

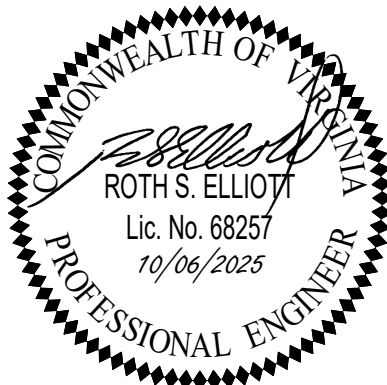
**Contract Documents**  
**For**  
**Central WTP Electrical Improvements**  
**Bedford County, Virginia**  
**October 6, 2025**



**Prepared for the Bedford Regional Water Authority**  
**Bedford, Virginia**

**Brian M. Key, P.E., Executive Director**  
**Rhonda English, P.E., Deputy Director**

**BRWA Job No. 2023-025.1**  
**Wiley|Wilson Project. No. 230031**



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**All Construction shall conform to BRWA's Master Specifications. The Master Specifications are included in the contract by reference. In the case of contradicting specification, the more stringent will take precedent unless written authorization has been provided by the BRWA.**

**Bedford Regional Water Authority  
1723 Falling Creek Road  
Bedford, VA 24523**

#### **INVITATION FOR BIDS**

Sealed bids for the construction of the Central WTP Electrical Improvements Phase 1 project will be received by the Bedford Regional Water Authority (BRWA) at the Bedford Regional Water Authority's Office, 1723 Falling Creek Road, Bedford, Virginia 24523, until **2:00 PM**, local prevailing time on **Thursday, October 30, 2025**, and then at said office publicly opened and read aloud.

#### **CONTRACT DESCRIPTION**

**This project consists of Phase 1 work to include replacing emergency generator equipment and the automatic transfer switch at the Central WTP, as shown on the contract documents. The generator equipment must be provided as Owner Furnished/Contractor Installed equipment. Phases 2 and 3 work, as identified on the contract documents, are not included in the scope of this project.**

#### **PRE-BID CONFERENCE, CLARIFICATIONS, AND ADDENDA**

A non-mandatory pre-bid conference will be held at **2:00 PM** on **Thursday, October 16, 2025**, at the Central WTP at 1132 Mountain Water Drive, Bedford, VA 24523. Bidders are strongly encouraged to attend. Deadline for questions and clarifications on the contract documents must be made in writing by **5:00 PM** on **October 22, 2025**. Only clarifications by formal written addenda will be binding. All communications in regard to clarifications and any other matters related to this project shall be addressed to the Authority, Attn: Rhonda English, P.E., Deputy Director, 1723 Falling Creek Road, Bedford, VA 24523, email: [r.english@brwa.com](mailto:r.english@brwa.com).

#### **WITHDRAWAL OF BIDS**

The procedure for withdrawal of Bids shall be according to Section 2.2-4330 of the Code of Virginia.

#### **CONTRACT AWARD**

The contract is to be awarded on a lump sum basis.

#### **BIDDING DOCUMENTS**

**Bidding Documents can be downloaded from the BRWA website ([www.brwa.com](http://www.brwa.com)) free of charge. The BRWA Master Specifications can also be downloaded from the BRWA website free of charge. Addenda will be posted to the BRWA website, and it is the Contractor's responsibility to acknowledge all addenda on the Bid Form.**



**CONTRACT LICENSING**

Bidder's attention is invited to the requirements of Title 54.1, Chapter 11, of the Code of Virginia pertaining to registration, which specifies the following:

"Class A contractors" perform or manage construction, removal, repair, or improvements when (i) the total value referred to in a single contract or project is \$120,000 or more, or (ii) the total value of all such construction, removal, repair, or improvements undertaken by such person within any 12-month period is \$750,000 or more.

"Class B contractors" perform or manage construction, removal, repair, or improvements when (i) the total value referred to in a single contract or project is \$10,000 or more, but less than \$120,000, or (ii) the total value of all such construction, removal, repair or improvements undertaken by such person within any 12-month period is \$150,000 or more, but less than \$750,000.

The bidder shall place on the outside of the envelope containing the bid and shall place in the bid over his signature whichever of the following notations is appropriate:

"Licensed Class A Virginia Contractor No. \_\_\_\_\_."

"Licensed Class B Virginia Contractor No. \_\_\_\_\_."

**NONDISCRIMINATION AND DRUG-FREE WORKPLACE**

The successful bidder must comply with the Presidents Executive Order #11246, prohibiting discrimination in employment regarding race, creed, sex, or national origin; Executive Orders #12138 and 11625 regarding utilization of MBE/WBE subcontractors in the performance of this contract; provide certification that they do not or will not maintain or provide for their employees facilities that are segregated on the basis of race, color, creed, or national origin; and comply with the provisions of Civil Rights Act of 1964. The successful bidders and contractors performing work under this advertisement must meet the requirements of the Code of Virginia, Title 2.2, Chapter 43, Paragraph 2.2-4311, Employment Discrimination Prohibitions, and Paragraph 2.24312, Drug-free Workplace.

Owner: Bedford Regional Water Authority

By: Rhonda English, P.E.

Title: Deputy Director

Date: October 8, 2025

**END OF DOCUMENT**

INSTRUCTIONS TO BIDDERS FOR CONSTRUCTION CONTRACT

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**ARTICLE 1—BIDDING DOCUMENTS**

- 1.01 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.
- 1.02 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.
- 1.03 Owner has established a Bidding Documents Website as indicated in the Advertisement or invitation to bid. 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.
- 1.04 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. 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.
- 1.05 *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. 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. 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 2—QUALIFICATIONS OF BIDDERS**

- 2.01 To demonstrate Bidder's qualifications to perform the Work, after submitting its Bid and within 10 days of Owner's request, Bidder must submit the following information if requested by the Owner:
  - A. Written evidence establishing its qualifications such as financial data, previous experience, and present commitments.
  - B. Subcontractor and Supplier qualification information.
  - C. Other required information regarding qualifications.
- 2.02 A Bidder's failure to submit required qualification information within the times indicated may disqualify Bidder from receiving an award of the Contract.
- 2.03 No requirement in this Article to submit information will prejudice the right of Owner to seek additional pertinent information regarding Bidder's qualifications.

## **ARTICLE 3—PRE-BID CONFERENCE**

- 3.01 A non-mandatory pre-bid conference will be held at the time and location indicated in the Advertisement or invitation to bid. Representatives of Owner and Engineer will be present to discuss the Project. Bidders are encouraged to attend and participate in the conference; however, attendance at this conference is not required to submit a Bid.
- 3.02 Information presented at the pre-Bid conference does not alter the Contract Documents. Owner will issue Addenda to make any changes to the Contract Documents that result from discussions at the pre-Bid conference. Information presented, and statements made at the pre-bid conference will not be binding or legally effective unless incorporated in an Addendum.

## **ARTICLE 4—SITE AND OTHER AREAS; EXISTING SITE CONDITIONS; EXAMINATION OF SITE; OWNER'S SAFETY PROGRAM; OTHER WORK AT THE SITE**

- 4.01 *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.
- 4.02 *Existing Site Conditions*
  - A. *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.

**4.03** *Site Visit and Testing by Bidders*

- A. Bidder is required to visit the Site and conduct a thorough visual examination of the Site and adjacent areas. During the visit the Bidder must not disturb any ongoing operations at the Site.
- B. 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.

**ARTICLE 5—BIDDER'S REPRESENTATIONS AND CERTIFICATIONS**

**5.01** *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 6—INTERPRETATIONS AND ADDENDA**

- 6.01 Owner on its own initiative may issue Addenda to clarify, correct, supplement, or change the Bidding Documents.
- 6.02 Bidder shall submit all questions about the meaning or intent of the Bidding Documents to Engineer in writing.
- 6.03 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.
- 6.04 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 7—BID SECURITY**

- 7.01 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.
- 7.02 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.
- 7.03 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.
- 7.04 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 8—CONTRACT TIMES**

- 8.01 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.
- 8.02 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 9—SUBSTITUTE AND "OR EQUAL" ITEMS**

- 9.01 The Contract for the Work, as awarded, will be on the basis of materials and equipment specified or described in the Bidding Documents, and those "or-equal" or substitute materials and equipment subsequently approved by Engineer prior to the submittal of Bids and identified by Addendum. No item of material or equipment will be considered by Engineer as an "or-equal" or substitute unless written request for approval has been submitted by Bidder and has been received by Engineer within 10 days of the issuance of the Advertisement for Bids or invitation to Bidders. Each such request must comply with the requirements of Paragraphs 7.05 and 7.06 of the General Conditions, and the review of the request will be governed by the

principles in those paragraphs. The burden of proof of the merit of the proposed item is upon Bidder. Engineer's decision of approval or disapproval of a proposed item will be final. If Engineer approves any such proposed item, such approval will be set forth in an Addendum issued to all registered Bidders. Bidders cannot rely upon approvals made in any other manner.

- 9.02 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 10—PREPARATION OF BID**

- 10.01 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."
- 10.02 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.
- 10.03 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.
- 10.04 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.
- 10.05 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.
- 10.06 A Bid by an individual must show the Bidder's name and official address.
- 10.07 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.
- 10.08 All names must be printed in ink below the signatures.

- 10.09 The Bid must contain an acknowledgment of receipt of all Addenda, the numbers of which must be filled in on the Bid Form.
- 10.10 Postal and e-mail addresses and telephone number for communications regarding the Bid must be shown.
- 10.11 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.
- 10.12 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.
- 10.13 In accordance with Section 2.2 - 4334, of the Code of Virginia, for bids of \$200,000 or more for construction of highways, roads, streets, bridges, parking lots, demolition, clearing, grading, excavating, paving, pile driving, miscellaneous drainage structures, and the installation of water, gas, sewer lines and pumping stations, the Bid Form will include a space for the bidder to indicate an option to use the escrow account procedure in order to have retained funds paid to an escrow agent.

#### **ARTICLE 11—BASIS OF BID**

##### **11.01 *Lump Sum***

- A. Bidders must submit a Bid on a lump sum basis as set forth in the Bid Form.

#### **ARTICLE 12—SUBMITTAL OF BID**

- 12.01 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.
- 12.02 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.
- 12.03 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 13—MODIFICATION AND WITHDRAWAL OF BID**

- 13.01 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.
- 13.02 The procedure for withdrawal of bids shall be as set forth in the Advertisement for Bids.

**ARTICLE 14—OPENING OF BIDS**

- 14.01 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 15—BIDS TO REMAIN SUBJECT TO ACCEPTANCE**

- 15.01 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 16—EVALUATION OF BIDS AND AWARD OF CONTRACT**

- 16.01 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.
- 16.02 Owner will reject the Bid of any Bidder that Owner finds, after reasonable inquiry and evaluation, to not be responsible.
- 16.03 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.
- 16.04 If Owner awards the contract for the Work, such award will be to the responsible Bidder submitting the lowest responsive Bid.
- 16.05 *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. 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.

- 16.06 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.
- 16.07 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.
- 16.08 Negotiation with the Lowest Bidder: Unless all bids are canceled or rejected, Owner reserves the right to negotiate with the lowest responsive and responsible bidder to obtain a contract price within the funds available to Owner whenever such low bid exceeds Owner's available funds for the project. Owner shall initiate such negotiations by written notice to the lowest responsive, responsible bidder that its bid exceeds the available funds and Owner wishes to negotiate a lower contract price. The times, places and manner of negotiating shall be agreed to by Owner and the lowest responsive, responsible bidder. Contract modifications as a result of negotiations will be issued as a change order issued concurrently with the Notice of Award and Agreement in accordance with the procedures identified in the General Conditions and/or Agreement.

#### **ARTICLE 17—BONDS AND INSURANCE**

- 17.01 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.
- 17.02 The Bid Security Article, of these Instructions, addresses any requirements for providing bid bonds as part of the bidding process.

#### **ARTICLE 18—SIGNING OF AGREEMENT**

- 18.01 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, insurance documentation, and in the event the Contract meets the requirements as stipulated in Section 10.13 of these Instructions to Bidders and the successful bidder elects to use the escrow account procedure, the Escrow Agreement, 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.

## BID FORM FOR CONSTRUCTION CONTRACT

### PROJECT IDENTIFICATION:

Central WTP Electrical Improvements Phase 1  
Bedford Regional Water Authority  
Bedford, VA

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:  
**Bedford Regional Water Authority**  
**1723 Falling Creek Road**  
**Bedford, VA 24523**  
**Attn: Rhonda English, P.E., Deputy Director**
- 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. 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;
  - C. Required Bidder Qualification Statement with supporting data.

**ARTICLE 3—BASIS OF BID—LUMP SUM PRICE BID**

3.01 Bidder will perform the following Work for a lump sum price of:

|                    |    |
|--------------------|----|
| Lump Sum Bid Price | \$ |
|--------------------|----|

3.02 Bidder acknowledges that:

- A. 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
- B. 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 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*

Bidder hereby acknowledges receipt of the following Addenda:

| 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:

---

EJCDC® C-410, Bid Form for Construction Contract.

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and American Society of Civil Engineers. All rights reserved.

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.

#### **ARTICLE 7 - ESCROW OF RETAINED FUNDS**

In accordance with Section 2.2-4334 of the Virginia Public Procurement Act (VPPA), any Contract valued at \$200,000.00 or more for construction of highways, roads, streets, bridges, parking lots, demolition, clearing, grading, excavating, paving, pile driving miscellaneous drainage structures, and the installation of water, gas, sewer lines and pumping stations where portions of the Contract price are to be retained, at the time of submitting a bid, the Contractor shall have the option to indicate preference for using the escrow account procedure for utilization of the Owner retained funds by so indicating in the space provided in this Article 7, below. In the event the successful Contractor elects to use the escrow account procedure, the "Escrow Agreement" included in the Contract documents shall be executed and submitted to the Owner within 15 days after receipt of the Notice to Award. If the "Escrow Agreement" form is not submitted, the Contractor shall forfeit his rights to the use of the escrow account procedure within the 15-day period.

In order to have retained funds paid to an escrow agent, the Contractor, the escrow agent, and the surety shall execute the "Escrow Agreement" furnished by the Owner, and submit same to the Owner for approval. The Contractor's escrow agent shall be a trust company, approved bank or savings and loan institution with its principal office located in the Commonwealth of Virginia. The "Escrow Agreement" shall contain the complete address of the escrow agent and surety, and the executed "Escrow Agreement" will be authority for the Owner to make payment of retained funds to the escrow agent. After approving the agreement, the Owner will pay to the escrow agent the funds retained as provided herein, except that funds retained for lack of progress or other deficiencies on the part of the Contractor will not be paid to

the escrow agent. The escrow agent may, in accordance with the stipulations contained in the "Escrow Agreement", invest the funds paid into the escrow account and pay earnings on such investments to the Contractor, or release the funds to the Contractor, provided such funds are fully secured by approved securities.

Retained funds invested, and securities held as collateral for retainage may be released only as and when directed by the Owner. When the final estimate is released for payment, the Owner will direct the escrow agent to settle the escrow amount by paying the Contractor or the Owner monies due them as determined by the Owner. The Owner reserves the right to recall retained funds and to release same to the surety upon receipt of written request from the Contractor or in the event of default.

- ( ) Bidder elects to use the escrow account procedure for the deposit of retained funds.
- ( ) Bidder elects not to use the escrow account procedure for the deposit of retained funds.

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 BOND (PENAL SUM FORM)

|                                                                                                                                                                                                               |                                                                                                                                             |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Bidder</b><br>Name:<br>Address <i>(principal place of business)</i> :                                                                                                                                      | <b>Surety</b><br>Name:<br>Address <i>(principal place of business)</i> :                                                                    |
| <b>Owner</b><br>Name: <b>Bedford Regional Water Authority</b><br>Address <i>(principal place of business)</i> :<br><b>1723 Falling Creek Road</b><br><b>Bedford, VA 2452</b>                                  | <b>Bid</b><br>Project <i>(name and location)</i> :<br><b>Central WTP Electrical Improvements</b><br><b>Bedford, VA</b><br><br>Bid Due Date: |
| <b>Bond</b><br>Penal Sum:<br>Date of Bond:                                                                                                                                                                    |                                                                                                                                             |
| Surety and Bidder, intending to be legally bound hereby, subject to the terms set forth in this Bid Bond, do each cause this Bid Bond to be duly executed by an authorized officer, agent, or representative. |                                                                                                                                             |
| Bidder                                                                                                                                                                                                        | Surety                                                                                                                                      |
| _____<br><i>(Full formal name of Bidder)</i>                                                                                                                                                                  | _____<br><i>(Full formal name of Surety) (corporate seal)</i>                                                                               |
| By: _____<br><i>(Signature)</i>                                                                                                                                                                               | By: _____<br><i>(Signature) (Attach Power of Attorney)</i>                                                                                  |
| Name: _____<br><i>(Printed or typed)</i>                                                                                                                                                                      | Name: _____<br><i>(Printed or typed)</i>                                                                                                    |
| Title: _____                                                                                                                                                                                                  | Title: _____                                                                                                                                |
| Attest: _____<br><i>(Signature)</i>                                                                                                                                                                           | Attest: _____<br><i>(Signature)</i>                                                                                                         |
| Name: _____<br><i>(Printed or typed)</i>                                                                                                                                                                      | Name: _____<br><i>(Printed or typed)</i>                                                                                                    |
| Title: _____                                                                                                                                                                                                  | Title: _____                                                                                                                                |
| Notes: (1) Note: Addresses are to be used for giving any required notice. (2) Provide execution by any additional parties, such as joint venturers, if necessary.                                             |                                                                                                                                             |

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

as if set forth at length. If any provision of this Bond conflicts with any applicable statute, then the provision of said statute governs and the remainder of this Bond that is not in conflict therewith continues in full force and effect.

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

**ARTICLE 1—GENERAL INFORMATION**

1.01 Provide contact information for the Business:

|                                       |  |                |  |
|---------------------------------------|--|----------------|--|
| Legal Name of Business:               |  |                |  |
| Corporate Office                      |  |                |  |
| Name:                                 |  | Phone number:  |  |
| Title:                                |  | Email address: |  |
| Business address of corporate office: |  |                |  |
|                                       |  |                |  |
|                                       |  |                |  |
| Local Office                          |  |                |  |
| Name:                                 |  | Phone number:  |  |
| Title:                                |  | Email address: |  |
| Business address of local office:     |  |                |  |
|                                       |  |                |  |
|                                       |  |                |  |

**ARTICLE 2—LICENSING**

2.01 Provide information regarding licensure for Business:

|                   |  |                  |  |
|-------------------|--|------------------|--|
| Name of License:  |  |                  |  |
| Licensing Agency: |  |                  |  |
| License No:       |  | Expiration Date: |  |
| Name of License:  |  |                  |  |
| Licensing Agency: |  |                  |  |
| License No:       |  | Expiration Date: |  |

**ARTICLE 3—DIVERSE BUSINESS CERTIFICATIONS**

3.01 Provide information regarding Business's Diverse Business Certification, if any. Provide evidence of current certification.

| Certification                                              | Certifying Agency | Certification Date |
|------------------------------------------------------------|-------------------|--------------------|
| <input type="checkbox"/> Disadvantaged Business Enterprise |                   |                    |
| <input type="checkbox"/> Minority Business Enterprise      |                   |                    |

|                                                                                 |  |  |
|---------------------------------------------------------------------------------|--|--|
| <input type="checkbox"/> Woman-Owned Business Enterprise                        |  |  |
| <input type="checkbox"/> Small Business Enterprise                              |  |  |
| <input type="checkbox"/> Disabled Business Enterprise                           |  |  |
| <input type="checkbox"/> Veteran-Owned Business Enterprise                      |  |  |
| <input type="checkbox"/> Service-Disabled Veteran-Owned Business                |  |  |
| <input type="checkbox"/> HUBZone Business (Historically Underutilized) Business |  |  |
| <input type="checkbox"/> Other                                                  |  |  |
| <input type="checkbox"/> None                                                   |  |  |

#### ARTICLE 4—SURETY INFORMATION

- 4.01 Provide information regarding the surety company that will issue required bonds on behalf of the Business, including but not limited to performance and payment bonds.

|                                                                                                                                                                                                                                                                                                                                      |  |                                                          |  |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|----------------------------------------------------------|--|
| Surety Name:                                                                                                                                                                                                                                                                                                                         |  |                                                          |  |
| Surety is a corporation organized and existing under the laws of the state of:                                                                                                                                                                                                                                                       |  |                                                          |  |
| Is surety authorized to provide surety bonds in the Project location?                                                                                                                                                                                                                                                                |  | <input type="checkbox"/> Yes <input type="checkbox"/> No |  |
| Is surety listed in “Companies Holding Certificates of Authority as Acceptable Sureties on Federal Bonds and as Acceptable Reinsuring Companies” published in Department Circular 570 (as amended) by the Bureau of the Fiscal Service, U.S. Department of the Treasury?<br><input type="checkbox"/> Yes <input type="checkbox"/> No |  |                                                          |  |
| Mailing Address<br>(principal place of business):                                                                                                                                                                                                                                                                                    |  |                                                          |  |
|                                                                                                                                                                                                                                                                                                                                      |  |                                                          |  |
|                                                                                                                                                                                                                                                                                                                                      |  |                                                          |  |
| Physical Address<br>(principal place of business):                                                                                                                                                                                                                                                                                   |  |                                                          |  |
|                                                                                                                                                                                                                                                                                                                                      |  |                                                          |  |
|                                                                                                                                                                                                                                                                                                                                      |  |                                                          |  |
| Phone (main):                                                                                                                                                                                                                                                                                                                        |  | Phone (claims):                                          |  |

#### ARTICLE 5—INSURANCE

- 5.01 Provide information regarding Business’s insurance company(s), including but not limited to its Commercial General Liability carrier. Provide information for each provider.

|                                                                   |                                    |  |
|-------------------------------------------------------------------|------------------------------------|--|
| Name of insurance provider, and type of policy (CLE, auto, etc.): |                                    |  |
| Insurance Provider                                                | Type of Policy (Coverage Provided) |  |
|                                                                   |                                    |  |
|                                                                   |                                    |  |

|                                                                                 |  |                                                          |  |
|---------------------------------------------------------------------------------|--|----------------------------------------------------------|--|
|                                                                                 |  |                                                          |  |
|                                                                                 |  |                                                          |  |
| Are providers licensed or authorized to issue policies in the Project location? |  | <input type="checkbox"/> Yes <input type="checkbox"/> No |  |
| Does provider have an A.M. Best Rating of A-VII or better?                      |  | <input type="checkbox"/> Yes <input type="checkbox"/> No |  |
| Mailing Address<br>(principal place of business):                               |  |                                                          |  |
|                                                                                 |  |                                                          |  |
|                                                                                 |  |                                                          |  |
| Physical Address<br>(principal place of business):                              |  |                                                          |  |
|                                                                                 |  |                                                          |  |
|                                                                                 |  |                                                          |  |
| Phone (main):                                                                   |  | Phone (claims):                                          |  |

#### ARTICLE 6—CONSTRUCTION EXPERIENCE

6.01 Provide information that will identify the overall size and capacity of the Business.

|                                                |  |
|------------------------------------------------|--|
| Average number of current full-time employees: |  |
| Estimate of revenue for the current year:      |  |
| Estimate of revenue for the previous year:     |  |

6.02 Provide information regarding the Business's previous contracting experience.

|                                                                                                                                                                       |  |                      |  |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|----------------------|--|
| Years of experience with projects like the proposed project:                                                                                                          |  |                      |  |
| As a general contractor:                                                                                                                                              |  | As a joint venturer: |  |
| Has Business, or a predecessor in interest, or an affiliate identified in Paragraph 1.03:                                                                             |  |                      |  |
| Been disqualified as a bidder by any local, state, or federal agency within the last 5 years?<br><input type="checkbox"/> Yes <input type="checkbox"/> No             |  |                      |  |
| Been barred from contracting by any local, state, or federal agency within the last 5 years?<br><input type="checkbox"/> Yes <input type="checkbox"/> No              |  |                      |  |
| Been released from a bid in the past 5 years? <input type="checkbox"/> Yes <input type="checkbox"/> No                                                                |  |                      |  |
| Defaulted on a project or failed to complete any contract awarded to it? <input type="checkbox"/> Yes <input type="checkbox"/> No                                     |  |                      |  |
| Refused to construct or refused to provide materials defined in the contract documents or in a change order? <input type="checkbox"/> Yes <input type="checkbox"/> No |  |                      |  |
| Been a party to any currently pending litigation or arbitration? <input type="checkbox"/> Yes <input type="checkbox"/> No                                             |  |                      |  |
| Provide full details in a separate attachment if the response to any of these questions is Yes.                                                                       |  |                      |  |

This Statement of Qualifications is offered by:

Business:

\_\_\_\_\_  
(typed or printed name of organization)

By:

\_\_\_\_\_  
(individual's signature)

Name:

\_\_\_\_\_  
(typed or printed)

Title:

\_\_\_\_\_  
(typed or printed)

Date:

\_\_\_\_\_  
(date signed)

*(If Business 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)

Address for giving notices:

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Designated Representative:

Name:

\_\_\_\_\_  
(typed or printed)

Title:

\_\_\_\_\_  
(typed or printed)

Address:

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Phone:

\_\_\_\_\_

Email:

\_\_\_\_\_

**NOTICE OF AWARD**

Date of Issuance:

Owner: **Bedford Regional Water Authority** Owner's Project No.: **2023-025.1**Engineer: **Wiley|Wilson** Engineer's Project No.: **230031**Project: **Central WTP Electrical Improvements**Contract Name: **Central WTP Electrical Improvements**

Bidder:

Bidder's Address:

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

**Construction of the Central WTP Electrical Improvements Project**

The Contract Price of the awarded Contract is \$\_\_\_\_\_. 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.

