran

Oxamyl (vydate)

PFAS

(CPFAS, 36PF)*

Perfluorobutanesulfonic Acid (PFBS)

Perfluorohexane Sulfonic Acid (PFHxS)

Perfluorononanoic Acid (PFNA)

Perfluorooctane Sulfonic Acid (PFOS)

Perfluorooctanoic Acid (PFOA)

Perfluorohexanoic Acid (PFHxA)

HFPO-DA

RADIOACTIVITY

(Not performed at EGLE Lab)*

Gross Alpha

Radium 226

Radium 228

A certified laboratory must perform the above testing.

Michigan Department of Environment, Great Lakes, and Energy (EGLE) Laboratory scans may include other contaminants for which monitoring is not mandated.

* EGLE Lab Test Code and Sample Unit