\_\_\_\_ 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 \_\_\_\_ 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.

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: **Bedford Regional Water Authority**

By (signature): \_\_\_\_\_

Name (printed): \_\_\_\_\_

Title: \_\_\_\_\_





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

This Agreement is by and between **Bedford Regional Water Authority** ("Owner") and  
\_\_\_\_\_ ("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: **This project consists of Phase 1 work to include replacing emergency generator equipment and automatic transfer switch at the Central WTP as shown on the contract documents. The generator equipment must be provided as Owner Furnished/Contractor Installed equipment. Phases 2 and 3 work as identified on the contract documents is not included in the scope of this project.**

### ARTICLE 2—THE PROJECT

2.01 The Project, of which the Work under the Contract Documents is a part, is generally described as follows: **Central WTP Electrical Improvements Phase 1**

### ARTICLE 3—ENGINEER

3.01 The Work has been designed by Wiley|Wilson. BRWA, hereinafter called Engineer, is to assume all duties and responsibilities and has the rights and authority assigned to Engineer in the Contract Documents in connection with completion of the Work in accordance with the Contract Documents.

### ARTICLE 4—CONTRACT TIMES

4.01 *Time is of the Essence*

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

4.02 *Contract Times: Days*

A. The Work will be substantially complete within **120** days after the date when the Contract Times commence to run as provided in Paragraph 4.01 of the General Conditions, and completed and ready for final payment in accordance with Paragraph 15.06 of the General Conditions within **150** days after the date when the Contract Times commence to run.

#### 4.03 *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 \$500 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 \$500 for each day that expires after such time until the Work is completed and ready for final payment.
  3. 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.

#### 4.04 *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. 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 1<sup>st</sup> 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. 95 percent of the value of the Work completed (with the balance being retainage).
- b. 95 percent of cost of materials and equipment not incorporated in the Work (with the balance being retainage).

- B. Upon Substantial Completion of the entire construction to be provided under the construction Contract Documents, Owner shall pay an amount sufficient to increase total payments to Contractor to 98 percent of the Work completed, less such amounts set off by Owner pursuant to Paragraph 15.01.E of the General Conditions.

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 maximum rate allowed by law at the place of the Project.

**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.
  6. Drawings as listed in the table of contents of the project manual.
  7. Addenda (numbers \_\_\_\_ to \_\_\_\_, inclusive).
  8. Escrow Agreement (if applicable)
  9. 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 [ \_\_\_\_\_ ] (which is the Effective Date of the Contract).

Owner:

Contractor:

\_\_\_\_\_  
*(typed or printed name of organization)*

\_\_\_\_\_  
*(typed or printed name of organization)*

By: \_\_\_\_\_  
*(individual's signature)*

By: \_\_\_\_\_  
*(individual's signature)*

Date: \_\_\_\_\_  
*(date signed)*

Date: \_\_\_\_\_  
*(date signed)*

Name: \_\_\_\_\_  
*(typed or printed)*

Name: \_\_\_\_\_  
*(typed or printed)*

Title: \_\_\_\_\_  
*(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)*

Attest: \_\_\_\_\_  
*(individual's signature)*

Title: \_\_\_\_\_  
*(typed or printed)*

Title: \_\_\_\_\_  
*(typed or printed)*

Address for giving notices:

Address for giving notices:

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Designated Representative:

Designated Representative:

Name: \_\_\_\_\_  
*(typed or printed)*

Name: \_\_\_\_\_  
*(typed or printed)*

Title: \_\_\_\_\_  
*(typed or printed)*

Title: \_\_\_\_\_  
*(typed or printed)*

Address:

Address:

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Phone: \_\_\_\_\_

Phone: \_\_\_\_\_

Email: \_\_\_\_\_

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.)*

License No.: \_\_\_\_\_  
*(where applicable)*

State: \_\_\_\_\_



**NOTICE TO PROCEED**

Owner: Bedford Regional Water Authority Owner's Project No.: 2023-025.1  
Engineer: Wiley|Wilson Engineer's Project No.: 230031  
Contractor: \_\_\_\_\_ Contractor's Project No.: \_\_\_\_\_  
Project: Central WTP Electrical Improvements  
Contract Name: Central WTP Electrical Improvements  
Effective Date of Contract: \_\_\_\_\_

Owner hereby notifies Contractor that the Contract Times under the above Contract will commence to run on \_\_\_\_\_ 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 number of days to achieve Substantial Completion is **360** from the date stated above for the commencement of the Contract Times, resulting in a date for Substantial Completion of \_\_\_\_\_; and the number of days to achieve readiness for final payment is **390** from the commencement date of the Contract Times, resulting in a date for readiness for final payment of \_\_\_\_\_.

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

Owner: Bedford Regional Water Authority  
By (signature): \_\_\_\_\_  
Name (printed): \_\_\_\_\_  
Title: \_\_\_\_\_  
Date Issued: \_\_\_\_\_  
Copy: Engineer

## PERFORMANCE BOND

|                                                                                                                                                                                                                                        |                                                                                                                                                                                       |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Contractor</b><br>Name:<br>Address <i>(principal place of business)</i> :                                                                                                                                                           | <b>Surety</b><br>Name:<br>Address <i>(principal place of business)</i> :                                                                                                              |
| <b>Owner</b><br>Name: <b>Bedford Regional Water Authority</b><br>Mailing address <i>(principal place of business)</i> :<br><b>1723 Falling Creek Road</b><br><b>Bedford, VA 2452</b>                                                   | <b>Contract</b><br>Description <i>(name and location)</i> :<br><b>Central WTP Electrical Improvements</b><br><b>Bedford, VA</b><br><br>Contract Price:<br>Effective Date of Contract: |
| <b>Bond</b><br>Bond Amount:<br>Date of Bond:<br><i>(Date of Bond cannot be earlier than Effective Date of Contract)</i><br>Modifications to this Bond form:<br><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: _____<br><i>(Signature)</i>                                                                                                                                                                                                        | By: _____<br><i>(Signature)(Attach Power of Attorney)</i>                                                                                                                             |
| Name: _____<br><i>(Printed or typed)</i>                                                                                                                                                                                               | Name: _____<br><i>(Printed or typed)</i>                                                                                                                                              |
| Title: _____                                                                                                                                                                                                                           | Title: _____                                                                                                                                                                          |
| Attest: _____<br><i>(Signature)</i>                                                                                                                                                                                                    | Attest: _____<br><i>(Signature)</i>                                                                                                                                                   |
| Name: _____<br><i>(Printed or typed)</i>                                                                                                                                                                                               | Name: _____<br><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:

## PAYMENT BOND

|                                                                                                                                                                                                                                        |                                                                                                                                                                                       |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Contractor</b><br>Name:<br>Address <i>(principal place of business)</i> :                                                                                                                                                           | <b>Surety</b><br>Name:<br>Address <i>(principal place of business)</i> :                                                                                                              |
| <b>Owner</b><br>Name: <b>Bedford Regional Water Authority</b><br>Mailing address <i>(principal place of business)</i> :<br><b>1723 Falling Creek Road</b><br><b>Bedford, VA 2452</b>                                                   | <b>Contract</b><br>Description <i>(name and location)</i> :<br><b>Central WTP Electrical Improvements</b><br><b>Bedford, VA</b><br><br>Contract Price:<br>Effective Date of Contract: |
| <b>Bond</b><br>Bond Amount:<br>Date of Bond:<br><i>(Date of Bond cannot be earlier than Effective Date of Contract)</i><br>Modifications to this Bond form:<br><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: _____<br><i>(Signature)</i>                                                                                                                                                                                                        | By: _____<br><i>(Signature)(Attach Power of Attorney)</i>                                                                                                                             |
| Name: _____<br><i>(Printed or typed)</i>                                                                                                                                                                                               | Name: _____<br><i>(Printed or typed)</i>                                                                                                                                              |
| Title: _____                                                                                                                                                                                                                           | Title: _____                                                                                                                                                                          |
| Attest: _____<br><i>(Signature)</i>                                                                                                                                                                                                    | Attest: _____<br><i>(Signature)</i>                                                                                                                                                   |
| Name: _____<br><i>(Printed or typed)</i>                                                                                                                                                                                               | Name: _____<br><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 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:

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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# **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.
- 3.5 EJCDC C-620 contains calculation functions that are provided solely for the convenience of the user. EJCDC and its Sponsoring Organizations do not warrant or guarantee the accuracy or completeness of any information generated by the calculator.



#### **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](http://www.ejcdc.org) and the websites of EJCDC's sponsoring organizations.

**Contractor's Application for Payment**

|                                                              |                                               |
|--------------------------------------------------------------|-----------------------------------------------|
| <b>Owner:</b> <u>Bedford Regional Water Authority</u>        | <b>Owner's Project No.:</b> <u>2023-025.1</u> |
| <b>Engineer:</b> <u>Wiley Wilson</u>                         | <b>Engineer's Project No.:</b> <u>230031</u>  |
| <b>Contractor:</b> _____                                     | <b>Contractor's Project No.:</b> _____        |
| <b>Project:</b> <u>Central WTP Electrical Improvements</u>   |                                               |
| <b>Contract:</b> <u>Central WTP Electrical Improvements</u>  |                                               |
| <b>Application No.:</b> _____ <b>Application Date:</b> _____ |                                               |
| <b>Application Period:</b> <b>From</b> _____ <b>to</b> _____ |                                               |

|                                                                                                                        |    |   |
|------------------------------------------------------------------------------------------------------------------------|----|---|
| 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<br>(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 + Line 5.c)                                                 | \$ | - |

**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.

|                          |                    |
|--------------------------|--------------------|
| <b>Contractor:</b> _____ |                    |
| <b>Signature:</b> _____  | <b>Date:</b> _____ |

|                                   |                          |
|-----------------------------------|--------------------------|
| <b>Recommended by Engineer</b>    | <b>Approved by Owner</b> |
| <b>By:</b> _____                  | <b>By:</b> _____         |
| <b>Title:</b> _____               | <b>Title:</b> _____      |
| <b>Date:</b> _____                | <b>Date:</b> _____       |
| <b>Approved by Funding Agency</b> |                          |
| <b>By:</b> _____                  | <b>By:</b> _____         |
| <b>Title:</b> _____               | <b>Title:</b> _____      |
| <b>Date:</b> _____                | <b>Date:</b> _____       |

# Progress Estimate - Lump Sum Work

# Contractor's Application for Payment

|                    |                                     |  |  |  |  |                                  |            |  |
|--------------------|-------------------------------------|--|--|--|--|----------------------------------|------------|--|
| <b>Owner:</b>      | Bedford Regional Water Authority    |  |  |  |  | <b>Owner's Project No.:</b>      | 2023-025.1 |  |
| <b>Engineer:</b>   | Wiley Wilson                        |  |  |  |  | <b>Engineer's Project No.:</b>   | 230031     |  |
| <b>Contractor:</b> |                                     |  |  |  |  | <b>Contractor's Project No.:</b> |            |  |
| <b>Project:</b>    | Central WTP Electrical Improvements |  |  |  |  |                                  |            |  |
| <b>Contract:</b>   | Central WTP Electrical Improvements |  |  |  |  |                                  |            |  |

|                         |  |                            |             |  |           |  |                          |  |
|-------------------------|--|----------------------------|-------------|--|-----------|--|--------------------------|--|
| <b>Application No.:</b> |  | <b>Application Period:</b> | <b>From</b> |  | <b>to</b> |  | <b>Application Date:</b> |  |
|-------------------------|--|----------------------------|-------------|--|-----------|--|--------------------------|--|

| 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        |             |                      |                                        |                  |                                                 |                                                              |                                  |                                |
|                          |             |                      |                                        |                  |                                                 | -                                                            |                                  | -                              |
|                          |             |                      |                                        |                  |                                                 | -                                                            |                                  | -                              |
|                          |             |                      |                                        |                  |                                                 | -                                                            |                                  | -                              |
|                          |             |                      |                                        |                  |                                                 | -                                                            |                                  | -                              |
|                          |             |                      |                                        |                  |                                                 | -                                                            |                                  | -                              |
|                          |             |                      |                                        |                  |                                                 | -                                                            |                                  | -                              |
|                          |             |                      |                                        |                  |                                                 | -                                                            |                                  | -                              |
|                          |             |                      |                                        |                  |                                                 | -                                                            |                                  | -                              |
|                          |             |                      |                                        |                  |                                                 | -                                                            |                                  | -                              |
|                          |             |                      |                                        |                  |                                                 | -                                                            |                                  | -                              |
|                          |             |                      |                                        |                  |                                                 | -                                                            |                                  | -                              |
|                          |             |                      |                                        |                  |                                                 | -                                                            |                                  | -                              |
|                          |             |                      |                                        |                  |                                                 | -                                                            |                                  | -                              |
|                          |             |                      |                                        |                  |                                                 | -                                                            |                                  | -                              |
|                          |             |                      |                                        |                  |                                                 | -                                                            |                                  | -                              |
|                          |             |                      |                                        |                  |                                                 | -                                                            |                                  | -                              |
|                          |             |                      |                                        |                  |                                                 | -                                                            |                                  | -                              |
|                          |             |                      |                                        |                  |                                                 | -                                                            |                                  | -                              |
|                          |             |                      |                                        |                  |                                                 | -                                                            |                                  | -                              |
| Original Contract Totals |             | \$ -                 | \$ -                                   | \$ -             | \$ -                                            | \$ -                                                         |                                  | \$ -                           |

# Progress Estimate - Lump Sum Work

# Contractor's Application for Payment

|                    |                                     |  |  |  |  |                                  |            |  |
|--------------------|-------------------------------------|--|--|--|--|----------------------------------|------------|--|
| <b>Owner:</b>      | Bedford Regional Water Authority    |  |  |  |  | <b>Owner's Project No.:</b>      | 2023-025.1 |  |
| <b>Engineer:</b>   | Wiley Wilson                        |  |  |  |  | <b>Engineer's Project No.:</b>   | 230031     |  |
| <b>Contractor:</b> |                                     |  |  |  |  | <b>Contractor's Project No.:</b> |            |  |
| <b>Project:</b>    | Central WTP Electrical Improvements |  |  |  |  |                                  |            |  |
| <b>Contract:</b>   | Central WTP Electrical Improvements |  |  |  |  |                                  |            |  |

|                         |  |                            |             |  |           |  |                          |  |
|-------------------------|--|----------------------------|-------------|--|-----------|--|--------------------------|--|
| <b>Application No.:</b> |  | <b>Application Period:</b> | <b>From</b> |  | <b>to</b> |  | <b>Application Date:</b> |  |
|-------------------------|--|----------------------------|-------------|--|-----------|--|--------------------------|--|

| 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 (\$) |                                                 |                                                              |                                  |                                |
| Change Orders                       |             |                      |                                        |                  |                                                 |                                                              |                                  |                                |
|                                     |             |                      |                                        |                  |                                                 | -                                                            |                                  | -                              |
|                                     |             |                      |                                        |                  |                                                 | -                                                            |                                  | -                              |
|                                     |             |                      |                                        |                  |                                                 | -                                                            |                                  | -                              |
|                                     |             |                      |                                        |                  |                                                 | -                                                            |                                  | -                              |
|                                     |             |                      |                                        |                  |                                                 | -                                                            |                                  | -                              |
|                                     |             |                      |                                        |                  |                                                 | -                                                            |                                  | -                              |
|                                     |             |                      |                                        |                  |                                                 | -                                                            |                                  | -                              |
|                                     |             |                      |                                        |                  |                                                 | -                                                            |                                  | -                              |
|                                     |             |                      |                                        |                  |                                                 | -                                                            |                                  | -                              |
|                                     |             |                      |                                        |                  |                                                 | -                                                            |                                  | -                              |
|                                     |             |                      |                                        |                  |                                                 | -                                                            |                                  | -                              |
|                                     |             |                      |                                        |                  |                                                 | -                                                            |                                  | -                              |
|                                     |             |                      |                                        |                  |                                                 | -                                                            |                                  | -                              |
|                                     |             |                      |                                        |                  |                                                 | -                                                            |                                  | -                              |
|                                     |             |                      |                                        |                  |                                                 | -                                                            |                                  | -                              |
|                                     |             |                      |                                        |                  |                                                 | -                                                            |                                  | -                              |
|                                     |             |                      |                                        |                  |                                                 | -                                                            |                                  | -                              |
|                                     |             |                      |                                        |                  |                                                 | -                                                            |                                  | -                              |
|                                     |             |                      |                                        |                  |                                                 | -                                                            |                                  | -                              |
| Change Order Totals                 |             | \$ -                 | \$ -                                   | \$ -             | \$ -                                            | \$ -                                                         |                                  | \$ -                           |
| Original Contract and Change Orders |             |                      |                                        |                  |                                                 |                                                              |                                  |                                |
| Project Totals                      |             | \$ -                 | \$ -                                   | \$ -             | \$ -                                            | \$ -                                                         |                                  | \$ -                           |

## Contractor's Application for Payment

|                    |                                     |                                  |            |
|--------------------|-------------------------------------|----------------------------------|------------|
| <b>Owner:</b>      | Bedford Regional Water Authority    | <b>Owner's Project No.:</b>      | 2023-025.1 |
| <b>Engineer:</b>   | Wiley Wilson                        | <b>Engineer's Project No.:</b>   | 230031     |
| <b>Contractor:</b> |                                     | <b>Contractor's Project No.:</b> |            |
| <b>Project:</b>    | Central WTP Electrical Improvements |                                  |            |
| <b>Contract:</b>   | Central WTP Electrical Improvements |                                  |            |

Application No.: \_\_\_\_\_ Application Period: From \_\_\_\_\_ to \_\_\_\_\_ Application Date: \_\_\_\_\_

| A                                   | B           | C                    | D     | E               | F                              | G                                           | H                                            | I                                          | J                                                        | K                              | L                              |
|-------------------------------------|-------------|----------------------|-------|-----------------|--------------------------------|---------------------------------------------|----------------------------------------------|--------------------------------------------|----------------------------------------------------------|--------------------------------|--------------------------------|
| Bid Item No.                        | Description | 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                   |             |                      |       |                 |                                |                                             |                                              |                                            |                                                          |                                |                                |
|                                     |             |                      |       |                 | -                              |                                             | -                                            |                                            | -                                                        |                                | -                              |
|                                     |             |                      |       |                 | -                              |                                             | -                                            |                                            | -                                                        |                                | -                              |
|                                     |             |                      |       |                 | -                              |                                             | -                                            |                                            | -                                                        |                                | -                              |
|                                     |             |                      |       |                 | -                              |                                             | -                                            |                                            | -                                                        |                                | -                              |
|                                     |             |                      |       |                 | -                              |                                             | -                                            |                                            | -                                                        |                                | -                              |
|                                     |             |                      |       |                 | -                              |                                             | -                                            |                                            | -                                                        |                                | -                              |
|                                     |             |                      |       |                 | -                              |                                             | -                                            |                                            | -                                                        |                                | -                              |
|                                     |             |                      |       |                 | -                              |                                             | -                                            |                                            | -                                                        |                                | -                              |
|                                     |             |                      |       |                 | -                              |                                             | -                                            |                                            | -                                                        |                                | -                              |
|                                     |             |                      |       |                 | -                              |                                             | -                                            |                                            | -                                                        |                                | -                              |
|                                     |             |                      |       |                 | -                              |                                             | -                                            |                                            | -                                                        |                                | -                              |
|                                     |             |                      |       |                 | -                              |                                             | -                                            |                                            | -                                                        |                                | -                              |
|                                     |             |                      |       |                 | -                              |                                             | -                                            |                                            | -                                                        |                                | -                              |
|                                     |             |                      |       |                 | -                              |                                             | -                                            |                                            | -                                                        |                                | -                              |
|                                     |             |                      |       |                 | -                              |                                             | -                                            |                                            | -                                                        |                                | -                              |
|                                     |             |                      |       |                 | -                              |                                             | -                                            |                                            | -                                                        |                                | -                              |
|                                     |             |                      |       |                 | -                              |                                             | -                                            |                                            | -                                                        |                                | -                              |
|                                     |             |                      |       |                 | -                              |                                             | -                                            |                                            | -                                                        |                                | -                              |
|                                     |             |                      |       |                 | -                              |                                             | -                                            |                                            | -                                                        |                                | -                              |
|                                     |             |                      |       |                 | -                              |                                             | -                                            |                                            | -                                                        |                                | -                              |
| Original Contract Totals            |             |                      |       |                 | \$ -                           |                                             | \$ -                                         | \$ -                                       | \$ -                                                     |                                | \$ -                           |
| Change Orders                       |             |                      |       |                 |                                |                                             |                                              |                                            |                                                          |                                |                                |
|                                     |             |                      |       |                 | -                              |                                             | -                                            |                                            | -                                                        |                                | -                              |
|                                     |             |                      |       |                 | -                              |                                             | -                                            |                                            | -                                                        |                                | -                              |
|                                     |             |                      |       |                 | -                              |                                             | -                                            |                                            | -                                                        |                                | -                              |
|                                     |             |                      |       |                 | -                              |                                             | -                                            |                                            | -                                                        |                                | -                              |
|                                     |             |                      |       |                 | -                              |                                             | -                                            |                                            | -                                                        |                                | -                              |
|                                     |             |                      |       |                 | -                              |                                             | -                                            |                                            | -                                                        |                                | -                              |
|                                     |             |                      |       |                 | -                              |                                             | -                                            |                                            | -                                                        |                                | -                              |
|                                     |             |                      |       |                 | -                              |                                             | -                                            |                                            | -                                                        |                                | -                              |
|                                     |             |                      |       |                 | -                              |                                             | -                                            |                                            | -                                                        |                                | -                              |
|                                     |             |                      |       |                 | -                              |                                             | -                                            |                                            | -                                                        |                                | -                              |
|                                     |             |                      |       |                 | -                              |                                             | -                                            |                                            | -                                                        |                                | -                              |
| Change Order Totals                 |             |                      |       |                 | \$ -                           |                                             | \$ -                                         | \$ -                                       | \$ -                                                     |                                | \$ -                           |
| Original Contract and Change Orders |             |                      |       |                 |                                |                                             |                                              |                                            |                                                          |                                |                                |
| Project Totals                      |             |                      |       |                 | \$ -                           |                                             | \$ -                                         | \$ -                                       | \$ -                                                     |                                | \$ -                           |

### Stored Materials Summary

### Contractor's Application for Payment

|                                                                                        |                         |                                                       |                                              |                  |                                                  |                                     |                                |                                  |                                                 |                                                  |                                                  |                                              |
|----------------------------------------------------------------------------------------|-------------------------|-------------------------------------------------------|----------------------------------------------|------------------|--------------------------------------------------|-------------------------------------|--------------------------------|----------------------------------|-------------------------------------------------|--------------------------------------------------|--------------------------------------------------|----------------------------------------------|
| Owner:                                                                                 |                         |                                                       |                                              |                  |                                                  | Bedford Regional Water Authority    |                                |                                  |                                                 |                                                  |                                                  |                                              |
| Engineer:                                                                              |                         |                                                       |                                              |                  |                                                  | Wiley Wilson                        |                                |                                  |                                                 |                                                  |                                                  |                                              |
| Contractor:                                                                            |                         |                                                       |                                              |                  |                                                  |                                     |                                |                                  |                                                 |                                                  |                                                  |                                              |
| Project:                                                                               |                         |                                                       |                                              |                  |                                                  | Central WTP Electrical Improvements |                                |                                  |                                                 |                                                  |                                                  |                                              |
| Contract:                                                                              |                         |                                                       |                                              |                  |                                                  | Central WTP Electrical Improvements |                                |                                  |                                                 |                                                  |                                                  |                                              |
| Application No.: _____ Application Period: From _____ to _____ Application Date: _____ |                         |                                                       |                                              |                  |                                                  |                                     |                                |                                  |                                                 |                                                  |                                                  |                                              |
| A                                                                                      | B                       | C                                                     | D                                            | E                | F                                                | G                                   | H                              | I                                | J                                               | K                                                | L                                                | M                                            |
| Item No.<br>(Lump Sum Tab)<br>or Bid Item No.<br>(Unit Price Tab)                      | Supplier<br>Invoice No. | Submittal No.<br><br>(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<br>(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) (\$) |                                              |
|                                                                                        |                         |                                                       |                                              |                  |                                                  |                                     |                                | -                                |                                                 |                                                  | -                                                | -                                            |
|                                                                                        |                         |                                                       |                                              |                  |                                                  |                                     |                                | -                                |                                                 |                                                  | -                                                | -                                            |
|                                                                                        |                         |                                                       |                                              |                  |                                                  |                                     |                                | -                                |                                                 |                                                  | -                                                | -                                            |
|                                                                                        |                         |                                                       |                                              |                  |                                                  |                                     |                                | -                                |                                                 |                                                  | -                                                | -                                            |
|                                                                                        |                         |                                                       |                                              |                  |                                                  |                                     |                                | -                                |                                                 |                                                  | -                                                | -                                            |
|                                                                                        |                         |                                                       |                                              |                  |                                                  |                                     |                                | -                                |                                                 |                                                  | -                                                | -                                            |
|                                                                                        |                         |                                                       |                                              |                  |                                                  |                                     |                                | -                                |                                                 |                                                  | -                                                | -                                            |
|                                                                                        |                         |                                                       |                                              |                  |                                                  |                                     |                                | -                                |                                                 |                                                  | -                                                | -                                            |
|                                                                                        |                         |                                                       |                                              |                  |                                                  |                                     |                                | -                                |                                                 |                                                  | -                                                | -                                            |
|                                                                                        |                         |                                                       |                                              |                  |                                                  |                                     |                                | -                                |                                                 |                                                  | -                                                | -                                            |
|                                                                                        |                         |                                                       |                                              |                  |                                                  |                                     |                                | -                                |                                                 |                                                  | -                                                | -                                            |
|                                                                                        |                         |                                                       |                                              |                  |                                                  |                                     |                                | -                                |                                                 |                                                  | -                                                | -                                            |
|                                                                                        |                         |                                                       |                                              |                  |                                                  |                                     |                                | -                                |                                                 |                                                  | -                                                | -                                            |
|                                                                                        |                         |                                                       |                                              |                  |                                                  |                                     |                                | -                                |                                                 |                                                  | -                                                | -                                            |
|                                                                                        |                         |                                                       |                                              |                  |                                                  |                                     |                                | -                                |                                                 |                                                  | -                                                | -                                            |
|                                                                                        |                         |                                                       |                                              |                  |                                                  |                                     |                                | -                                |                                                 |                                                  | -                                                | -                                            |
|                                                                                        |                         |                                                       |                                              |                  | Totals                                           | \$ -                                | \$ -                           | \$ -                             | \$ -                                            | \$ -                                             | \$ -                                             | \$ -                                         |



**CERTIFICATE OF SUBSTANTIAL COMPLETION**

Owner: **Bedford Regional Water Authority** Owner's Project No.: **2023-025.1**  
Engineer: **Wiley|Wilson** Engineer's Project No.: **230031**  
Contractor: Contractor's Project No.:  
Project: **Central WTP Electrical Improvements**  
Contract Name: **Central WTP Electrical Improvements**

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

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

Date of Substantial Completion:

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:

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

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

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:

---

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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.

## STANDARD GENERAL CONDITIONS OF THE CONSTRUCTION CONTRACT

Prepared By



Endorsed By



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## STANDARD GENERAL CONDITIONS OF THE CONSTRUCTION CONTRACT

### ARTICLE 1—DEFINITIONS AND TERMINOLOGY

#### 1.01 *Defined Terms*

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

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

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

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

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

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

## 1.02 Terminology

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

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

## ARTICLE 2—PRELIMINARY MATTERS

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

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

### 2.02 *Copies of Documents*

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

### 2.03 *Before Starting Construction*

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

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

**2.04 *Preconstruction Conference; Designation of Authorized Representatives***

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

**2.05 *Acceptance of Schedules***

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

**2.06 *Electronic Transmittals***

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



**ARTICLE 3—CONTRACT DOCUMENTS: INTENT, REQUIREMENTS, REUSE****3.01 Intent**

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

**3.02 Reference Standards**

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

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

### 3.03 *Reporting and Resolving Discrepancies*

#### A. *Reporting Discrepancies*

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

#### B. *Resolving Discrepancies*

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

### 3.04 *Requirements of the Contract Documents*

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

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

### 3.05 *Reuse of Documents*

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

## ARTICLE 4—COMMENCEMENT AND PROGRESS OF THE WORK

### 4.01 *Commencement of Contract Times; Notice to Proceed*

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

### 4.02 *Starting the Work*

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

### 4.03 *Reference Points*

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

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

#### 4.04 *Progress Schedule*

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

#### 4.05 *Delays in Contractor's Progress*

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

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

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

### **5.01 *Availability of Lands***

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

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

## 5.02 *Use of Site and Other Areas*

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

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

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

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

5.03 *Subsurface and Physical Conditions*

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

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

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

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

- D. *Limitations of Other Data and Documents:* Except for such reliance on Technical Data, Contractor may not rely upon or make any claim against Owner or Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors, with respect to:
1. the completeness of such reports and drawings for Contractor's purposes, including, but not limited to, any aspects of the means, methods, techniques, sequences, and procedures of construction to be employed by Contractor, and safety precautions and programs incident thereto;
  2. other data, interpretations, opinions, and information contained in such reports or shown or indicated in such drawings;
  3. the contents of other Site-related documents made available to Contractor, such as record drawings from other projects at or adjacent to the Site, or Owner's archival documents concerning the Site; or
  4. any Contractor interpretation of or conclusion drawn from any Technical Data or any such other data, interpretations, opinions, or information.

#### 5.04 *Differing Subsurface or Physical Conditions*

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

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

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



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

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

#### 5.05 *Underground Facilities*

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

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

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

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

#### 5.06 *Hazardous Environmental Conditions at Site*

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

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

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

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

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

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

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

## **ARTICLE 6—BONDS AND INSURANCE**

### **6.01 *Performance, Payment, and Other Bonds***

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

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

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

#### 6.02 *Insurance—General Provisions*

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

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

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

#### 6.03 *Contractor's Insurance*

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



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

6.04 *Builder's Risk and Other Property Insurance*

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

6.05 *Property Losses; Subrogation*

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

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

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

**6.06**    *Receipt and Application of Property Insurance Proceeds*

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

**ARTICLE 7—CONTRACTOR'S RESPONSIBILITIES****7.01**    *Contractor's Means and Methods of Construction*

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

**7.02**    *Supervision and Superintendence*

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

**7.03**    *Labor; Working Hours*

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

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

#### 7.04 *Services, Materials, and Equipment*

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

#### 7.05 *"Or Equals"*

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

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

#### 7.06 Substitutes

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

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

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

7.07 *Concerning Subcontractors and Suppliers*

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

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

#### 7.08 *Patent Fees and Royalties*

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



#### 7.09 *Permits*

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

#### 7.10 *Taxes*

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

#### 7.11 *Laws and Regulations*

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

#### 7.12 *Record Documents*

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

### 7.13 *Safety and Protection*

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

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

#### 7.14 *Hazard Communication Programs*

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

#### 7.15 *Emergencies*

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

#### 7.16 *Submittals*

##### A. *Shop Drawing and Sample Requirements*

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

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

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

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

*D. Resubmittal Procedures for Shop Drawings and Samples*

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

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

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

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

**7.17 Contractor's General Warranty and Guarantee**

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

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

**7.18 Indemnification**

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

**7.19 Delegation of Professional Design Services**

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

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

## **ARTICLE 8—OTHER WORK AT THE SITE**

### **8.01 *Other Work***

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



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

#### 8.02 *Coordination*

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

#### 8.03 *Legal Relationships*

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

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

## **ARTICLE 9—OWNER'S RESPONSIBILITIES**

### **9.01   *Communications to Contractor***

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

### **9.02   *Replacement of Engineer***

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

### **9.03   *Furnish Data***

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

### **9.04   *Pay When Due***

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

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

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

9.06 *Insurance*

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

9.07 *Change Orders*

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

9.08 *Inspections, Tests, and Approvals*

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

9.09 *Limitations on Owner's Responsibilities*

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

9.10 *Undisclosed Hazardous Environmental Condition*

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

9.11 *Evidence of Financial Arrangements*

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

9.12 *Safety Programs*

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

**ARTICLE 10—ENGINEER'S STATUS DURING CONSTRUCTION****10.01 *Owner's Representative***

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

**10.02 *Visits to Site***

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

**10.03 *Resident Project Representative***

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

**10.04 *Engineer's Authority***

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

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

**10.05 *Determinations for Unit Price Work***

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

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

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

**10.07 *Limitations on Engineer's Authority and Responsibilities***

- A. Neither Engineer's authority or responsibility under this Article 10 or under any other provision of the Contract, nor any decision made by Engineer in good faith either to exercise or not exercise such authority or responsibility or the undertaking, exercise, or performance of any authority or responsibility by Engineer, will create, impose, or give rise to any duty in contract, tort, or otherwise owed by Engineer to Contractor, any Subcontractor, any Supplier, any other individual or entity, or to any surety for or employee or agent of any of them.
- B. Engineer will not supervise, direct, control, or have authority over or be responsible for Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work. Engineer will not be responsible for Contractor's failure to perform the Work in accordance with the Contract Documents.
- C. Engineer will not be responsible for the acts or omissions of Contractor or of any Subcontractor, any Supplier, or of any other individual or entity performing any of the Work.
- D. Engineer's review of the final Application for Payment and accompanying documentation, and all maintenance and operating instructions, schedules, guarantees, bonds, certificates of inspection, tests and approvals, and other documentation required to be delivered by Contractor under Paragraph 15.06.A, will only be to determine generally that their content complies with the requirements of, and in the case of certificates of inspections, tests, and approvals, that the results certified indicate compliance with the Contract Documents.
- E. The limitations upon authority and responsibility set forth in this Paragraph 10.07 also apply to the Resident Project Representative, if any.

**10.08 *Compliance with Safety Program***

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

**ARTICLE 11—CHANGES TO THE CONTRACT****11.01 *Amending and Supplementing the Contract***

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

**11.02 *Change Orders***

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

**11.03 *Work Change Directives***

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

B. If Owner has issued a Work Change Directive and:

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

11.04 *Field Orders*

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

11.05 *Owner-Authorized Changes in the Work*

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

11.06 *Unauthorized Changes in the Work*

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

11.07 *Change of Contract Price*

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

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



### 11.08 *Change of Contract Times*

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

### 11.09 *Change Proposals*

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

- B. *Change Proposal Procedures*

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

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

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

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

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

#### 11.10 Notification to Surety

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

### ARTICLE 12—CLAIMS

#### 12.01 Claims

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

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

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

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

### **13.01 *Cost of the Work***

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

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

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

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

c. *Construction Equipment Rental*

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

- g. The cost of utilities, fuel, and sanitary facilities at the Site.
  - h. Minor expenses such as communication service at the Site, express and courier services, and similar petty cash items in connection with the Work.
  - i. The costs of premiums for all bonds and insurance that Contractor is required by the Contract Documents to purchase and maintain.
- C. *Costs Excluded:* The term Cost of the Work does not include any of the following items:
- 1. Payroll costs and other compensation of Contractor's officers, executives, principals, general managers, engineers, architects, estimators, attorneys, auditors, accountants, purchasing and contracting agents, expeditors, timekeepers, clerks, and other personnel employed by Contractor, whether at the Site or in Contractor's principal or branch office for general administration of the Work and not specifically included in the agreed upon schedule of job classifications referred to in Paragraph 13.01.B.1 or specifically covered by Paragraph 13.01.B.4. The payroll costs and other compensation excluded here are to be considered administrative costs covered by the Contractor's fee.
  - 2. The cost of purchasing, renting, or furnishing small tools and hand tools.
  - 3. Expenses of Contractor's principal and branch offices other than Contractor's office at the Site.
  - 4. Any part of Contractor's capital expenses, including interest on Contractor's capital employed for the Work and charges against Contractor for delinquent payments.
  - 5. Costs due to the negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, including but not limited to, the correction of defective Work, disposal of materials or equipment wrongly supplied, and making good any damage to property.
  - 6. Expenses incurred in preparing and advancing Claims.
  - 7. Other overhead or general expense costs of any kind and the costs of any item not specifically and expressly included in Paragraph 13.01.B.
- D. *Contractor's Fee*
- 1. When the Work as a whole is performed on the basis of cost-plus-a-fee, then:
    - a. Contractor's fee for the Work set forth in the Contract Documents as of the Effective Date of the Contract will be determined as set forth in the Agreement.
    - b. for any Work covered by a Change Order, Change Proposal, Claim, set-off, or other adjustment in Contract Price on the basis of Cost of the Work, Contractor's fee will be determined as follows:
      - 1) When the fee for the Work as a whole is a percentage of the Cost of the Work, the fee will automatically adjust as the Cost of the Work changes.
      - 2) When the fee for the Work as a whole is a fixed fee, the fee for any additions or deletions will be determined in accordance with Paragraph 11.07.C.2.
  - 2. When the Work as a whole is performed on the basis of a stipulated sum, or any other basis other than cost-plus-a-fee, then Contractor's fee for any Work covered by a Change

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

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

### 13.02 Allowances

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

### 13.03 Unit Price Work

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

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

E. *Adjustments in Unit Price*

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

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

14.01 *Access to Work*

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

14.02 *Tests, Inspections, and Approvals*

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



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

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

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

#### 14.03 Defective Work

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

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

#### 14.04 *Acceptance of Defective Work*

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

#### 14.05 *Uncovering Work*

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

#### 14.06 *Owner May Stop the Work*

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

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

**14.07 Owner May Correct Defective Work**

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

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

**15.01 Progress Payments**

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

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

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

*C. Review of Applications*

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

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

**D. *Payment Becomes Due***

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

**E. *Reductions in Payment by Owner***

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

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

#### 15.02 *Contractor's Warranty of Title*

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

#### 15.03 *Substantial Completion*

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

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

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

#### 15.04 *Partial Use or Occupancy*

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

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

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

#### 15.05 *Final Inspection*

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

#### 15.06 *Final Payment*

##### A. *Application for Payment*

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



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

#### 15.07 *Waiver of Claims*

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

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

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

#### 15.08 *Correction Period*

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

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

## **ARTICLE 16—SUSPENSION OF WORK AND TERMINATION**

### **16.01 *Owner May Suspend Work***

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

### **16.02 *Owner May Terminate for Cause***

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

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

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

#### 16.03 *Owner May Terminate for Convenience*

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

#### 16.04 *Contractor May Stop Work or Terminate*

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

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

## **ARTICLE 17—FINAL RESOLUTION OF DISPUTES**

### **17.01 *Methods and Procedures***

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

## **ARTICLE 18—MISCELLANEOUS**

### **18.01 *Giving Notice***

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

### **18.02 *Computation of Times***

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

**18.03 Cumulative Remedies**

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

**18.04 Limitation of Damages**

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

**18.05 No Waiver**

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

**18.06 Survival of Obligations**

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

**18.07 Controlling Law**

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

**18.08 Assignment of Contract**

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

**18.09 Successors and Assigns**

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

**18.10 Headings**

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

## 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."

### 5.03 *Subsurface and Physical Conditions*

SC-5.03 Add the following new paragraphs immediately after Paragraph 5.03.D:

- E. The following table lists the reports of explorations and tests of subsurface conditions at or adjacent to the Site that contain Technical Data, and specifically identifies the Technical Data in the report upon which Contractor may rely: **No Such Reports.**
- F. The following table lists the 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 specifically identifies the Technical Data upon which Contractor may rely: **No Such Drawings.**

### 5.06 *Hazardous Environmental Conditions*

SC-5.06 Add the following new paragraphs immediately after Paragraph 5.06.A.3:

- 4. The following table lists the reports known to Owner relating to Hazardous Environmental Conditions at or adjacent to the Site, and the Technical Data (if any) upon which Contractor may rely: **No Such Reports.**
- 5. The following table lists the drawings known to Owner relating to Hazardous Environmental Conditions at or adjacent to the Site, and Technical Data (if any) contained in such Drawings upon which Contractor may rely: **No Such Drawings.**

### 6.03 *Contractor's Insurance*

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

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

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

| Workers' Compensation and Related Policies | Policy limits of not less than: |
|--------------------------------------------|---------------------------------|
| Workers' Compensation                      |                                 |
| State                                      | Statutory                       |
| Applicable Federal (e.g., Longshoreman's)  | Statutory                       |
| Employer's Liability                       | \$500,000                       |

- E. *Commercial General Liability—Claims Covered:* Contractor shall purchase and maintain commercial general liability insurance, covering all operations by or on behalf of Contractor, on an occurrence basis, against claims for:
1. damages because of bodily injury, sickness or disease, or death of any person other than Contractor's employees,
  2. damages insured by reasonably available personal injury liability coverage, and
  3. damages because of injury to or destruction of tangible property wherever located, including loss of use resulting therefrom.
- F. *Commercial General Liability—Form and Content:* Contractor's commercial liability policy must be written on a 1996 (or later) Insurance Services Organization, Inc. (ISO) commercial general liability form (occurrence form) and include the following coverages and endorsements:
1. Products and completed operations coverage.
    - a. Such insurance must be maintained for three years after final payment.
    - b. Contractor shall furnish Owner and each other additional insured (as identified in the Supplementary Conditions or elsewhere in the Contract) evidence of continuation of such insurance at final payment and three years thereafter.
  2. Blanket contractual liability coverage, including but not limited to coverage of Contractor's contractual indemnity obligations in Paragraph 7.18.
  3. Severability of interests and no insured-versus-insured or cross-liability exclusions.
  4. Underground, explosion, and collapse coverage.
  5. Personal injury coverage.
  6. Additional insured endorsements that include both ongoing operations and products and completed operations coverage through ISO Endorsements CG 20 10 10 01 and CG 20 37 10 01 (together). If Contractor demonstrates to Owner that the specified ISO endorsements are not commercially available, then Contractor may satisfy this requirement by providing equivalent endorsements.



7. For design professional additional insureds, ISO Endorsement CG 20 32 07 04 “Additional Insured—Engineers, Architects or Surveyors Not Engaged by the Named Insured” or its equivalent.
- G. *Commercial General Liability—Excluded Content:* The commercial general liability insurance policy, including its coverages, endorsements, and incorporated provisions, must not include any of the following:
1. Any modification of the standard definition of “insured contract” (except to delete the railroad protective liability exclusion if Contractor is required to indemnify a railroad or others with respect to Work within 50 feet of railroad property).
  2. Any exclusion for water intrusion or water damage.
  3. Any provisions resulting in the erosion of insurance limits by defense costs other than those already incorporated in ISO form CG 00 01.
  4. Any exclusion of coverage relating to earth subsidence or movement.
  5. Any exclusion for the insured’s vicarious liability, strict liability, or statutory liability (other than worker’s compensation).
  6. Any limitation or exclusion based on the nature of Contractor’s work.
  7. Any professional liability exclusion broader in effect than the most recent edition of ISO form CG 22 79.
- H. *Commercial General Liability—Minimum Policy Limits*

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

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

| Automobile Liability | Policy limits of not less than: |
|----------------------|---------------------------------|
| Bodily Injury        |                                 |
| Each Person          | \$1,000,000                     |
| Each Accident        | \$1,000,000                     |
| Property Damage      |                                 |
| Each Accident        | \$1,000,000                     |
| [or]                 |                                 |

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

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

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

### 10.03 Resident Project Representative

SC-10.03 Add the following new paragraphs immediately after Paragraph 10.03.B:

- C. The Resident Project Representative (RPR) will be Engineer's representative at the Site. RPR's dealings in matters pertaining to the Work in general will be with Engineer and Contractor. RPR's dealings with Subcontractors will only be through or with the full knowledge or approval of Contractor. The RPR will:
1. *Conferences and Meetings:* Attend meetings with Contractor, such as preconstruction conferences, progress meetings, job conferences, and other Project-related meetings (but not including Contractor's safety meetings), and as appropriate prepare and circulate copies of minutes thereof.
  2. *Safety Compliance:* Comply with Site safety programs, as they apply to RPR, and if required to do so by such safety programs, receive safety training specifically related to RPR's own personal safety while at the Site.
  3. *Liaison*
    - a. Serve as Engineer's liaison with Contractor. Working principally through Contractor's authorized representative or designee, assist in providing information regarding the provisions and intent of the Contract Documents.
    - b. Assist Engineer in serving as Owner's liaison with Contractor when Contractor's operations affect Owner's on-Site operations.
    - c. Assist in obtaining from Owner additional details or information, when required for Contractor's proper execution of the Work.
  4. *Review of Work; Defective Work*

- a. Conduct on-Site observations of the Work to assist Engineer in determining, to the extent set forth in Paragraph 10.02, if the Work is in general proceeding in accordance with the Contract Documents.
  - b. Observe whether any Work in place appears to be defective.
  - c. Observe whether any Work in place should be uncovered for observation, or requires special testing, inspection or approval.
5. *Inspections and Tests*
- a. Observe Contractor-arranged inspections required by Laws and Regulations, including but not limited to those performed by public or other agencies having jurisdiction over the Work.
  - b. Accompany visiting inspectors representing public or other agencies having jurisdiction over the Work.
6. *Payment Requests:* Review Applications for Payment with Contractor.
7. *Completion*
- a. Participate in Engineer's visits regarding Substantial Completion.
  - b. Assist in the preparation of a punch list of items to be completed or corrected.
  - c. Participate in Engineer's visit to the Site in the company of Owner and Contractor regarding completion of the Work, and prepare a final punch list of items to be completed or corrected by Contractor.
  - d. Observe whether items on the final punch list have been completed or corrected.
- D. The RPR will not:
1. Authorize any deviation from the Contract Documents or substitution of materials or equipment (including "or-equal" items).
  2. Exceed limitations of Engineer's authority as set forth in the Contract Documents.
  3. Undertake any of the responsibilities of Contractor, Subcontractors, or Suppliers.
  4. Advise on, issue directions relative to, or assume control over any aspect of the means, methods, techniques, sequences or procedures of construction.
  5. Advise on, issue directions regarding, or assume control over security or safety practices, precautions, and programs in connection with the activities or operations of Owner or Contractor.
  6. Participate in specialized field or laboratory tests or inspections conducted off-site by others except as specifically authorized by Engineer.
  7. Authorize Owner to occupy the Project in whole or in part.

**7.11 Laws and Regulations**

SC-7.11 Add the following new paragraphs immediately after Paragraph 7.11.C:

- D. Compliance with VDOT Land Use Permit Regulations shall be as follows: Where the Work is in, or encroaches upon, the VDOT Right-of-Way, Contractor shall perform all Work in strict compliance with all applicable VDOT regulations and requirements, and to the approval of local VDOT Resident Engineer and his/her agents. Strict adherence to the latest edition of the Virginia Work Area Protection Manual will be required. Frequent inspections of job conditions will be conducted to determine compliance with all VDOT requirements. Compliance with VDOT requirements shall be the sole responsibility of the Contractor, with the determination of compliance at the sole discretion of VDOT personnel. Failure to comply with any VDOT requirement will result in a full-time VDOT inspector being assigned to the project. Charges for the VDOT inspector will be based on the actual cost of the labor, materials, and incidentals as determined by VDOT, with the average rate being approximately \$30/hr; these charges will be at the expense of the Contractor. These charges will be invoiced from VDOT to the Owner, and the Owner shall deduct these expenses plus a 10% administrative fee from the progress payments to the Contractor. A retainage will be held from the Contractor's final payment until the Owner has received a Land Use Permit Completion Notice and the final invoice from VDOT has been received.

**WORK CHANGE DIRECTIVE NO.:** \_\_\_\_\_

|                |                                            |                                          |                   |
|----------------|--------------------------------------------|------------------------------------------|-------------------|
| Owner:         | <b>Bedford Regional Water Authority</b>    | Owner's Project No.:                     | <b>2023-025.1</b> |
| Engineer:      | <b>Wiley Wilson</b>                        | Engineer's Project No.:                  | <b>230031</b>     |
| Contractor:    |                                            | Contractor's Project No.:                |                   |
| Project:       | <b>Central WTP Electrical Improvements</b> |                                          |                   |
| Contract Name: | <b>Central WTP Electrical Improvements</b> |                                          |                   |
| Date Issued:   |                                            | Effective Date of Work Change Directive: |                   |

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

Description:

Attachments:

Purpose for the Work Change Directive:

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

☐ 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: \$ \_\_\_\_\_

Contract Time: \_\_\_\_\_ days

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:

CHANGE ORDER NO.: \_\_\_\_\_

Owner: **Bedford Regional Water Authority** Owner's Project No.: **2023-025.1**  
Engineer: **Wiley|Wilson** Engineer's Project No.: **230031**  
Project: **Central WTP Electrical Improvements**  
Contract Name: **Central WTP Electrical Improvements**  
Contract Name: **Central WTP Electrical Improvements Project**  
Date Issued: \_\_\_\_\_ Effective Date of Change Order: \_\_\_\_\_

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

Description:

Attachments:

| Change in Contract Price                                                                         | Change in Contract Times                                                                                                                               |
|--------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------|
| Original Contract Price:<br>\$ _____                                                             | Original Contract Times:<br>Substantial Completion: _____<br>Ready for final payment: _____                                                            |
| <b>[Increase] [Decrease]</b> from previously approved Change Orders No. 1 to No. __:<br>\$ _____ | <b>[Increase] [Decrease]</b> from previously approved Change Orders No.1 to No. __:<br>Substantial Completion: _____<br>Ready for final payment: _____ |
| Contract Price prior to this Change Order:<br>\$ _____                                           | Contract Times prior to this Change Order:<br>Substantial Completion: _____<br>Ready for final payment: _____                                          |
| <b>[Increase] [Decrease]</b> this Change Order:<br>\$ _____                                      | <b>[Increase] [Decrease]</b> this Change Order:<br>Substantial Completion: _____<br>Ready for final payment: _____                                     |
| Contract Price incorporating this Change Order:<br>\$ _____                                      | Contract Times with all approved Change Orders:<br>Substantial Completion: _____<br>Ready for final payment: _____                                     |

Recommended by Engineer (if required)

Authorized by Owner

By: \_\_\_\_\_

Title: \_\_\_\_\_

Date: \_\_\_\_\_

Authorized by Owner

Approved by Funding Agency (if applicable)

By: \_\_\_\_\_

Title: \_\_\_\_\_

Date: \_\_\_\_\_



## SECTION 011000 – BASIC REQUIREMENTS

### PART 1 – GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

#### 1.2 SUMMARY

- A. Section Includes
  - 1. Summary of Work.
  - 2. Limits of Work area.
  - 3. Construction permits and easements.
  - 4. Work sequence.
  - 5. Schedule of values.
  - 6. Applications for payment.
  - 7. Change procedures.
  - 8. Coordination.
  - 9. Field engineering.
  - 10. Preconstruction conference.
  - 11. Progress meetings.
  - 12. Submittals.
  - 13. Quality control; inspections and tests.
  - 14. Material and equipment.
  - 15. Substitutions.
  - 16. Pre-construction/Post-construction Video

#### 1.3 SUMMARY OF WORK

- A. Work Covered by Contract Documents
  - 1. Work of this Contract comprises the project, for construction of the **Central WTP Electrical Improvements Project Phase 1**.
  - 2. Perform Work under a lump sum contract with Owner.



3. Work of this Contract is identified on the Drawings and in the Contract Documents.
4. Work not specifically identified on the Drawings, but required in the Contract Documents, shall be performed as specified.
5. Work is generally described as:

**This project consists of Phase 1 work to include replacing emergency generator equipment and automatic transfer switch at the Central WTP as shown on the contract documents. The generator equipment must be provided as Owner Furnished/Contractor Installed equipment. Phases 2 and 3 work as identified on the contract documents is not included in the scope of this project.**

#### 1.4 OWNER-FURNISHED/CONTRACTOR-INSTALLED (OFCI) PRODUCTS

- A. Owner's Responsibilities: Owner will furnish products indicated and perform the following, as applicable:
  1. Provide to Contractor Owner-reviewed Product Data, Shop Drawings, and Samples.
  2. Provide for delivery of Owner-furnished products to Project site.
  3. Upon delivery, inspect, with Contractor present, delivered items.
    - a. If Owner-furnished products are damaged, defective, or missing, arrange for replacement.
  4. Obtain manufacturer's inspections, service, and warranties.
  5. Inform Contractor of earliest available delivery date for Owner-furnished products.
- B. Contractor's Responsibilities: The Work includes the following, as applicable:
  1. Designate delivery dates of Owner-furnished products in Contractor's construction schedule, utilizing Owner-furnished earliest available delivery dates.
  2. Review Owner-reviewed Product Data, Shop Drawings, and Samples, noting discrepancies and other issues in providing for Owner-furnished products in the Work.
  3. Receive, unload, handle, store, protect, and install Owner-furnished products.
  4. Make building services connections for Owner-furnished products.
  5. Protect Owner-furnished products from damage during storage, handling, and installation and prior to Substantial Completion.
  6. Repair or replace Owner-furnished products damaged following receipt.
- C. Owner-Furnished/Contractor-Installed (OFCI) Products:
  1. Emergency generator and automatic transfer switch equipment.

## 1.5 LIMITS OF WORK AREA

- A. Confine construction operations within the right-of-way limits shown on the Drawings. Storage of equipment and materials, or erection and use of sheds outside of the Contract Limits, if such areas are the property of Owner, shall be used only with Owner's approval. Such storage or temporary structures, even within the Contract Limits, shall be confined to Owner's property and shall not be placed on properties designated as easements or rights-of-way.

## 1.6 WORK SEQUENCE

- A. Take and submit pre-construction videotape and photographs of existing conditions.
- B. Perform work in accordance with sequence of construction requirements shown on the drawings.
- C. Upon substantial completion, complete final punchlist items.

## 1.7 APPLICATIONS FOR PAYMENT

- A. Submit three copies of each application on forms furnished by Engineer.
- B. Content and Format - Certification by Contractor must accompany each application.
- C. Payment Period - Monthly
- D. Use Form C620 – Application for Payment.
- E. Attach required documents and Contractor's back-up data, when indicated.
- F. Follow procedures outlined in General Conditions and Supplementary Conditions and Agreement between Owner and Contractor.
- G. Provide updated progress schedule, which highlights any portion of work behind schedule and describes remedial actions taken or planned to restore satisfactory progress.

## 1.8 CHANGE PROCEDURES

- A. The Engineer will advise of minor changes in the Work not involving an adjustment of Contract Price or Contract Time by issuing supplemental instructions in a Field Order.
- B. The Engineer may issue a Proposal Request or Notice of Change which includes a detailed description of a proposed change with supplementary or revised Drawings and Specifications, a change in Contract Time for executing the change and the period of time during which the requested price will be considered valid. Contractor shall prepare and submit an estimate within 7 days.

- C. Lump Sum Change Order - Submit itemized account and supporting data on Virginia DGS Form CO-1. Engineer will determine the change allowable in Contract Price and Contract Time as provided in the Contract Documents.
- D. Work Change Directive –Engineer may issue a directive instructing the Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order. Document will describe changes in the Work, and designate method of determining any change in Contract Price or Contract Time. Promptly execute the change.
- E. Time and Material Change Order - Submit itemized account and supporting data after completion of change, within time limits indicated in the Conditions of the Contract. Engineer will determine the change allowable in Contract Price and Contract Time as provided in the Contract Documents.
- F. Maintain detailed records of Work done on Time and Material basis. Provide full information required for evaluation of proposed changes, and to substantiate costs for changes in the Work.
- G. Change Order Forms – Use Form C941.
- H. Execution of Change Orders –Engineer will issue Change Orders for signatures of parties in the following order: Engineer, Contractor, Owner.

#### 1.9 COORDINATION

- A. Coordinate scheduled Work sequences and related operations beforehand with appropriate local, county, and state officials and agencies including affected property owners, when project is to be located in or adjacent to the public right-of-way.
- B. Coordinate scheduling, submittals, and Work of the various Sections of Specifications to assure efficient and orderly sequence of installation of interdependent construction elements.
- C. Coordinate completion and cleanup of Work of separate Sections in preparation for Substantial Completion and for portions of Work designated for Owner’s partial occupancy.
- D. After Owner occupancy of premises, coordinate access to site for correction of defective Work and Work not in accordance with Contract Documents, to minimize disruption of Owner’s activities.

#### 1.10 FIELD ENGINEERING

- A. Control datum for survey work is that provided by Engineer as shown on the Drawings.
- B. Engineer has provided control points along route of water main.
- C. Contractor shall protect all control and reference points. Accurately replace any such point that is damaged or moved.

- D. Owner will provide construction stakeout of waterline no less frequently than every 200 feet, except, where the alignment deflects more than 6 degrees, stakeout will be required every 50' and at each bend.

#### 1.11 PRE-CONSTRUCTION CONFERENCE

- A. Owner will schedule a conference after Effective Date of Agreement. Attendance required: Owner, Contractor, Contractor's Job Superintendent, Major Subcontractors, and Representatives of Utility Companies affected by the work.
- B. Agenda
  - 1. Distribution of extra sets of Contract Documents.
  - 2. Submission of list of Subcontractors, list of products, and Progress Schedule.
  - 3. Designation of personnel representing the parties in Contract.
  - 4. Procedures and processing of field decisions, submittals, substitutions, applications for payments, proposal request, Change Orders and Contract closeout procedures.
  - 5. Scheduling.
  - 6. Scheduling activities of testing laboratory.
  - 7. Requirements of regulatory agencies.
  - 8. Use of premises by Owner and Contractor.
  - 9. Temporary facilities to be provided by Owner; and by Contractor.
  - 10. Procedures for testing.
  - 11. Procedures for maintaining record documents.
  - 12. Periodic cleanup of site.
  - 13. Notification of utilities' owners.
  - 14. Other business relating to the work.
- C. Owner will record minutes and distribute copies within five days after meeting to participants, and to those affected by decisions made.

#### 1.12 PROGRESS MEETINGS

- A. Owner will schedule and administer meetings throughout progress of the Work at regular intervals during the second and fourth week of each month or of shorter intervals as necessary.

- B. Owner will make arrangements for meetings, prepare agenda with copies for participants, preside at meetings, record minutes, and distribute copies within two days to participants, and those affected by decisions made.
- C. Attendance Required - Owner, Contractor's Job Superintendent, major subcontractors and suppliers, other parties as appropriate to agenda topics for each meeting.
- D. Agenda
  - 1. Review minutes of previous meetings.
  - 2. Review of Work progress.
  - 3. Field observations, problems, and decisions.
  - 4. Identification of problems that impede planned progress.
  - 5. Review of submittals schedule and status of submittals.
  - 6. Review of off-site fabrication and delivery schedules.
  - 7. Maintenance of progress schedule.
  - 8. Corrective measures to regain projected schedules.
  - 9. Planned progress during succeeding work period.
  - 10. Coordination of projected progress.
  - 11. Maintenance of quality and work standards.
  - 12. Effect of proposed changes on progress schedule and coordination.
  - 13. Other business relating to Work.

#### 1.13 SUBMITTALS

- A. Procedures
  - 1. Transmit each required submittal using Owner accepted form.
  - 2. Sequentially number the transmittal forms. Re-submittals shall have original number with sequential alphabetic suffix.
  - 3. Identify Project, Contractor, subcontractor or supplier; pertinent Drawing sheet and detail number(s), and Specification Section number, as appropriate.
  - 4. Apply Contractor's stamp, signed or initialed certifying that review, verification of products required, field dimensions, adjacent construction Work, and coordination of information, is in accordance with the requirements of the Work and Contract Documents.

5. Schedule submittals to expedite the Project, and deliver to Engineer at business address. Coordinate submission of related items.
6. Identify deviations from Contract Documents and Product or system limitations that may be detrimental to successful performance of the completed Work. Identify space requirements that differ from those designed or shown on the Contract Documents.
7. Provide space for Contractor and Engineer review stamps.
8. Revise and resubmit submittals as required, identify all changes made since previous submittal.
9. Distribute copies of reviewed submittals to concerned parties. Instruct parties to promptly report any inability to comply with provisions.

**B. Construction Progress Schedule**

1. Submit preliminary progress schedule in duplicate within 10 days after effective date of Owner-Contractor Agreement for Engineer review.
2. Submit finalized progress schedule at least 10 days before submission of the first Application for Payment.
3. Submit revised schedules at each progress meeting, identifying changes since previous version.
4. Prepare horizontal bar chart with separate entry for each major section of Work. Include Work Sequence requirements, if any. Identify first workday of each week.
5. Show complete sequence of construction by activity, identifying Work of separate stages and other logically grouped activities. Indicate the early and late start, early and late finish, float dates, and duration.
6. Indicate estimated percentage of completion for each item of Work at each progress meeting.
7. Submit revised schedules with each application for payment.

**C. Product Data**

1. Submit five copies to Owner, three copies of which will be retained by the Owner.
2. Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturers' standard data to provide information unique to this Project.
3. After review and approval by Owner, distribute copies in accordance with Article on Submittals (above) and preserve copies for Record Documents purposes.

**D. Shop Drawings**

1. Submit five opaque reproductions to Owner, three copies of which will be retained by the Owner.
2. After review and approval by Owner, distribute copies in accordance with Article on Submittals (above) and for Record Documents purposes.

**E. Pre-construction/Post Construction Video**

1. Take pre-construction and post-construction video of existing conditions in all areas that may be disturbed by Contractor's operations:
  - a. Take photographs just prior to start of construction of the areas where work will be performed.
  - b. Camera angle, direction, and duration will be dictated by range and nature of physical features to be recorded.
  - c. Provide minimum of 2 videotapes and 100 photos to Owner.

**1.14 QUALITY CONTROL; INSPECTIONS AND TESTS****A. Quality Assurance/Control of Installation**

1. Monitor quality control over suppliers, manufacturers, products, services, site conditions, and workmanship, to produce Work of specified quality.
2. Comply fully with manufacturers' instructions, including each step in sequence.
3. Should manufacturers' instructions conflict with Contract Documents, request clarification from Engineer before proceeding.
4. Comply with specified standards as a minimum quality for the Work except when more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.
5. Perform Work by persons qualified to produce workmanship of specified quality.
6. Secure Products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion or disfigurement.
7. Furnish field samples at the site as required by individual Specification Sections.
8. Acceptable samples represent a quality level for the Work.

**B. Testing by Contractor**

1. Furnish necessary labor, facilities, tools, equipment, compressed air, water, fuels, lubricants, and electric power for tests, and conduct hydrostatic pressure tests on installed waterlines in accordance with individual Sections of the Specifications.
2. Pay all costs associated with such tests.

#### 1.15 MATERIAL AND EQUIPMENT

- A. Products - Means new material, machinery, components, equipment, fixtures, and systems forming the Work. Does not include machinery and equipment used for preparation, fabrication, conveying and erection of the Work. Products may also include existing materials or components, if required by the Contract Documents, for reuse.
- B. Transportation and Handling
  1. Arrange deliveries of products in accordance with construction progress schedules. Allow time for inspection prior to installation.
  2. Coordinate deliveries to avoid conflict with work, conditions at site, and availability of personnel and handling equipment.
  3. Transport products by methods to avoid product damage; deliver in undamaged condition in manufacturer's unopened containers or packaging, dry, with identifying labels intact and legible.
  4. Provide equipment and personnel to handle products by methods to prevent soiling or damage. Protect sensitive equipment and finishes against impact, abrasion and other damage.
  5. Promptly inspect shipments to assure that products comply with requirements, quantities are correct, and products are undamaged.
- C. Storage and Protection
  1. Store and protect products in accordance with manufacturer's instructions, with seals and labels intact and legible. Store sensitive products in weather-tight, climate controlled enclosures.
  2. For exterior storage of fabricated products, place on sloped supports, above ground.
  3. Provide off-site storage and protection when site does not permit on-site storage or protection.
  4. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to avoid condensation.
  5. Store loose granular materials on solid flat surfaces in a well-drainage area. Prevent mixing with foreign matter.



6. Provide equipment and personnel to store products by methods to prevent soiling, disfigurement, or damage.
7. Arrange storage of products to permit access for inspection. Periodically inspect to assure products are undamaged and are maintained under specified conditions.

#### 1.16 SUBSTITUTIONS

- A. Owner will consider requests for substitute or “or equal” items after the Effective Date of the Owner-Contractor Agreement.
- B. Substitutions may be considered when a product becomes unavailable through no fault of the Contractor. Furnish evidence that product is unavailable.
- C. Document each request with complete data substantiating compliance of proposed substitution with Contract Documents.
- D. A request constitutes a representation that the Contractor:
  1. Has investigated proposed product and determined that it meets or exceeds the quality level of the specified product.
  2. Will provide the same warranty for the substitution as for the specified product.
  3. Will coordinate installation and make changes to other Work that may be required for the Work to be complete with no additional cost to Owner.
  4. Waives claims for additional costs or time extension that may subsequently become apparent.
  5. Will reimburse Owner the costs incurred by Owner for review and any subsequent redesign services by Engineer, including Engineer’s revisions to the Contract Documents, and Engineer’s assistance in connection with review by authorities when re-approval is required, if Engineer determines that the item of material or equipment proposed by Contractor is a substitute item.
- E. Substitutions will not be considered when they are indicated or implied on shop drawing or product data submittals, without separate written request, or when acceptance will require revision to the Contract Documents.
- F. Submittal Procedures
  1. Submit to Owner four copies of request for substitution for consideration, limiting each request to one proposed substitution.
  2. Each request shall basically conform to the procedures outlined in the Article covering submittals of this Section.

3. Include shop drawings, product data, and certified test results attesting to the proposed product equivalence.
4. The Owner will notify Contractor, in writing, of decision to accept or reject request.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

**END OF SECTION 011000**

## **SECTION 015000 – TEMPORARY FACILITIES AND CONTROLS**

### **PART 1 – GENERAL**

#### **1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

#### **1.2 SUMMARY**

- A. Section Includes
  - 1. Temporary Utilities - sanitary facilities, electrical power.
  - 2. Temporary Controls - Barriers, protection of the Work, water control and Pollution Controls.
  - 3. Construction Facilities - progress cleaning, removal of utilities, facilities and controls.

#### **1.3 TEMPORARY SANITARY FACILITIES**

- A. Provide and maintain required sanitary facilities and enclosures for use by all persons employed at the site.
- B. Remove facilities from site at end of construction.
- C. Facilities shall be maintained in conformance with applicable State Regulations and Local ordinances. Contents shall be removed and disposed of in satisfactory manner as occasion requires.
- D. Enforce sanitary regulations amongst employees and take precautions against infectious diseases as deemed necessary. Isolate infected employee(s) and arrange for immediate removal of such person(s) from site.

#### **1.4 TEMPORARY ELECTRICAL POWER**

- A. Provide a portable generator for temporary electrical power to maintain critical facility operations for power outages greater than four hours in duration.

#### **1.5 BARRIERS**

- A. Provide barriers to prevent unauthorized entry to construction areas, and to protect existing facilities and adjacent properties from damage from construction operations.
- B. Provide barricades required by governing authorities for public rights-of-way.
- C. Provide protection for plant life designated to remain. Replace damaged plant life.
- D. Protect vehicular traffic, stored materials, site and structures from damage.

- E. Supplement barriers with suitable signs, railings, fencing and night lights, as necessary.

#### 1.6 WATER CONTROL

- A. Grade site to drain. Maintain excavations free of water. Provide, operate, and maintain pumping equipment.
- B. Protect site from puddling or running water. Provide water barriers as required to protect site from soil erosion and damage to cultivated vegetation, plants, trees, and shrubs.

#### 1.7 PROTECTION OF INSTALLED WORK

- A. Protect installed Work from damage and deterioration due to floods driving rain, wind, snow storms or freezing temperatures; provide special protection where specified in individual specification sections.
- B. Provide temporary and removable protection for installed Products. Control activity in immediate work area to minimize damage.
- C. Prohibit traffic over landscaped areas.
- D. Owner reserves right to order that additional protective measures be taken beyond those proposed by Contractor, to safeguard the Work.

#### 1.8 PARKING

- A. Arrange for temporary parking areas to accommodate all construction personnel involved with project.
- B. When site space is not adequate, provide additional off-site parking.
- C. Do not allow vehicle parking on existing pavement.

#### 1.9 MAINTENANCE OF TRAFFIC

- A. Maintain and regulate traffic within Contract Limits in accordance with applicable State, County, and Local Regulations.
- B. Conduct operations so as to maintain access for vehicular and pedestrian traffic to and from properties adjoining or adjacent to those streets and roads affected by construction activities, and to subject the public to a minimum of delay and inconvenience.
- C. Erect suitable signs and barricades including warning lights at night, to alert traveling public. Provide watchmen and flagmen as necessary to maintain and regulate traffic.
- D. Plan operations so that access to any dwelling, building or hospital is assured in case of fire or other emergency. Review with and obtain approval from local fire and police departments regarding anticipated detours and obstructions to traffic flow which could hinder passage of fire apparatus, ambulance or otherwise.

- E. Not more than one block nor more than one cross-street intersection may be torn up, obstructed or closed to travel at one time without permission of the Owner. If the project involves pipe-laying operations, and if more than one pipe-laying crew is operating at separate locations in the work area, this requirement shall apply to each crew's operation, but shall be consistent with traffic maintenance procedures required by the Owner.
- F. When the normal route of vehicular access to any property must be temporarily obstructed, notify the affected property owner at least 24 hours in advance of intended operations at the location. The route shall subsequently be re-opened not later than one day following the start of construction at that location, unless special arrangements have been made with property owner. Vehicular access to hospitals, Fire and Police Departments must be provided at all times.

#### 1.10 PROGRESS CLEANING

- A. Maintain areas free of waste materials, debris and rubbish; collect and remove same from site daily and dispose off-site.
- B. Store unused tools and equipment at Contractor's yard or base of operations.

#### 1.11 POLLUTION CONTROLS

- A. Dust Control
  - 1. Execute Work by methods to minimize raising dust from construction operations.
  - 2. Provide positive means to prevent air-borne dust from dispersing into atmosphere.
- B. Erosion and Sediment Control
  - 1. Plan and execute construction by methods to control surface drainage from cuts and fills, from borrow and waste disposal areas.
  - 2. Minimize amount of bare soil exposed at one time.
  - 3. Provide temporary measures such as berms, dikes, and drains, to regulate water flow and prevent soil erosion.
  - 4. Periodically inspect earthwork in disturbed areas to detect evidence of erosion and sedimentation; promptly apply corrective measures.
- C. Noise Control
  - 1. All construction equipment and tools exhibiting potential noise nuisance shall be provided with noise muffling devices.
  - 2. Confine use of equipment and tools between the hours of 7 a.m. and 5 p.m, Monday to Friday.

- D. Pollutants Control - Provide methods, means and facilities to prevent contamination of soil, water and atmosphere from discharge of noxious, toxic substances, and pollutants produced by construction operations.

#### 1.12 REMOVAL OF UTILITIES, FACILITIES, AND CONTROLS

- A. Remove temporary above grade or buried utilities, equipment, facilities, materials, prior to Final Application for Payment.
- B. Remove temporary controls, barriers, enclosures, etc. in concert with completion of those segments of Work which no longer require such measures.
- C. Clean and repair damage caused by installation or use of temporary work.
- D. Restore existing facilities used during construction to original condition. Restore permanent facilities used during construction to specified condition.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

**END OF SECTION 015000**

## **SECTION 17700 – CLOSEOUT PROCEDURES**

### **PART 1 – GENERAL**

#### **1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

#### **1.2 SUMMARY**

##### **A. SECTION INCLUDES**

- 1. Closeout procedures.
- 2. Final cleanup.
- 3. Project record documents.

#### **1.3 CLOSEOUT PROCEDURES**

- A. Submit written certification that Contract Documents have been reviewed, Work has been inspected, and that Work is complete in accordance with Contract Documents and ready for Owner/Engineer's inspection.
- B. Correct or replace defective work in accordance with requirements of Article 13 of General Conditions.
- C. Provide submittals to Owner/Engineer that are required by governing or other authorities and Contract Documents. Before the Certificate of Substantial Completion is issued, submit to the Owner/Engineer the following:
  - 1. Test results of project components.
  - 2. Performance affidavits for equipment.
  - 3. Certification of equipment or materials in compliance with Contract Documents.
- D. Conform to procedures established by Owner/Engineer, in concert with requirements of the General conditions and Supplementary Conditions, for final payment application, certificate of substantial completion, final inspection, release of liens, and other related documentations or conditions required by Contract Documents.

#### **1.4 FINAL CLEAN-UP**

- A. Execute final cleanup prior to final inspection.
- B. Clean site; sweep paved areas, rake clean landscaped and restored surfaces.
- C. Remove waste and surplus materials, rubbish, sheds, tools and construction facilities from the site.

## 1.5 PROJECT RECORD DOCUMENTS

- A. Maintain on site, one set of the following record documents; record actual revisions to the Work:
  - 1. Contract Drawings.
  - 2. Specifications.
  - 3. Addenda.
  - 4. Change orders and other modifications to the contract.
  - 5. Approved shop drawings, product data, and samples.
- B. Store record documents separate from documents used for construction.
- C. Record information concurrent with construction progress; make available for periodic examination by Engineer.
- D. Ensure that entries are complete and accurate, enabling future reference by Owner.
- E. Contract Drawings and Shop Drawings - Legibly mark in red ink or pencil to show all changes in, or directly associated with, the work of this contract. Keep entire set of drawings current on day-to-day basis. Examples of types of changes which could occur and are to be recorded:
  - 1. Change in location or elevation of manholes, meter pits, or similar underground structures.
  - 2. Change in dimensions of structures.
  - 3. Unforeseen modifications to existing structures made necessary by work requirements.
  - 4. Change in location or elevations of underground utilities installed under this Contract (sewer, water).
  - 5. Change in materials, such as pipe materials.
  - 6. Relocation of existing underground utilities made necessary because of interference with work under this contract.
  - 7. Change in topographical contours of finished earth and paved surfaces.
  - 8. Change in elevations of finished surfaces along route of installed underground utilities (sewer, water).
- F. Affix Contractor's identification stamp to each Contract Drawing, shop drawing, and on the front cover of all other documents, labeling each as "Record Documents."
- G. Submit documents to Owner/Engineer with final Application for Payment.



PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

**END OF SECTION 017700**

## SECTION 017823 - OPERATION AND MAINTENANCE DATA

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

#### 1.2 SUMMARY

- A. Section includes administrative and procedural requirements for preparing operation and maintenance manuals, including the following:
  - 1. Operation and maintenance documentation directory manuals.
  - 2. Emergency manuals.
  - 3. Systems and equipment operation manuals.
  - 4. Systems and equipment maintenance manuals.
  - 5. Product maintenance manuals.
- B. Related Requirements:
  - 1. Section 011000 "Basic Requirements" for submitting copies of submittals for operation and maintenance manuals.

#### 1.3 DEFINITIONS

- A. System: An organized collection of parts, equipment, or subsystems united by regular interaction.
- B. Subsystem: A portion of a system with characteristics similar to a system.

#### 1.4 CLOSEOUT SUBMITTALS

- A. Submit operation and maintenance manuals indicated. Provide content for each manual as specified in individual Specification Sections, and as reviewed and approved at the time of Section submittals. Submit reviewed manual content formatted and organized as required by this Section.
  - 1. Engineer will comment on whether content of operation and maintenance submittals is acceptable.

2. Where applicable, clarify and update reviewed manual content to correspond to revisions and field conditions.
- B. Format: Submit operation and maintenance manuals in the following format:
  1. Submit on digital media acceptable to Engineer. Enable reviewer comments on draft submittals.
  2. Submit three paper copies of final approved submittals. Engineer will not return copies.
- C. Initial Manual Submittal: Submit draft copy of each manual at least thirty (30) days before commencing demonstration and training. Engineer will comment on whether general scope and content of manual are acceptable.
- D. Final Manual Submittal: Submit each manual in final form prior to requesting inspection for Substantial Completion. Engineer will return copy with comments.
  1. Correct or revise each manual to comply with Engineer's comments. Submit copies of each corrected manual within fifteen (15) days of receipt of Engineer's comments.
- E. Comply with Section 017700 "Closeout Procedures" for schedule for submitting operation and maintenance documentation.

#### 1.5 FORMAT OF OPERATION AND MAINTENANCE MANUALS

- A. Manuals, Electronic Files: Submit manuals in the form of a multiple file composite electronic PDF file for each manual type required.
  1. Electronic Files: Use electronic files prepared by manufacturer where available. Where scanning of paper documents is required, configure scanned file for minimum readable file size.
  2. File Names and Bookmarks: Bookmark individual documents based on file names. Name document files to correspond to system, subsystem, and equipment names used in manual directory and table of contents. Group documents for each system and subsystem into individual composite bookmarked files, then create composite manual, so that resulting bookmarks reflect the system, subsystem, and equipment names in a readily navigated file tree. Configure electronic manual to display bookmark panel on opening file.
- B. Manuals, Paper Copy: Submit manuals in the form of hard-copy, bound and labeled volumes.
  1. Binders: Heavy-duty, three-ring, vinyl-covered, loose-leaf binders, in thickness necessary to accommodate contents, sized to hold 8-1/2-by-11-inch paper; with clear plastic sleeve on spine to hold label describing contents and with pockets inside covers to hold folded oversize sheets.

- a. If two or more binders are necessary to accommodate data of a system, organize data in each binder into groupings by subsystem and related components. Cross-reference other binders if necessary to provide essential information for proper operation or maintenance of equipment or system.
  - b. Identify each binder on front and spine, with printed title "OPERATION AND MAINTENANCE MANUAL," Project title or name, and subject matter of contents, and indicate Specification Section number on bottom of spine. Indicate volume number for multiple-volume sets.
2. Dividers: Heavy-paper dividers with plastic-covered tabs for each section of the manual. Mark each tab to indicate contents. Include typed list of products and major components of equipment included in the section on each divider, cross-referenced to Specification Section number and title of Project Manual.
3. Protective Plastic Sleeves: Transparent plastic sleeves designed to enclose diagnostic software storage media for computerized electronic equipment. Enclose title pages and directories in clear plastic sleeves.
4. Supplementary Text: Prepared on 8-1/2-by-11-inch white bond paper.
5. Drawings: Attach reinforced, punched binder tabs on drawings and bind with text.
  - a. If oversize drawings are necessary, fold drawings to same size as text pages and use as foldouts.
  - b. If drawings are too large to be used as foldouts, fold and place drawings in labeled envelopes and bind envelopes in rear of manual. At appropriate locations in manual, insert typewritten pages indicating drawing titles, descriptions of contents, and drawing locations.

#### 1.6 REQUIREMENTS FOR OPERATION, AND MAINTENANCE MANUALS

- A. Organization of Manuals: Unless otherwise indicated, organize each manual into a separate section for each system and subsystem, and a separate section for each piece of equipment not part of a system. Each manual shall contain the following materials, in the order listed:
  1. Title page.
  2. Table of contents.
  3. Manual contents.
- B. Title Page: Include the following information:
  1. Subject matter included in manual.
  2. Name and address of Project.
  3. Name and address of Owner.
  4. Date of submittal.
  5. Name and contact information for Contractor.
  6. Name and contact information for Engineer.
  7. Cross-reference to related systems in other operation and maintenance manuals.

- C. Table of Contents: List each product included in manual, identified by product name, indexed to the content of the volume, and cross-referenced to Specification Section number in Project Manual.
  - 1. If operation or maintenance documentation requires more than one volume to accommodate data, include comprehensive table of contents for all volumes in each volume of the set.
- D. Manual Contents: Organize into sets of manageable size. Arrange contents alphabetically by system, subsystem, and equipment. If possible, assemble instructions for subsystems, equipment, and components of one system into a single binder.
- E. Identification: In the documentation directory and in each operation and maintenance manual, identify each system, subsystem, and piece of equipment with same designation used in the Contract Documents. If no designation exists, assign a designation according to ASHRAE Guideline 4, "Preparation of Operating and Maintenance Documentation for Building Systems."

#### 1.7 SYSTEMS AND EQUIPMENT OPERATION MANUALS

- A. Systems and Equipment Operation Manual: Assemble a complete set of data indicating operation of each system, subsystem, and piece of equipment not part of a system. Include information required for daily operation and management, operating standards, and routine and special operating procedures.
  - 1. Engage a factory-authorized service representative to assemble and prepare information for each system, subsystem, and piece of equipment not part of a system.
  - 2. Prepare a separate manual for each system and subsystem, in the form of an instructional manual for use by Owner's operating personnel.
- B. Content: In addition to requirements in this Section, include operation data required in individual Specification Sections and the following information:
  - 1. System, subsystem, and equipment descriptions. Use designations for systems and equipment indicated on Contract Documents.
  - 2. Performance and design criteria if Contractor has delegated design responsibility.
  - 3. Operating standards.
  - 4. Operating procedures.
  - 5. Operating logs.
  - 6. Wiring diagrams.
  - 7. Control diagrams.
  - 8. Piped system diagrams.
  - 9. Precautions against improper use.
  - 10. License requirements including inspection and renewal dates.
- C. Descriptions: Include the following:

1. Product name and model number. Use designations for products indicated on Contract Documents.
2. Manufacturer's name.
3. Equipment identification with serial number of each component.
4. Equipment function.
5. Operating characteristics.
6. Limiting conditions.
7. Performance curves.
8. Engineering data and tests.
9. Complete nomenclature and number of replacement parts.

D. Operating Procedures: Include the following, as applicable:

1. Startup procedures.
2. Equipment or system break-in procedures.
3. Routine and normal operating instructions.
4. Regulation and control procedures.
5. Instructions on stopping.
6. Normal shutdown instructions.
7. Seasonal and weekend operating instructions.
8. Required sequences for electric or electronic systems.
9. Special operating instructions and procedures.

E. Systems and Equipment Controls: Describe the sequence of operation, and diagram controls as installed.

F. Piped Systems: Diagram piping as installed and identify color coding where required for identification.

## 1.8 SYSTEMS AND EQUIPMENT MAINTENANCE MANUALS

A. Systems and Equipment Maintenance Manuals: Assemble a complete set of data indicating maintenance of each system, subsystem, and piece of equipment not part of a system. Include manufacturers' maintenance documentation, preventive maintenance procedures and frequency, repair procedures, wiring and systems diagrams, lists of spare parts, and warranty information.

1. Engage a factory-authorized service representative to assemble and prepare information for each system, subsystem, and piece of equipment not part of a system.
2. Prepare a separate manual for each system and subsystem, in the form of an instructional manual for use by Owner's operating personnel.

B. Content: For each system, subsystem, and piece of equipment not part of a system, include source information, manufacturers' maintenance documentation, maintenance procedures,

maintenance and service schedules, spare parts list and source information, maintenance service contracts, and warranties and bonds as described below.

- C. Source Information: List each system, subsystem, and piece of equipment included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual and drawing or schedule designation or identifier where applicable.
- D. Manufacturers' Maintenance Documentation: Include the following information for each component part or piece of equipment:
  - 1. Standard maintenance instructions and bulletins; include only sheets pertinent to product or component installed. Mark each sheet to identify each product or component incorporated into the Work. If data include more than one item in a tabular format, identify each item using appropriate references from the Contract Documents. Identify data applicable to the Work and delete references to information not applicable.
    - a. Prepare supplementary text if manufacturers' standard printed data are not available and where the information is necessary for proper operation and maintenance of equipment or systems.
  - 2. Drawings, diagrams, and instructions required for maintenance, including disassembly and component removal, replacement, and assembly.
  - 3. Identification and nomenclature of parts and components.
  - 4. List of items recommended to be stocked as spare parts.
- E. Maintenance Procedures: Include the following information and items that detail essential maintenance procedures:
  - 1. Test and inspection instructions.
  - 2. Troubleshooting guide.
  - 3. Precautions against improper maintenance.
  - 4. Disassembly; component removal, repair, and replacement; and reassembly instructions.
  - 5. Aligning, adjusting, and checking instructions.
  - 6. Demonstration and training video recording, if available.
- F. Maintenance and Service Schedules: Include service and lubrication requirements, list of required lubricants for equipment, and separate schedules for preventive and routine maintenance and service with standard time allotment.
  - 1. Scheduled Maintenance and Service: Tabulate actions for daily, weekly, monthly, quarterly, semiannual, and annual frequencies.

2. Maintenance and Service Record: Include manufacturers' forms for recording maintenance.
- G. Spare Parts List and Source Information: Include lists of replacement and repair parts, with parts identified and cross-referenced to manufacturers' maintenance documentation and local sources of maintenance materials and related services.
- H. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.
  1. Include procedures to follow and required notifications for warranty claims.
- I. Drawings: Prepare drawings supplementing manufacturers' printed data to illustrate the relationship of component parts of equipment and systems and to illustrate control sequence and flow diagrams. Coordinate these drawings with information contained in record Drawings to ensure correct illustration of completed installation.
  1. Do not use original project record documents as part of maintenance manuals.

#### 1.9 PRODUCT MAINTENANCE MANUALS

- A. Product Maintenance Manual: Assemble a complete set of maintenance data indicating care and maintenance of each product, material, and finish incorporated into the Work.
- B. Content: Organize manual into a separate section for each product, material, and finish. Include source information, product information, maintenance procedures, repair materials and sources, and warranties and bonds, as described below.
- C. Source Information: List each product included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual and drawing or schedule designation or identifier where applicable.
- D. Product Information: Include the following, as applicable:
  1. Product name and model number.
  2. Manufacturer's name.
  3. Color, pattern, and texture.
  4. Material and chemical composition.
  5. Reordering information for specially manufactured products.
- E. Maintenance Procedures: Include manufacturer's written recommendations and the following:
  1. Inspection procedures.
  2. Types of cleaning agents to be used and methods of cleaning.



3. List of cleaning agents and methods of cleaning detrimental to product.
  4. Schedule for routine cleaning and maintenance.
  5. Repair instructions.
- F. Repair Materials and Sources: Include lists of materials and local sources of materials and related services.
- G. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.
1. Include procedures to follow and required notifications for warranty claims.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 017823

## SECTION 260010 - SUPPLEMENTAL REQUIREMENTS FOR ELECTRICAL

## PART 1 - GENERAL

## 1.1 SUMMARY

## A. Section Includes:

1. Supplemental requirements generally applicable to the Work specified in Division 26 and Division 40. This Section is also referenced by related Work specified in other Divisions.

## B. Related Requirements:

1. Section 260011 "Facility Performance Requirements for Electrical" for field conditions applicable to Work specified in this Section.

## 1.2 REFERENCES

## A. Abbreviations and Acronyms for Electrical Terms and Units of Measure:

1. A: Ampere, unit of electrical current.
2. AC or ac: Alternating current.
3. ATS: Automatic transfer switch.
4. AWG: American wire gauge; see ASTM B258.
5. CB: Circuit breaker.
6. CO/ALR: Copper-aluminum, revised.
7. CU or Cu: Copper.
8. CU-AL or AL-CU: Copper-aluminum.
9. dB: Decibel, a unitless logarithmic ratio of two electrical, acoustical, or optical power values.
10. DC or dc: Direct current.
11. DDC: Direct digital control (HVAC).
12. EGC: Equipment grounding conductor.
13. ELV: Extra-low voltage.
14. EPS: Emergency power supply.
15. EPSS: Emergency power supply system.
16. FLC: Full-load current.
17. ft: Foot.
18. GEC: Grounding electrode conductor.
19. GFCI: Ground-fault circuit interrupter.
20. GND: Ground.
21. HP or hp: Horsepower.
22. HVAC: Heating, ventilating, and air conditioning.
23. Hz: Hertz.
24. inch: Inch. To avoid confusion, the abbreviation "in." is not used.

25. kAIC: Kiloampere interrupting capacity.
26. kcmil or MCM: One thousand circular mils.
27. kV: Kilovolt.
28. kVA: Kilovolt-ampere.
29. kW: Kilowatt.
30. LED: Light-emitting diode.
31. LRC: Locked-rotor current.
32. LV: Low voltage.
33. m: Meter.
34. MLO: Main lugs only.
35. MV: Medium voltage.
36. NC: Normally closed.
37. NO: Normally open.
38. NPT: National (American) standard pipe taper.
39. OCPD: Overcurrent protective device.
40. PF or pf: Power factor.
41. PVC: Polyvinyl chloride.
42. RFI: (electrical) Radio-frequency interference; (contract) Request for interpretation.
43. RMS or rms: Root-mean-square.
44. RPM or rpm: Revolutions per minute.
45. SPD: Surge protective device.
46. sq.: Square.
47. SWD: Switching duty.
48. TCP/IP: Transmission control protocol/Internet protocol.UL: (standards) Underwriters Laboratories, Inc.; (product categories) UL, LLC.
49. UL CCN: UL Category Control Number.
50. V: Volt, unit of electromotive force.
51. V(ac): Volt, alternating current.
52. V(dc): Volt, direct current.
53. VA: Volt-ampere, unit of complex electrical power.
54. W: Watt, unit of real electrical power.
55. WR: Weather resistant.

B. Abbreviations and Acronyms for Electrical Raceway Types:

1. EMT: Electrical metallic tubing.
2. EMT-S: Steel electrical metallic tubing.
3. ERMC: Electrical rigid metal conduit.
4. ERMC-S-G: Galvanized-steel electrical rigid metal conduit.
5. FMC: Flexible metal conduit.
6. FMC-S: Steel flexible metal conduit.
7. FMT: Steel flexible metallic tubing.
8. LFMC: Liquidtight flexible metal conduit.
9. LFMC-S: Steel liquidtight flexible metal conduit.
10. PVC: Rigid PVC conduit.
11. PVC-40: Schedule 40 rigid PVC conduit.
12. RGS: See ERMC-S-G.
13. RMC: See ERMC.

- C. Abbreviations and Acronyms for Electrical Single-Conductor and Multiple-Conductor Cable Types:
1. CL2: Class 2 cable.
  2. CL2X: Class 2 cable, limited use.
  3. CL3: Class 3 cable.
  4. CL3X: Class 3 cable, limited use.
  5. THHN: Thermoplastic, heat-resistant cable with nylon jacket outer sheath.
  6. THHW: Thermoplastic, heat- and moisture-resistant cable.
  7. THWN: Thermoplastic, moisture- and heat-resistant cable with nylon jacket outer sheath.
  8. XHHW: Cross-linked polyethylene, heat- and moisture-resistant cable.
- D. Definitions:
1. Cable: In accordance with NIST NBS Circular 37 and IEEE standards, in the United States for the purpose of interstate commerce, the definition of "cable" is (1) a conductor with insulation, or a stranded conductor with or without insulation (single-conductor cable); or (2) a combination of conductors insulated from one another (multiple-conductor cable).
  2. Conductor: In accordance with NIST NBS Circular 37 and IEEE standards, in the United States for the purpose of interstate commerce, the definition of "conductor" is (1) a wire or combination of wires not insulated from one another, suitable for carrying an electric current; (2) (National Electrical Safety Code) a material, usually in the form of wire, cable, or bar, suitable for carrying an electric current; or (3) (general) a substance or body that allows a current of electricity to pass continuously along it.
  3. Direct Buried: Installed underground without encasement in concrete or other protective material.
  4. Enclosure: The case or housing of an apparatus, or the fence or wall(s) surrounding an installation, to prevent personnel from accidentally contacting energized parts or to protect the equipment from physical damage. Types of enclosures and enclosure covers include the following:
    - a. Cabinet: An enclosure that is designed for either surface mounting or flush mounting and is provided with a frame, mat, or trim in which a swinging door or doors are or can be hung.
    - b. Conduit Body: A means for providing access to the interior of a conduit or tubing system through one or more removable covers at a junction or terminal point. In the United States, conduit bodies are listed in accordance with outlet box requirements.
    - c. Conduit Box: A box having threaded openings or knockouts for conduit, EMT, or fittings.
    - d. Device Box: A box with provisions for mounting a wiring device directly to the box.
    - e. Junction Box: A box with a blank cover that joins different runs of raceway or cable and provides space for connection and branching of the enclosed conductors.
    - f. Pull Box: A box with a blank cover that joins different runs of raceway and provides access for pulling or replacing the enclosed cables or conductors.
  5. Emergency Systems: Those systems legally required and classed as emergency by municipal, state, federal, or other codes, or by any governmental agency having

jurisdiction that are designed to ensure continuity of lighting, electrical power, or both, to designated areas and equipment in the event of failure of the normal supply for safety to human life.

6. Fault Limited: Providing or being served by a source of electrical power that is limited to not more than 100 W when tested in accordance with UL 62368-1.
  - a. The term "fault limited" is intended to encompass most Class 1, 2, and 3 power-limited sources complying with Article 725 of NFPA 70; Class ES1 and ES2 electrical energy sources that are Class PS1 electrical power sources (e.g., USB); and Class ES3 electrical energy sources that are Class PS1 and PS2 electrical power sources (e.g., PoE). See UL 62368-1 for discussion of classes of electrical energy sources and classes of electrical power sources.
7. Jacket: A continuous nonmetallic outer covering for conductors or cables.
8. Luminaire: A complete lighting unit consisting of a light source such as a lamp, together with the parts designed to position the light source and connect it to the power supply. It may also include parts to protect the light source or the ballast or to distribute the light.
9. Mode: The terms "Active Mode," "Off Mode," and "Standby Mode" are used as defined in the Energy Independence and Security Act (EISA) of 2007.
10. Receptacle: A fixed connecting device arranged for insertion of a power cord plug. Also called a power jack.
11. Receptacle Outlet: One or more receptacles mounted in a box with a suitable protective cover.
12. UL Category Control Number (CCN): An alphabetic or alphanumeric code used to identify product categories covered by UL's Listing, Classification, and Recognition Services.
13. Voltage Class: For specified circuits and equipment, voltage classes are defined as follows:
  - a. Control Voltage: Having electromotive force between any two conductors, or between a single conductor and ground, that is supplied from a battery or other Class 2 or Class 3 power-limited source.
  - b. Line Voltage: (1) (controls) Designed to operate using the supplied low-voltage power without transformation. (2) (transmission lines, transformers, SPDs) The line-to-line voltage of the supplying power system.
  - c. Extra-Low Voltage (ELV): Not having electromotive force between any two conductors, or between a single conductor and ground, exceeding 30 V(ac rms), 42 V(ac peak), or 60 V(dc).
  - d. Low Voltage (LV): Having electromotive force between any two conductors, or between a single conductor and ground, that is rated above 30 V but not exceeding 1000 V.
14. Wire: In accordance with NIST NBS Circular 37 and IEEE standards, in the United States for the purpose of interstate commerce, the definition of "wire" is a slender rod or filament of drawn metal. A group of small wires used as a single wire is properly called a "stranded wire." A wire or stranded wire covered with insulation is properly called an "insulated wire" or a "single-conductor cable." Nevertheless, when the context indicates that the wire is insulated, the term "wire" will be understood to include the insulation.

### 1.3 COORDINATION

- A. Interruption of Existing Electrical Service: Do not interrupt electrical service to facilities occupied by Owner or others unless permitted under the following conditions:
1. Notify Owner no fewer than seven days in advance of proposed interruption of electrical service.
  2. Do not proceed with interruption of electrical service without Owner's written permission.
  3. Coordinate interruption with systems impacted by outage including, but not limited to, the following:
    - a. Water Treatment Plant Facility Operations.
    - b. Emergency lighting.
    - c. Elevators.
    - d. Fire-alarm systems.
- B. Arrange to provide temporary electrical power in accordance with requirements specified in Division 01.

### 1.4 INFORMATIONAL SUBMITTALS

- A. Electrical Installation Schedule: At preconstruction meeting, and periodically thereafter as dates change, provide schedule for electrical installation Work to Owner and Architect/Engineer including, but not limited to, milestone dates for the following activities:
1. Submission of power system studies.
  2. Submission of specified coordination drawings.
  3. Submission of action submittals specified in Division 26.
  4. Orders placed for major electrical equipment.
  5. Arrival of major electrical equipment on-site.
  6. Utility service outages.
  7. Utility service inspection and activation.

### 1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data:
1. Provide emergency operation, normal operation, and preventive maintenance manuals for each system, equipment, and device listed below:
    - a. Panelboards.
    - b. Starters.
    - c. Generator
    - d. Power Meter.
    - e. Transfer Switches.
    - f. Programmable Logic Controllers.

## 2. Include the following information:

- a. Manufacturer's operating specifications.
- b. User's guides for software and hardware.
- c. Schedule of maintenance material items recommended to be stored at Project site.
- d. Detailed instructions covering operation under both normal and abnormal conditions.
- e. Time-current curves for overcurrent protective devices and manufacturer's written instructions for testing and adjusting their settings.
- f. List of load-current and overload-relay heaters with related motor nameplate data.
- g. Manufacturer's instructions for setting field-adjustable components.

## B. Software:

1. Program Software Backup: Provide username and password for approved online or cloud solution.
2. Provide to Owner upgrades and unrestricted licenses for installed and backup software, including operating systems and programming tools required for operation and maintenance.

## 1.6 QUALIFICATIONS

- A. Electrical Professional Engineer: Professional engineer possessing active qualifications with expertise in electrical engineering, including electrical power system modeling and analysis of electrical safety in accordance with NFPA 70E. Qualifications required:
  1. A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly, or product that is similar in material, design, and extent to those indicated for this Project.
- B. Electrical Power Monitoring Installers: Installer possessing active qualifications and able to present unexpired certified Installer credentials issued by manufacturer prior to starting installation. Qualifications required:
  1. A firm or individual experienced in installing, erecting, applying, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.
- C. Power Quality Specialist: Recognized experts possessing active credentials from a qualified electrical testing laboratory recognized by authorities having jurisdiction, and able to present unexpired NICET Level 4 credentials with documented experience in power quality testing for installations similar in complexity to this Project.
- D. Low-Voltage Electrical Testing and Inspecting Agency: Entities possessing active credentials from a qualified electrical testing laboratory recognized by authorities having jurisdiction.

1. On-site electrical testing supervisors must have documented certification and experience with testing electrical equipment in accordance with NETA testing standards.
- E. Power-Limited Electrical Testing Agency: Entity possessing active credentials from a qualified electrical testing laboratory recognized by authorities having jurisdiction.
  1. On-site power-limited testing supervisor must have BICSI Registered Communications Distribution Designer certification and documented training and experience with testing power-limited equipment in accordance with NETA testing standards.

## 1.7 FIELD CONDITIONS

- A. Modeling, analysis, product selection, installation, and quality control for Work specified in Division 26 and Division 40 must comply with requirements specified in Section 260011 "Facility Performance Requirements for Electrical."
- B. Service Conditions for Electrical Power Equipment: Besides conditions specified in Section 260011 "Facility Performance Requirements for Electrical," specified electrical power equipment must be suitable for operation under service conditions specified as usual service conditions in applicable NEMA PB series, IEEE C37 series, and IEEE C57 series standards, except for the following:
  1. Utility Yard:
    - a. Outdoor
    - b. Exposure to solar radiation.
    - c. Exposure to dust.
    - d. Ambient temperature range between 15 deg F and 95 deg F.
    - e. Exposure to hot and humid climate, and dripping water.
  2. Water Treatment Facility:
    - a. Indoor, ambient temperature range between 65 deg F and 85 deg F.
    - b. Indoor, select spaces provided with stainless steel enclosures to protect against corrosive environment.

## PART 2 - PRODUCTS

### 2.1 INSTALLATION OF ELECTRICAL WORK

- A. Unless more stringent requirements are specified in the Contract Documents or manufacturers' written instructions, comply with NFPA 70 and NECA NEIS 1 for installation of Work specified in Division 26 and Division 40. Consult Architect/Engineer for resolution of conflicting requirements.



2.2 CLOSEOUT ACTIVITIES

- A. Training: Train Owner's maintenance personnel on the following topics:
  - 1. Coordinate first How to adjust, operate, and maintain systems specified in Section 260913 "Electrical Power Monitoring."
- B. Allow Owner to record training sessions.

END OF SECTION 260010

## SECTION 260011 - FACILITY PERFORMANCE REQUIREMENTS FOR ELECTRICAL

### PART 1 - GENERAL

#### 1.1 SUMMARY

##### A. Section Includes:

1. Field conditions and other facility performance requirements applicable to Work specified in Division 26 and Division 40.

#### 1.2 FIELD CONDITIONS

##### A. Altitude:

1. Sea level to 1000 ft.

##### B. Ambient Temperature:

1. Exterior Temperature Range: 15 deg F to 95 deg F.
2. Interior Temperature Range: 60 deg F to 85 deg F.

##### C. Ground Water:

1. Assume ground-water level is 36 inch below ground surface unless a higher water table is indicated on Drawings.

### PART 2 - PRODUCTS (Not Used)

### PART 3 - EXECUTION (Not Used)

END OF SECTION 260011

## SECTION 260519 - LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

## PART 1 - GENERAL

## 1.1 SUMMARY

## A. Section Includes:

1. Copper building wire.
2. Connectors and splices.

## B. Related Requirements:

1. Section 260010 "Supplemental Requirements for Electrical" for additional abbreviations, definitions, submittals, qualifications, testing agencies, and other Project requirements applicable to Work specified in this Section.
2. Section 260011 "Facility Performance Requirements for Electrical" for field conditions applicable to Work specified in this Section.
3. Section 260523 "Control-Voltage Electrical Power Cables" for control systems communications cables and Classes 1, 2, and 3 control cables.
4. Section 406343 Programmable Logic Controllers (PLC)".

## 1.2 ACTION SUBMITTALS

## A. Product Data:

1. Copper building wire.
2. Connectors and splices.

## B. Product Schedule: Indicate type, use, location, and termination locations.

## 1.3 INFORMATIONAL SUBMITTALS

## A. Field quality-control reports.

## PART 2 - PRODUCTS

## 2.1 COPPER BUILDING WIRE

## A. Description: Flexible, insulated and uninsulated, drawn copper current-carrying conductor with an overall insulation layer or jacket, or both, rated 600 V or less.

## B. Standards:

1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.
  2. Conductor and Cable Marking: Comply with wire and cable marking according to UL's "Wire and Cable Marking and Application Guide."
- C. Conductors: Copper, complying with ASTM B3 for bare annealed copper and with ASTM B8 for stranded conductors.
- D. Conductor Insulation:
1. Type THHN and Type THWN-2. Comply with UL 83.

## 2.2 CONNECTORS AND SPLICES

- A. Description: Factory-fabricated connectors, splices, and lugs of size, ampacity rating, material, type, and class for application and service indicated; listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.

## PART 3 - EXECUTION

### 3.1 CONDUCTOR MATERIAL APPLICATIONS

- A. Feeders:
1. Copper; solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.
- B. Branch Circuits:
1. Copper: Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

### 3.2 CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS

- A. Exposed Feeders: Type THHN/THWN-2, single conductors in raceway.
- B. Feeders Concealed in Ceilings, Walls, Partitions, and Crawlspace: Type THHN/THWN-2, single conductors in raceway.
- C. Feeders Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN/THWN-2, single conductors in raceway.
- D. Exposed Branch Circuits, Including in Crawlspace: Type THHN/THWN-2, single conductors in raceway.
- E. Branch Circuits Concealed in Ceilings, Walls, and Partitions: Type THHN/THWN-2, single conductors in raceway.

- F. Branch Circuits Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN/THWN-2, single conductors in raceway.

#### INSTALLATION, GENERAL

- G. Complete raceway installation between conductor and cable termination points in accordance with Section 260533.13 "Conduits for Electrical Systems" prior to pulling conductors and cables.
- H. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.
- I. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.

### 3.3 CONNECTIONS

- A. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A-486B.
- B. Make splices, terminations, and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.
- C. Wiring at Outlets: Install conductor at each outlet, with at least 6 inch of slack.

### 3.4 IDENTIFICATION

- A. Identify and color-code conductors and cables according to Section 260553 "Identification for Electrical Systems."
- B. Identify each spare conductor at each end with identity number and location of other end of conductor, and identify as spare conductor.

### 3.5 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS

- A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies.

### 3.6 FIRESTOPPING

- A. Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly.

### 3.7 FIELD QUALITY CONTROL

#### A. Tests and Inspections:

1. After installing conductors and cables and before electrical circuitry has been energized, test service entrance and feeder conductors for compliance with requirements.
2. Perform each of the following visual and electrical tests:
  - a. Inspect exposed sections of conductor and cable for physical damage and correct connection according to the single-line diagram.
  - b. Inspect for correct identification.
  - c. Continuity test on each conductor and cable.

#### B. Cables will be considered defective if they do not pass tests and inspections.

#### C. Prepare test and inspection reports to record the following:

1. Results that do not comply with requirements, and corrective action taken to achieve compliance with requirements.

END OF SECTION 260519

## SECTION 260523 - CONTROL-VOLTAGE ELECTRICAL POWER CABLES

## PART 1 - GENERAL

## 1.1 SUMMARY

## A. Section Includes:

1. Category 6a balanced twisted pair cable.
2. Balanced twisted pair cable hardware.
3. RS-485 cable.
4. Control-circuit conductors.

## B. Related Requirements:

1. Section 260010 "Supplemental Requirements for Electrical" for additional abbreviations, definitions, submittals, qualifications, testing agencies, and other Project requirements applicable to Work specified in this Section.
2. Section 260011 "Facility Performance Requirements for Electrical" for field conditions applicable to Work specified in this Section.
3. Section 406343 "Programmable Logic Controllers (PLC)".

## 1.2 ACTION SUBMITTALS

## A. Product Data:

1. Category 6a balanced twisted pair cable.
2. Balanced twisted pair cable hardware.
3. RS-485 cable.
4. Control-circuit conductors.

## PART 2 - PRODUCTS

## 2.1 PERFORMANCE REQUIREMENTS

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

## 2.2 CATEGORY 6a BALANCED TWISTED PAIR CABLE

- A. Description: Four-pair, balanced-twisted pair cable, with internal spline, certified to meet transmission characteristics of Category 6a cable at frequencies up to 500 MHz.
- B. Standard: Comply with TIA-568-C.2 for Category 6a cables.

- C. Conductors: 100 ohm, No. 23 AWG solid copper.
- D. Shielding/Screening: Shielded twisted pairs (FTP)] .
- E. Cable Rating: Riser.
- F. Jacket: Blue thermoplastic.

## 2.3 BALANCED TWISTED PAIR CABLE HARDWARE

- A. Description: Hardware designed to connect, splice, and terminate balanced twisted pair copper communications cable.
- B. General Requirements for Balanced Twisted Pair Cable Hardware:
  - 1. Comply with the performance requirements of Category 6a.
  - 2. Comply with TIA-568-C.2, IDC type, with modules designed for punch-down caps or tools.
  - 3. Cables must be terminated with connecting hardware of same category or higher.
- C. Source Limitations: Obtain balanced twisted pair cable hardware from single source from single manufacturer.
- D. Plugs and Plug Assemblies:
  - 1. Male; eight position; color-coded modular telecommunications connector designed for termination of a single four-pair 100 ohm unshielded or shielded balanced twisted pair cable.
  - 2. Comply with IEC 60603-7-1, IEC 60603-7-2, IEC 60603-7-3, IEC 60603-7-4, and IEC 60603-7.5.

## 2.4 RS-485 CABLE

- A. Standard Cable: NFPA 70, Type CMG.
  - 1. Paired, one pair, twisted, No. 22 AWG, stranded (7x30) tinned-copper conductors.
  - 2. PVC insulation.
  - 3. Unshielded.
  - 4. PVC jacket.
  - 5. Flame Resistance: Comply with UL 1685.

## 2.5 CONTROL-CIRCUIT CONDUCTORS

- A. Class 1 Control Circuits: Stranded copper, Type THHN/THWN-2, complying with UL 83 in raceway.



- B. Class 2 Control Circuits: Stranded copper, Type THHN/THWN-2, complying with UL 83 in raceway.
- C. Class 3 Remote-Control and Signal Circuits: Stranded copper, Type THHN/THWN-2, complying with UL 83 in raceway.

## 2.6 SOURCE QUALITY CONTROL

- A. Factory test twisted pair cables according to TIA-568-C.2.
- B. Cable will be considered defective if it does not pass tests and inspections.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Test cables on receipt at Project site.
  - 1. Test each pair of twisted pair cable for open and short circuits.

### 3.2 INSTALLATION OF RACEWAYS AND BOXES

- A. Comply with requirements in Section 260533.13 "Conduits for Electrical Systems" for raceway selection and installation requirements for conduits as supplemented or modified in this Section.
- B. Comply with requirements in Section 260533.16 "Boxes and Covers for Electrical Systems" for raceway selection and installation requirements for boxes as supplemented or modified in this Section.
  - 1. Outlet boxes must be no smaller than 2 inch wide, 3 inch high, and 2-1/2 inch deep.
  - 2. Outlet boxes for cables must be no smaller than 4 inch square by 1-1/2 inch deep.
  - 3. Flexible metal conduit must not be used.
- C. Comply with TIA-569-D for pull-box sizing and length of conduit and number of bends between pull points.

### 3.3 INSTALLATION OF CONDUCTORS AND CABLES

- A. Comply with NECA 1.
- B. General Requirements for Cabling:
  - 1. Comply with TIA-568-C Series of standards.
  - 2. Comply with BICSI ITSIMM, Ch. 5, "Copper Structured Cabling Systems."

3. Terminate all conductors; cable must not contain unterminated elements. Make terminations only at indicated outlets, terminals, and cross-connect and patch panels.
  4. Cables may not be spliced and must be continuous from terminal to terminal. Do not splice cable between termination, tap, or junction points.
  5. Cables serving a common system may be grouped in a common raceway. Install network cabling and control wiring and cable in separate raceway from power wiring. Do not group conductors from different systems or different voltages.
  6. Bundle, lace, and train conductors to terminal points without exceeding manufacturer's limitations on bending radii, but not less than radii specified in BICSI ITSIMM, Ch. 5, "Copper Structured Cabling Systems." Install lacing bars and distribution spools.
  7. Do not install bruised, kinked, scored, deformed, or abraded cable. Remove and discard cable if damaged during installation and replace it with new cable.
  8. Cold-Weather Installation: Bring cable to room temperature before dereeling. Do not use heat lamps for heating.
  9. Pulling Cable: Comply with BICSI ITSIMM, Ch. 5, "Copper Structured Cabling Systems." Monitor cable pull tensions.
  10. Secure: Fasten securely in place with hardware specifically designed and installed so as to not damage cables.
  11. Provide strain relief.
  12. Keep runs short. Allow extra length for connecting to terminals. Do not bend cables in a radius less than 10 times the cable OD. Use sleeves or grommets to protect cables from vibration at points where they pass around sharp corners and through penetrations.
  13. Ground wire must be copper, and grounding methods must comply with IEEE C2. Demonstrate ground resistance.
- C. Balanced Twisted Pair Cable Installation:
1. Comply with TIA-568-C.2.
  2. Do not untwist balanced twisted pair cables more than 1/2 inch at the point of termination to maintain cable geometry.
- D. Installation of Control-Circuit Conductors:
1. Install wiring in raceways.
  2. Use insulated spade lugs for wire and cable connection to screw terminals.
- E. Separation from EMI Sources:
1. Separation between communications cables in grounded metallic raceways and power lines and electrical equipment located in grounded metallic conduits or enclosures must be as follows:
    - a. Electrical Equipment or Circuit Rating Less Than 2 kVA: No requirement.
    - b. Electrical Equipment or Circuit Rating between 2 and 5 kVA: A minimum of 3 inch .
    - c. Electrical Equipment or Circuit Rating More Than 5 kVA: A minimum of 6 inch.
  2. Separation between Communications Cables and Electrical Motors and Transformers, 5 kVA or 5 HP and Larger: A minimum of 48 inch.

### 3.4 CONTROL-CIRCUIT CONDUCTORS

#### A. Minimum Conductor Sizes:

1. Class 1 remote-control and signal circuits; No 14 AWG .
2. Class 2 low-energy, remote-control, and signal circuits; No. 16 AWG .
3. Class 3 low-energy, remote-control, alarm, and signal circuits; No 12 AWG .

### 3.5 GROUNDING

- #### A.
- For control-voltage wiring and cabling, comply with requirements in Section 260526 "Grounding and Bonding for Electrical Systems."

### 3.6 IDENTIFICATION

- #### A.
- Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

### 3.7 FIELD QUALITY CONTROL

#### A. Tests and Inspections:

1. Visually inspect cable jacket materials for UL or third-party certification markings. Inspect cabling terminations to confirm color-coding for pin assignments, and inspect cabling connections to confirm compliance with TIA-568-C.1.
2. Visually inspect cable placement, cable termination, grounding and bonding, equipment and patch cords, and labeling of all components.

- #### B.
- End-to-end cabling will be considered defective if it does not pass tests and inspections.

END OF SECTION 260523

## SECTION 260526 - GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

## PART 1 - GENERAL

## 1.1 SUMMARY

## A. Section Includes:

1. Grounding and bonding conductors.
2. Grounding and bonding clamps.
3. Grounding and bonding bushings.
4. Grounding and bonding hubs.
5. Grounding and bonding connectors.
6. Grounding (earthing) electrodes.

## B. Related Requirements:

1. Section 260010 "Supplemental Requirements for Electrical" for additional abbreviations, definitions, submittals, qualifications, testing agencies, and other Project requirements applicable to Work specified in this Section.
2. Section 260011 "Facility Performance Requirements for Electrical" for field conditions applicable to Work specified in this Section.
3. Section 406343 "Programmable Logic Controllers (PLC)".

## 1.2 ACTION SUBMITTALS

## A. Product Data:

1. For each type of product indicated.

## B. Shop Drawings: Plans showing dimensioned locations of grounding features described in "Field Quality Control" Article, including the following:

1. Test wells.
2. Rod electrodes.
3. Grounding arrangements and connections for separately derived systems.

## C. Field Quality-Control Submittals:

1. Field quality-control reports.

## 1.3 CLOSEOUT SUBMITTALS

## A. Operation and Maintenance Data:

1. In addition to items specified in Section 260010 "Supplemental Requirements for Electrical," include the following:
  - a. Plans showing locations of grounding features described in "Field Quality Control" Article, including the following:
    - 1) Test wells.
    - 2) Rod electrodes.
    - 3) Grounding arrangements and connections for separately derived systems.
  - b. Grounding test Report

## PART 2 - PRODUCTS

### 2.1 GROUNDING AND BONDING CONDUCTORS

#### A. Equipment Grounding Conductor:

1. General Characteristics: 600 V, THHN/THWN-2, copper wire or cable, green color, in accordance with Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

#### B. ASTM - Bare Copper Grounding and Bonding Conductor:

1. Referenced Standards: Complying with one or more of the following:
  - a. Soft or Annealed Copper Wire: ASTM B3
  - b. Concentric-Lay Stranded Copper Conductor: ASTM B8.
  - c. Tin-Coated Soft or Annealed Copper Wire: ASTM B33.
  - d. 19-Wire Combination Unilay-Stranded Copper Conductor: ASTM B787/B787M.
2. Listing Criteria:
  - a. Grounding and Bonding Equipment: UL CCN KDER; including UL 467.

### 2.2 GROUNDING AND BONDING CLAMPS

- A. Description: Clamps suitable for attachment of grounding and bonding conductors to grounding electrodes, pipes, tubing, and rebar.
- B. Source Limitations: Obtain products from single manufacturer.
- C. Performance Criteria:
  1. Regulatory Requirements:

- a. Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction and marked for intended location and application.
- 2. Listing Criteria:
  - a. Grounding and Bonding Equipment: UL CCN KDER; including UL 467.
- D. UL KDER- Hex-Fitting-Type Pipe and Rod Grounding and Bonding Clamp
  - 1. General Characteristics:
    - a. Two pieces with stainless steel bolts.
    - b. Clamp Material: Silicon bronze
    - c. Listed for outdoor use.
- E. UL KDER - Exothermically Welded Connection:
  - 1. General Characteristics: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.

## 2.3 GROUNDING AND BONDING BUSHINGS

- A. Description: Bonding bushings connect conduit fittings, tubing fittings, threaded metal conduit, and unthreaded metal conduit to metal boxes and equipment enclosures and have one or more bonding screws intended to provide electrical continuity between bushing and enclosure. Grounding bushings have provision for connection of bonding or grounding conductor and may or may not also have bonding screws.
- B. Source Limitations: Obtain products from single manufacturer.
- C. Performance Criteria:
  - 1. Regulatory Requirements:
    - a. Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction and marked for intended location and application.
  - 2. Listing Criteria:
    - a. Grounding and Bonding Equipment: UL CCN KDER; including UL 467.
- D. UL KDER - Bonding Bushing:
  - 1. General Characteristics: Threaded bushing with insulated throat.
- E. UL KDER - Grounding Bushing:
  - 1. General Characteristics: Threaded bushing with insulated throat and mechanical-type wire terminal.

## 2.4 GROUNDING AND BONDING HUBS

- A. Description: Hubs with certified grounding or bonding locknut.
- B. Source Limitations: Obtain products from single manufacturer.
- C. Performance Criteria:
  - 1. Regulatory Requirements:
    - a. Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction and marked for intended location and application.
  - 2. Listing Criteria:
    - a. Grounding and Bonding Equipment: UL CCN KDER; including UL 467.
- D. UL KDER - Grounding and Bonding Hub:
  - 1. General Characteristics: Insulated, gasketed, watertight hub with mechanical-type wire terminal.

## 2.5 GROUNDING AND BONDING CONNECTORS

- A. Source Limitations: Obtain products from single manufacturer.
- B. Performance Criteria:
  - 1. Regulatory Requirements:
    - a. Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction and marked for intended location and application.
  - 2. Listing Criteria:
    - a. Grounding and Bonding Equipment: UL CCN KDER; including UL 467.
- C. UL KDER - Crimped Lug Pressure-Type Grounding and Bonding Busbar Terminal:
  - 1. General Characteristics: Cast silicon bronze, solderless compression-type wire terminals; with long barrel and two holes spaced on 5/8- or 1-inch centers for two-bolt connection to busbar.

## 2.6 GROUNDING (EARTHING) ELECTRODES

- A. Description: Grounding electrodes include rod electrodes, ring electrodes, metal underground water pipes, metal building frames, concrete-encased electrodes, and pipe and plate electrodes.

- B. Source Limitations: Obtain products from single manufacturer.
- C. Performance Criteria:
  - 1. Regulatory Requirements:
    - a. Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction and marked for intended location and application.
  - 2. Listing Criteria:
    - a. Grounding and Bonding Equipment: UL CCN KDER; including UL 467.
- D. UL KDER - Rod Electrode:
  - 1. General Characteristics: Copper-clad steel; 3/4 inch by 10 ft.

### PART 3 - EXECUTION

#### 3.1 SELECTION OF GROUNDING AND BONDING CONDUCTORS

- A. Conductors: Install solid conductor for 8 AWG and smaller, and stranded conductors for 6 AWG and larger unless otherwise indicated.
- B. Custom-Length Insulated Equipment Bonding Jumpers: 6 AWG, 19-strand, Type THHN.
- C. Bonding Conductor: 4 AWG or 6 AWG, stranded conductor unless otherwise indicated
- D. Underground Grounding Conductors: Install bare tinned-copper conductor, 2 AWG minimum.
  - 1. Bury at least 30 inches below grade.

#### 3.2 SELECTION OF CONNECTORS

- A. Conductor Terminations and Connections:
  - 1. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.
  - 2. Underground Connections: Welded connectors except at test wells and as otherwise indicated.
  - 3. Connections to Ground Rods at Test Wells: Bolted connectors.
  - 4. Connections to Structural Steel: Welded connectors.

#### 3.3 INSTALLATION

- A. Comply with manufacturer's published instructions.



## B. Reference Standards:

1. Consult Architect/Engineer for resolution of conflicting requirements.

## C. Special Techniques:

1. Conductors:

- a. Route along shortest and straightest paths possible unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.

2. Connections: Make connections so possibility of galvanic action or electrolysis is minimized. Select connectors, connection hardware, conductors, and connection methods so metals in direct contact are galvanically compatible.

- a. Use electroplated or hot-tin-coated materials to ensure high conductivity and to make contact points closer in order of galvanic series.
- b. Make connections with clean, bare metal at points of contact.
- c. Make aluminum-to-steel connections with stainless steel separators and mechanical clamps.
- d. Make aluminum-to-galvanized-steel connections with tin-plated copper jumpers and mechanical clamps.
- e. Coat and seal connections having dissimilar metals with inert material to prevent future penetration of moisture to contact surfaces.
- f. Bonding Jumpers: Install in locations accessible for inspection and maintenance except where routed through short lengths of conduit.

- 1) Bonding to Structure: Bond directly to basic structure, taking care not to penetrate adjacent parts.
- 2) Use exothermic-welded connectors for outdoor locations; if disconnect-type connection is required, use bolted clamp.

- g. Grounding and Bonding for Piping:

- 1) Metal Water Service Pipe: Install insulated copper grounding conductors, in conduit, from building's main service equipment, or grounding bus, to main metal water service entrances to building. Connect grounding conductors to main metal water service pipes; use bolted clamp connector or bolt lug-type connector to pipe flange by using one of lug bolts of flange. Where dielectric main water fitting is installed, connect grounding conductor on street side of fitting. Bond metal grounding conductor conduit or sleeve to conductor at each end.

3. Electrodes:

- a. Ground Rods: Drive rods until tops are 24 inch below finished floor or final grade unless otherwise indicated.

- 1) Interconnect ground rods with grounding electrode conductor below grade and as otherwise indicated. Make connections without exposing steel or damaging coating if any.
    - 2) Use exothermic welds for below-grade connections.
  - b. For grounding electrode system, install at least three rods spaced at least one-rod length from each other and located at least same distance from other grounding electrodes, and connect to service grounding electrode conductor.
  - c. Test Wells: Ground rod driven through drilled hole in bottom of handhole.
    - 1) Install at least one test well for each service unless otherwise indicated. Install at ground rod electrically closest to service entrance. Set top of test well flush with finished grade or floor.
4. Grounding at Service:
- a. Equipment grounding conductors and grounding electrode conductors must be connected to ground bus. Install main bonding jumper between neutral and ground buses where indicated in Drawings.
5. Equipment Grounding:
- a. Install insulated equipment grounding conductors with the following items, in addition to those required by NFPA 70:
    - 1) Feeders and branch circuits.
    - 2) Lighting circuits.
    - 3) Receptacle circuits.
    - 4) Single-phase motor and appliance branch circuits.
    - 5) Three-phase motor and appliance branch circuits.
    - 6) Flexible raceway runs.
  - b. Raceway is not permitted for use as an equipment grounding conductor.

### 3.4 FIELD QUALITY CONTROL

#### A. Tests and Inspections:

1. After installing grounding system but before permanent electrical circuits have been energized, test for compliance with requirements.
2. Inspect physical and mechanical condition. Verify tightness of accessible, bolted, electrical connections with calibrated torque wrench in accordance with manufacturer's published instructions.
3. Test completed grounding system at each location where maximum ground-resistance level is specified, at service disconnect enclosure grounding terminal, at ground test wells. Make tests at ground rods before conductors are connected.

- a. Measure ground resistance no fewer than two full days after last trace of precipitation and without soil being moistened by means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance.
  - b. Perform tests by fall-of-potential method in accordance with IEEE Std 81.
  - c. Excessive Ground Resistance: If resistance to ground exceeds specified values, notify Architect/Engineer promptly and include recommendations to reduce ground resistance.
- B. Nonconforming Work:
1. Grounding system will be considered defective if it does not pass tests and inspections.
  2. Remove and replace defective components and retest.
- C. Collect, assemble, and submit test and inspection reports.
1. Report measured ground resistances that exceed the following values:
    - a. Power and Lighting Equipment or System with Capacity of 500 kVA and Less: 10  $\Omega$ .
    - b. Power and Lighting Equipment or System with Capacity of 500 to 1000 kVA: 5  $\Omega$ .
    - c. Substations and Pad-Mounted Equipment: 5  $\Omega$ .

### 3.5 PROTECTION

- A. After installation, protect grounding and bonding cables and equipment from construction activities. Remove and replace items that are contaminated, defaced, damaged, or otherwise caused to be unfit for use prior to acceptance by Owner.

END OF SECTION 260526

## SECTION 260529 - HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

## PART 1 - GENERAL

## 1.1 SUMMARY

## A. Section Includes:

1. Support, anchorage, and attachment components.
2. Fabricated metal equipment support assemblies.

## B. Related Requirements:

1. Section 260010 "Supplemental Requirements for Electrical" for additional abbreviations, definitions, submittals, qualifications, testing agencies, and other Project requirements applicable to Work specified in this Section.
2. Section 260011 "Facility Performance Requirements for Electrical" for field conditions applicable to Work specified in this Section.
3. Section 406343 "Programmable Logic Controllers (PLC)".

## 1.2 ACTION SUBMITTALS

## A. Product Data:

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for the following:
  - a. Slotted support systems, hardware, and accessories.
  - b. Clamps.
  - c. Hangers.
  - d. Fasteners.
  - e. Anchors.
  - f. Saddles.
  - g. Brackets.
2. Include rated capacities and furnished specialties and accessories.

## B. Shop Drawings: For fabrication and installation details for electrical hangers and support systems.

1. Hangers. Include product data for components.
2. Slotted support systems.
3. Equipment supports.

## PART 2 - PRODUCTS

## 2.1 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS

- A. Steel Slotted Support Systems: Preformed steel channels and angles with minimum 13/32 inch diameter holes at a maximum of 8 inch on center in at least one surface.
  - 1. Standard: Comply with MFMA-4 factory-fabricated components for field assembly.
  - 2. Material for Channel, Fittings, and Accessories: Galvanized steel Stainless steel, Type 304.
  - 3. Channel Width: 1-5/8 inch.
  - 4. Metallic Coatings: Hot-dip galvanized after fabrication and applied according to MFMA-4.
- B. Conduit and Cable Support Devices: Steel Stainless steel hangers, clamps, and associated fittings, designed for types and sizes of raceway or cable to be supported.
- C. Structural Steel for Fabricated Supports and Restraints: ASTM A36/A36M steel plates, shapes, and bars; black and galvanized.
- D. Mounting, Anchoring, and Attachment Components: Items for fastening electrical items or their supports to building surfaces include the following:
  - 1. Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated steel, for use in hardened Portland cement concrete, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.
  - 2. Concrete Inserts: Steel or malleable-iron, slotted support system units are similar to MSS Type 18 units and comply with MFMA-4 or MSS SP-58.
  - 3. Clamps for Attachment to Steel Structural Elements: MSS SP-58 units are suitable for attached structural element.
  - 4. Through Bolts: Structural type, hex head, and high strength. Comply with ASTM F3125/F3125M, Grade A325.
  - 5. Hanger Rods: Threaded steel.

## PART 3 - EXECUTION

## 3.1 SELECTION

- A. Comply with the following standards for selection and installation of hangers and supports, except where requirements on Drawings or in this Section are stricter:
  - 1. NECA NEIS 101
- B. Comply with requirements for raceways specified in Section 260533.13 "Conduits for Electrical Systems."

- C. Comply with requirements for boxes specified in Section 260533.16 "Boxes and Covers for Electrical Systems."
- D. Maximum Support Spacing and Minimum Hanger Rod Size for Raceways: Space supports for EMT, IMC, and ERM as required by NFPA 70. Minimum rod size must be 1/4 inch in diameter.
- E. Multiple Raceways or Cables: Install trapeze-type supports fabricated with steel slotted support system, sized so capacity can be increased by at least 25 percent in future without exceeding specified design load limits.
  - 1. Secure raceways and cables to these supports with single-bolt conduit clamps using spring friction action for retention in support channel.

### 3.2 INSTALLATION OF SUPPORTS

- A. Comply with NECA NEIS 101 for installation requirements except as specified in this article.
- B. Strength of Support Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination must be weight of supported components plus 200 lb.
- C. Mounting and Anchorage of Surface-Mounted Equipment and Components: Anchor and fasten electrical items and their supports to building structural elements by the following methods unless otherwise indicated by code:
  - 1. To Wood: Fasten with lag screws or through bolts.
  - 2. To New Concrete: Bolt to concrete inserts.
  - 3. To Masonry: Approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.
  - 4. To Existing Concrete: Expansion anchor fasteners.
  - 5. To Steel: Beam clamps (MSS SP-58, Type 19, 21, 23, 25, or 27), complying with MSS SP-69.
  - 6. To Light Steel: Sheet metal screws.
  - 7. Items Mounted on Hollow Walls and Nonstructural Building Surfaces: Mount cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices on slotted-channel racks attached to substrate.
- D. Drill holes for expansion anchors in concrete at locations and to depths that avoid the need for reinforcing bars.

### 3.3 CONCRETE BASES

- A. Construct concrete bases of dimensions indicated, but not less than 4 inch larger in both directions than supported unit, and so anchors will be a minimum of 10 bolt diameters from edge of the base.

- B. Use 4000 psi, 28-day compressive-strength concrete.
- C. Anchor equipment to concrete base as follows:
  - 1. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
  - 2. Install anchor bolts to elevations required for proper attachment to supported equipment.
  - 3. Install anchor bolts according to anchor-bolt manufacturer's written instructions.

### 3.4 PAINTING

- A. Touchup:
  - 1. Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.
    - a. Apply paint by brush or spray to provide minimum dry film thickness of 2.0 mils.
- B. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A780.

END OF SECTION 260529

## SECTION 260533.13 - CONDUITS FOR ELECTRICAL SYSTEMS

## PART 1 - GENERAL

## 1.1 SUMMARY

## A. Section Includes:

1. Type EMT-S duct raceways and elbows.
2. Type ERMC-S duct raceways, elbows, couplings, and nipples.
3. Type LFMC duct raceways.
4. Type PVC duct raceways and fittings.
5. Fittings for conduit, tubing, and cable.
6. Electrically conductive corrosion-resistant compounds for threaded conduit.
7. Solvent cements.

## B. Products Installed, but Not Furnished, under This Section:

1. See Section 260553 "Identification for Electrical Systems" for electrical equipment labels.

## C. Related Requirements:

1. Section 260010 "Supplemental Requirements for Electrical" for additional abbreviations, definitions, submittals, qualifications, testing agencies, and other Project requirements applicable to Work specified in this Section.
2. Section 260011 "Facility Performance Requirements for Electrical" for field conditions applicable to Work specified in this Section.

## 1.2 DEFINITIONS

A. Conduit: A structure containing one or more duct raceways.

B. Duct Raceway: A single enclosed raceway for conductors or cable.

## PART 2 - PRODUCTS

## 2.1 TYPE EMT-S DUCT RACEWAYS AND ELBOWS

## A. Performance Criteria:

1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.



2. Listing Criteria: UL CCN FJMX; including UL 797.

B. UL FJMX - Steel Electrical Metal Tubing (EMT-S) and Elbows:

1. Material: Steel.
2. Options:
  - a. Exterior Coating: Zinc.
  - b. Interior Coating: Zinc with organic top coating.
  - c. Minimum Trade Size: Metric designator 21 (trade size 3/4).

2.2 TYPE ERM-C-S DUCT RACEWAYS, ELBOWS, COUPLINGS, AND NIPPLES

A. Performance Criteria:

1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.
2. Listing Criteria: UL CCN DYIX; including UL 6.

B. UL DYIX - Galvanized-Steel Electrical Rigid Metal Conduit (ERM-C-S-G), Elbows, Couplings, and Nipples:

1. Exterior Coating: Zinc.
2. Options:
  - a. Interior Coating: Zinc with organic top coating.
  - b. Minimum Trade Size: Metric designator 21 (trade size 3/4).

2.3 TYPE LFM-C DUCT RACEWAYS

A. Performance Criteria:

1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction and marked for intended location and application.
2. Listing Criteria: UL CCN DXHR; including UL 360.

B. UL DXHR - Steel Liquidtight Flexible Metal Conduit (LFM-C-S):

1. Material: Steel.
2. Options:
  - a. Minimum Trade Size: Metric designator 21 (trade size 3/4).

2.4 TYPE PVC DUCT RACEWAYS AND FITTINGS

A. Performance Criteria:

1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.
  2. Listing Criteria: UL CCN DZYR; including UL 651.
- B. UL DZYR - Schedule 40 Rigid PVC Conduit (PVC-40) and Fittings:
1. Dimensional Specifications: Schedule 40.
  2. Options:
    - a. Minimum Trade Size: Metric designator 21 (trade size 3/4).
    - b. Markings: For use with maximum 90 deg C wire.

## 2.5 FITTINGS FOR CONDUIT, TUBING, AND CABLE

- A. Performance Criteria:
1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.
- B. UL DWTT - Fittings for Type ERMFC, and Type PVC Duct Raceways:
1. Listing Criteria: UL CCN DWTT; including UL 514B.
  2. Options:
    - a. Material: Steel.
    - b. Coupling Method: Compression coupling.
- C. UL FKAV - Fittings for Type EMT Duct Raceways:
1. Listing Criteria: UL CCN FKAV; including UL 514B.
  2. Options:
    - a. Material: Steel.
    - b. Coupling Method: Compression coupling.
- D. UL DXAS - Fittings for Type LFMC Duct Raceways:
1. Listing Criteria: UL CCN DXAS; including UL 514B.

## 2.6 ELECTRICALLY CONDUCTIVE CORROSION-RESISTANT COMPOUNDS FOR THREADED CONDUIT

- A. Performance Criteria:
1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.
  2. Listing Criteria: UL CCN FOIZ; including UL Subject 2419.

- B. UL FOIZ - Electrically Conductive Corrosion-Resistant Compound for Threaded Conduit:

## 2.7 SOLVENT CEMENTS

- A. Performance Criteria:

1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.
2. Listing Criteria: UL CCN DWTT; including UL 514B.

## PART 3 - EXECUTION

### 3.1 SELECTION OF CONDUITS FOR ELECTRICAL SYSTEMS

- A. Unless more stringent requirements are specified in Contract Documents or manufacturers' published instructions, comply with NFPA 70 for selection of duct raceways. Consult Engineer of Record for resolution of conflicting requirements.
- B. Outdoors:
1. Exposed and Subject to Severe Physical Damage: ERMCMC.
  2. Exposed and Subject to Physical Damage: ERMCMC.
    - a. Locations less than 2.5 m (8 ft) above finished floor.
  3. Exposed and Not Subject to Physical Damage: ERMCMC.
  4. Concealed Aboveground: ERMCMC.
  5. Direct Buried: PVC-40.
  6. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMCMC.
- C. Indoors:
1. Exposed and Subject to Severe Physical Damage: ERMCMC. Locations include the following:
    - a. Pump Room.
    - b. Generator Room.
  2. Exposed and Subject to Physical Damage: ERMCMC. Locations include the following:
    - a. Locations less than 2.5 m (8 ft) above finished floor.
    - b. Stub-ups to above suspended ceilings.
  3. Exposed and Not Subject to Physical Damage: EMT.
  4. Concealed in Ceilings and Interior Walls and Partitions: EMT.
  5. Damp or Wet Locations: ERMCMC.

6. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.

### 3.2 INSTALLATION OF CONDUITS FOR ELECTRICAL SYSTEMS

- A. Comply with manufacturer's published instructions.
- B. Reference Standards for Installation: Unless more stringent installation requirements are specified in Contract Documents or manufacturers' published instructions, comply with the following:
  1. Type EMT-S: Article 358 of NFPA 70 and NECA NEIS 101.
  2. Type ERMC-S: Article 344 of NFPA 70 and NECA NEIS 101.
  3. Type LFMC: Article 350 of NFPA 70 and NECA NEIS 101.
  4. Type PVC: Article 356 of NFPA 70 and NECA NEIS 111.
  5. Expansion Fittings: NEMA FB 2.40.
  6. Consult Architect/Engineer for resolution of conflicting requirements.
- C. Special Installation Techniques:
  1. Types ERMC:
    - a. Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound that maintains electrical conductivity to threads of duct raceway and fittings before making up joints. Follow compound manufacturer's published instructions.
  2. Type LFMC:
    - a. Provide a maximum of 36 inches of flexible conduit for equipment subject to vibration, noise transmission, or movement; and for transformers and motors.
  3. Types PVC:
    - a. Do not install Type PVC conduit where ambient temperature exceeds 122 deg F. Conductor ratings must be limited to 75 deg C except where installed in a trench outside buildings with concrete encasement, where 90 deg C conductors are permitted.
    - b. Comply with manufacturer's published instructions for solvent welding and fittings.
- D. Interfaces with Other Work:
  1. Coordinate installation of new products with existing conditions.
  2. Coordinate with Section 260529 "Hangers and Supports for Electrical Systems" for installation of conduit hangers and supports.

3.3 PROTECTION

A. Protect coatings, finishes, and cabinets from damage and deterioration.

1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.

END OF SECTION 260533.13

## SECTION 260533.16 - BOXES AND COVERS FOR ELECTRICAL SYSTEMS

## PART 1 - GENERAL

## 1.1 SUMMARY

## A. Section Includes:

1. Metallic outlet boxes, device boxes, rings, and covers.
2. Nonmetallic outlet boxes, device boxes, rings, and covers.
3. Junction boxes and pull boxes.
4. Cover plates for device boxes.

## B. Products Installed, but Not Furnished, under This Section:

1. See Section 260553 "Identification for Electrical Systems" for electrical equipment labels.

## C. Related Requirements:

1. Section 260010 "Supplemental Requirements for Electrical" for additional abbreviations, definitions, submittals, qualifications, testing agencies, and other Project requirements applicable to Work specified in this Section.
2. Section 260011 "Facility Performance Requirements for Electrical" for field conditions applicable to Work specified in this Section.

## PART 2 - PRODUCTS

## 2.1 METALLIC OUTLET BOXES, DEVICE BOXES, AND COVERS

## A. Performance Criteria:

1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.
2. Listing Criteria: UL CCN QCIT; including UL 514A.

## B. Source Quality Control:

1. Product Data: Prepare and submit catalog cuts, brochures, and performance data illustrating size, physical appearance, and other characteristics of product.

## C. UL QCIT - Metallic Outlet Boxes and Covers:

1. Description: Box having pryout openings, knockouts, threaded entries, or hubs in either the sides of the back, or both, for entrance of conduit, conduit or cable fittings, or cables, with provisions for mounting outlet box cover, but without provisions for mounting wiring device directly to box.
2. Options:
  - a. Material: Sheet steel, Cast metal.
  - b. Sheet Metal Depth: Minimum 1.5 inch.

D. UL QCIT - Metallic Conduit Bodies:

1. Description: Means for providing access to interior of conduit or tubing system through one or more removable covers at junction or terminal point. In the United States, conduit bodies are listed in accordance with outlet box requirements.

E. UL QCIT - Metallic Device Boxes:

1. Description: Box with provisions for mounting wiring device directly to box.
2. Options:
  - a. Material: Sheet steel, Cast metal.
  - b. Sheet Metal Depth: minimum 1.5 inch

## 2.2 JUNCTION BOXES AND PULL BOXES

A. Performance Criteria:

1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
2. Listing Criteria: UL CCN BGUZ; including UL 50 and UL 50E.

B. Source Quality Control:

1. Product Data: Prepare and submit catalog cuts, brochures, and performance data illustrating size, physical appearance, and other characteristics of product.

C. UL BGUZ - Indoor Sheet Metal Junction and Pull Boxes:

1. Description: Box with a blank cover that serves the purpose of joining different runs of raceway or cable.

D. UL BGUZ - Indoor Polymeric Junction and Pull Boxes:

1. Description: Box with a blank cover that serves the purpose of joining different runs of raceway or cable.

E. UL BGUZ - Outdoor Sheet Metal Junction and Pull Boxes:

1. Description: Box with a blank cover that serves the purpose of joining different runs of raceway or cable.
2. Options:
  - a. Degree of Protection: Type 3R.

F. UL BGUZ - Outdoor Polymeric Junction and Pull Boxes:

1. Description: Box with a blank cover that serves the purpose of joining different runs of raceway or cable.
2. Options:
  - a. Degree of Protection: Type 3R.

## 2.3 COVER PLATES FOR DEVICES BOXES

A. Performance Criteria:

1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
2. Listing Criteria: UL CCN QCIT or UL CCN QCMZ; including UL 514D.
3. Wallplate-Securing Screws: Metal with head color to match wallplate finish.

B. Source Quality Control:

1. Product Data: Prepare and submit catalog cuts, brochures, and performance data illustrating size, physical appearance, and other characteristics of product.

C. UL QCIT or QCMZ - Metallic Cover Plates for Device Boxes:

1. Options:
  - a. Damp and Wet Locations: Listed, labeled, and marked for location and use. Provide gaskets and accessories necessary for compliance with listing.

## PART 3 - EXECUTION

### 3.1 SELECTION OF BOXES AND COVERS FOR ELECTRICAL SYSTEMS

- A. Unless more stringent requirements are specified in Contract Documents or manufacturers' published instructions, comply with NFPA 70 for selection of boxes and enclosures. Consult Architect/Engineer for resolution of conflicting requirements.
- B. Degree of Protection:
  1. Outdoors:
    - a. Type 3R unless otherwise indicated.



2. Indoors:
  - a. Type 1 unless otherwise indicated.
  - b. Damp or Dusty Locations: Type 12.

### 3.2 INSTALLATION OF BOXES AND COVERS FOR ELECTRICAL SYSTEMS

- A. Comply with manufacturer's published instructions.
- B. Reference Standards for Installation: Unless more stringent installation requirements are specified in Contract Documents or manufacturers' published instructions, comply with the following:
  1. Outlet, Device, Pull, and Junction Boxes: Article 314 of NFPA 70.
  2. Consult Architect/Engineer for resolution of conflicting requirements.
- C. Special Installation Techniques:
  1. Provide boxes in wiring and raceway systems wherever required for pulling of wires, making connections, and mounting of devices or fixtures.
  2. Mount boxes at heights indicated on Drawings. If mounting heights of boxes are not individually indicated, give priority to ADA requirements. Install boxes with height measured to center of box unless otherwise indicated.
  3. Support boxes in recessed ceilings independent of ceiling tiles and ceiling grid.
  4. Fasten junction and pull boxes to, or support from, building structure. Do not support boxes by conduits.
  5. Do not rely on locknuts to penetrate nonconductive coatings on enclosures. Remove coatings in the locknut area prior to assembling conduit to enclosure to ensure a continuous ground path.
  6. Identification: Provide labels for boxes and associated electrical equipment.
    - a. Identify field-installed conductors, interconnecting wiring, and components.
- D. Interfaces with Other Work:
  1. Coordinate with Section 260573.13 "Short-Circuit Studies" for determining available fault current on input feeder.
  2. Coordinate with Section 260573.19 "Arc-Flash Hazard Analysis" for determining arc-flash hazard on input feeder.

### 3.3 CLEANING

- A. Remove construction dust and debris from boxes before installing wallplates, covers, and hoods.

3.4 PROTECTION

- A. After installation, protect boxes from construction activities. Remove and replace items that are contaminated, defaced, damaged, or otherwise caused to be unfit for use prior to acceptance by Owner.

END OF SECTION 260533.16

## SECTION 260553 - IDENTIFICATION FOR ELECTRICAL SYSTEMS

## PART 1 - GENERAL

## 1.1 SUMMARY

## A. Section Includes:

1. Labels.
2. Tapes and stencils.
3. Signs.
4. Cable ties.
5. Miscellaneous identification products.

## B. Related Requirements:

1. Section 260010 "Supplemental Requirements for Electrical" for additional abbreviations, definitions, submittals, qualifications, testing agencies, and other Project requirements applicable to Work specified in this Section.
2. Section 260011 "Facility Performance Requirements for Electrical" for field conditions applicable to Work specified in this Section.
3. Section 406343 "Programmable Logic Controllers (PLC)".

## 1.2 ACTION SUBMITTALS

## A. Product Data:

1. Labels.
2. Tapes and stencils.
3. Signs.

## PART 2 - PRODUCTS

## 2.1 PERFORMANCE REQUIREMENTS

- A. Comply with ASME A13.1.
- B. Comply with 29 CFR 1910.144 for color identification of hazards; 29 CFR 1910.145 for danger, caution, warning, and safety instruction signs and tags; and the following:
- C. Signs, labels, and tags required for personnel safety must comply with the following standards:

1. Safety Colors: NEMA Z535.1.
  2. Facility Safety Signs: NEMA Z535.2.
  3. Safety Symbols: NEMA Z535.3.
  4. Product Safety Signs and Labels: NEMA Z535.4.
  5. Safety Tags and Barricade Tapes for Temporary Hazards: NEMA Z535.5.
- D. Comply with NFPA 70E and Section 260573.19 "Arc-Flash Hazard Analysis" requirements for arc-flash warning labels.
- E. Adhesive-attached labeling materials, including label stocks, laminating adhesives, and inks used by label printers, must comply with UL 969.
- F. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.
1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

## 2.2 COLOR AND LEGEND REQUIREMENTS

- A. Raceways and Cables Carrying Circuits at 1000 V or Less:
1. Black letters on orange field.
  2. Legend: Indicate voltage.
- B. Color-Coding for Phase and Voltage-Level Identification, 1000 V or Less: Use colors listed below for ungrounded service, feeder, and branch-circuit conductors.
1. Color must be factory applied or field applied for sizes larger than 8 AWG if authorities having jurisdiction permit.
  2. Colors for 208Y/120 V Circuits:
    - a. Phase A: Black.
    - b. Phase B: Red.
    - c. Phase C: Blue.
  3. Colors for 480Y/277 V Circuits:
    - a. Phase A: Brown.
    - b. Phase B: Orange.
    - c. Phase C: Yellow.
  4. Color for Neutral: White or gray.
  5. Color for Equipment Grounds: Green.
- C. Warning Label Colors:
1. Identify system voltage with black letters on orange background.

- D. Warning labels and signs must include, but are not limited to, the following legends:
1. Multiple Power Source Warning: "DANGER - ELECTRICAL SHOCK HAZARD - EQUIPMENT HAS MULTIPLE POWER SOURCES."
  2. Workspace Clearance Warning: "WARNING - OSHA REGULATION - AREA IN FRONT OF ELECTRICAL EQUIPMENT MUST BE KEPT CLEAR FOR 3 FEET MINIMUM."
- E. Equipment Identification Labels:
1. Black letters on white field.

## 2.3 LABELS

- A. Vinyl Wraparound Labels: Preprinted, flexible labels laminated with clear, weather- and chemical-resistant coating and matching wraparound clear adhesive tape for securing label ends.
- B. Snap-Around Labels: Slit, pretensioned, flexible, preprinted, color-coded acrylic sleeves, with diameters sized to suit diameters and that stay in place by gripping action.
- C. Self-Adhesive Wraparound Labels: Preprinted, 3 milthick, polyester flexible label with acrylic pressure-sensitive adhesive.
1. Self-Lamination: Clear; UV-, weather- and chemical-resistant; self-laminating, protective shield over legend. Labels sized such that clear shield overlaps entire printed legend.
  2. Marker for Labels:
    - a. Machine-printed, permanent, waterproof, black ink recommended by printer manufacturer.
- D. Self-Adhesive Labels: Polyester, thermal, transfer-printed, 3 mil thick, multicolor, weather- and UV-resistant, pressure-sensitive adhesive labels, configured for intended use and location.
1. Minimum Nominal Size:
    - a. 1-1/2 by 6 inchfor raceway and conductors.
    - b. 3-1/2 by 5 inch for equipment.
    - c. As required by authorities having jurisdiction.

## 2.4 TAPES AND STENCILS

- A. Marker Tapes: Vinyl or vinyl-cloth, self-adhesive wraparound type, with circuit identification legend machine printed by thermal transfer or equivalent process.
- B. Self-Adhesive Vinyl Tape: Colored, heavy duty, waterproof, fade resistant; not less than 3 milthick by 1 to 2 inchwide; compounded for outdoor use.
- C. Tape and Stencil: 4 inchwide black stripes on 10 inch centers placed diagonally over orange background and are 12 inchwide. Stop stripes at legends.

- D. Floor Marking Tape: 2 inch wide, 5 mil pressure-sensitive vinyl tape, with yellow and black stripes and clear vinyl overlay.
1. Color and Printing:
    - a. Comply with APWA Uniform Color Code using NEMA Z535.1 safety colors.
    - b. Inscriptions for Red Tapes: "CAUTION BURIED ELECTRIC LINE BELOW" .
  2. Type IID Tape:
    - a. Reinforced, detectable three-layer laminate, consisting of printed pigmented woven scrim, solid aluminum-foil core, and clear protective film that allows inspection of continuity of conductive core; bright-colored, continuous-printed on one side with inscription of utility, compounded for direct-burial service.
    - b. Width: 3 inch.
    - c. Overall Thickness: 8 mil.
    - d. Foil Core Thickness: 0.35 mil.
    - e. Weight: 34 lb/1000 sq. ft.
    - f. Tensile in accordance with ASTM D882: 300 lbf and 12,500 psi.
- E. Stenciled Legend: In nonfading, waterproof, black ink or paint. Minimum letter height must be 1 inch.

## 2.5 SIGNS

- A. Baked-Enamel Signs:
1. Preprinted aluminum signs, high-intensity reflective, punched or drilled for fasteners, with colors, legend, and size required for application.
  2. 1/4 inch grommets in corners for mounting.
  3. Nominal Size: 7 by 10 inch.
- B. Metal-Backed Butyrate Signs:
1. Weather-resistant, nonfading, preprinted, cellulose-acetate butyrate signs, with 0.0396 inch galvanized-steel backing, punched and drilled for fasteners, and with colors, legend, and size required for application.
  2. 1/4 inch grommets in corners for mounting.
  3. Nominal Size: 10 by 14 inch.
- C. Laminated Acrylic or Melamine Plastic Signs:
1. Engraved legend.
  2. Thickness:
    - a. For signs up to 20 sq. inch, minimum 1/16 inch thick.
    - b. For signs larger than 20 sq. inch, 1/8 inch thick.
    - c. Engraved legend with black letters on white face .
    - d. Punched or drilled for mechanical fasteners with 1/4 inch grommets in corners for mounting.

- e. Framed with mitered acrylic molding and arranged for attachment at applicable equipment.

## 2.6 CABLE TIES

- A. General-Purpose Cable Ties: Fungus inert, self-extinguishing, one piece, self-locking, and Type 6/6 nylon.
  - 1. Minimum Width: 3/16 inch.
  - 2. Tensile Strength at 73 deg F in accordance with ASTM D638: 12,000 psi.
  - 3. Temperature Range: Minus 40 to plus 185 deg F.
  - 4. Color: Black, except where used for color-coding.
- B. UV-Stabilized Cable Ties: Fungus inert, designed for continuous exposure to exterior sunlight, self-extinguishing, one piece, self-locking, and Type 6/6 nylon.
  - 1. Minimum Width: 3/16 inch.
  - 2. Tensile Strength at 73 deg F in accordance with ASTM D638: 12,000 psi.
  - 3. Temperature Range: Minus 40 to plus 185 deg F.
  - 4. Color: Black.

## 2.7 MISCELLANEOUS IDENTIFICATION PRODUCTS

- A. Paint: Comply with requirements in painting Sections for paint materials and application requirements. Retain paint system applicable for surface material and location (exterior or interior).
- B. Fasteners for Labels and Signs: Self-tapping, stainless steel screws or stainless steel machine screws with nuts and flat and lock washers.

## PART 3 - EXECUTION

### 3.1 PREPARATION

- A. Self-Adhesive Identification Products: Before applying electrical identification products, clean substrates of substances that could impair bond, using materials and methods recommended by manufacturer of identification product.

### 3.2 INSTALLATION

- A. Verify and coordinate identification names, abbreviations, colors, and other features with requirements in other Sections requiring identification applications, Drawings, Shop Drawings, manufacturer's wiring diagrams, and operation and maintenance manual. Use consistent designations throughout Project.

- B. Install identifying devices before installing acoustical ceilings and similar concealment.
- C. Verify identity of item before installing identification products.
- D. Coordinate identification with Project Drawings, manufacturer's wiring diagrams, and operation and maintenance manual.
- E. Apply identification devices to surfaces that require finish after completing finish work.
- F. Install signs with approved legend to facilitate proper identification, operation, and maintenance of electrical systems and connected items.
- G. System Identification for Raceways and Cables under 1000 V: Identification must completely encircle cable or conduit. Place identification of two-color markings in contact, side by side.
  - 1. Secure tight to surface of conductor, cable, or raceway.
- H. Auxiliary Electrical Systems Conductor Identification: Identify field-installed alarm, control, and signal connections.
- I. Emergency Operating Instruction Signs: Install instruction signs with white legend on red background with minimum 3/8 inch high letters for emergency instructions at equipment used for power transfer .
- J. Elevated Components: Increase sizes of labels, signs, and letters to those appropriate for viewing from floor.
- K. Vinyl Wraparound Labels:
  - 1. Secure tight to surface of raceway or cable at location with high visibility and accessibility.
  - 2. Attach labels that are not self-adhesive type with clear vinyl tape, with adhesive appropriate to location and substrate.
- L. Snap-Around Labels: Secure tight to surface at location with high visibility and accessibility.
- M. Self-Adhesive Wraparound Labels: Secure tight to surface at location with high visibility and accessibility.
- N. Self-Adhesive Labels:
  - 1. Install unique designation label that is consistent with wiring diagrams, schedules, and operation and maintenance manual.
  - 2. Unless otherwise indicated, provide single line of text with 1/2 inch high letters on 1-1/2 inch high label; where two lines of text are required, use labels 2 inch high; where three lines of text are required, use labels 3 inch high.
- O. Marker Tapes: Secure tight to surface at location with high visibility and accessibility.



- P. Self-Adhesive Vinyl Tape: Secure tight to surface at location with high visibility and accessibility.
  - 1. Field-Applied, Color-Coding Conductor Tape: Apply in half-lapped turns for minimum distance of 6 inch where splices or taps are made. Apply last two turns of tape with no tension to prevent possible unwinding.
- Q. Tape and Stencil: Comply with requirements in painting Sections for surface preparation and paint application.
- R. Floor Marking Tape: Apply stripes to finished surfaces following manufacturer's instructions.
- S. Baked-Enamel Signs:
  - 1. Attach signs that are not self-adhesive type with mechanical fasteners appropriate to location and substrate.
  - 2. Unless otherwise indicated, provide single line of text with 1/2 inchhigh letters on minimum 1-1/2 inch high sign; where two lines of text are required, use signs minimum 2 inch high.
- T. Metal-Backed Butyrate Signs:
  - 1. Attach signs that are not self-adhesive type with mechanical fasteners appropriate to location and substrate.
  - 2. Unless otherwise indicated, provide single line of text with 1/2 inchhigh letters on 1-1/2 inchhigh sign; where two lines of text are required, use labels 2 inch high.
- U. Laminated Acrylic or Melamine Plastic Signs:
  - 1. Attach signs that are not self-adhesive type with mechanical fasteners appropriate to location and substrate.
  - 2. Unless otherwise indicated, provide single line of text with 1/2 inchhigh letters on 1-1/2 inchhigh sign; where two lines of text are required, use labels 2 inchhigh.
- V. Cable Ties: General purpose, for attaching tags, except as listed below:
  - 1. Outdoors: UV-stabilized nylon.

### 3.3 IDENTIFICATION SCHEDULE

- A. Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment. Install access doors or panels to provide view of identifying devices.
- B. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, pull points, and locations of high visibility. Identify by system and circuit designation.

- C. Power-Circuit Conductor Identification, 1000 V or Less: For conductors in vaults, pull and junction boxes, manholes, and handholes, use vinyl wraparound labels to identify phase.
  - 1. Locate identification at changes in direction, at penetrations of walls and floors, at 50 ft maximum intervals in straight runs, and at 25 ft maximum intervals in congested areas.
- D. Control-Circuit Conductor Identification: For conductors and cables in pull and junction boxes, manholes, and handholes, use self-adhesive labels with conductor or cable designation, origin, and destination.
- E. Control-Circuit Conductor Termination Identification: For identification at terminations, provide self-adhesive labels with conductor designation.
- F. Auxiliary Electrical Systems Conductor Identification: Self-adhesive vinyl tape that is uniform and consistent with system used by manufacturer for factory-installed connections.
  - 1. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, and pull points. Identify by system and circuit designation.
- G. Workspace Indication: Apply floor marking tape to finished surfaces. Show working clearances in direction of access to live parts. Workspace must comply with NFPA 70 and 29 CFR 1926.403 unless otherwise indicated. Do not install at flush-mounted panelboards and similar equipment in finished spaces.
- H. Instructional Signs: Self-adhesive labels, including color code for grounded and ungrounded conductors.
- I. Warning Labels for Indoor Cabinets, Boxes, and Enclosures for Power and Lighting: Self-adhesive labels.
  - 1. Apply to exterior of door, cover, or other access.
  - 2. For equipment with multiple power or control sources, apply to door or cover of equipment, including, but not limited to, the following:
    - a. Power-transfer switches.
- J. Arc Flash Warning Labeling: Self-adhesive labels.
- K. Operating Instruction Signs: Self-adhesive labels.
- L. Emergency Operating Instruction Signs: Self-adhesive labels with white legend on red background with minimum 3/8 inch high letters for emergency instructions at equipment used for power transfer.
- M. Equipment Identification Labels:
  - 1. Indoor Equipment: Laminated acrylic or melamine plastic sign.

2. Outdoor Equipment: Laminated acrylic or melamine sign.
3. Equipment to Be Labeled:
  - a. Panelboards:
    - 1) Typewritten directory of circuits in location provided by panelboard manufacturer.
    - 2) Panelboard identification must be in form of engraved, laminated acrylic or melamine label.
      - a) Line 1 – Panelboard equipment tag
      - b) Line 2 – Amp rating, voltage, 1 or 3 phase, 3 or 4 wire
      - c) Line 3 – Source panelboard is fed from
  - b. Enclosures and electrical cabinets.
    - 1) Identification must be in form of engraved, laminated acrylic or melamine label.
      - a) Line 1 – Equipment tag
  - c. Transformers: Label that includes tag designation indicated on Drawings for transformer, feeder, and panelboards or equipment supplied by secondary.
    - 1) Identification must be in form of engraved, laminated acrylic or melamine label.
      - a) Line 1 – Transformer equipment tag
      - b) Line 2 – kVA rating, primary voltage, secondary voltage, 1 or 3 phase
      - c) Line 3 - Source feeding transformer
  - d. Enclosed switches.
    - 1) Identification must be in form of engraved, laminated acrylic or melamine label.
      - a) Line 1 – Equipment tag
  - e. Enclosed controllers.
    - 1) Identification must be in form of engraved, laminated acrylic or melamine label.
      - a) Line 1 – Equipment tag
  - f. Power-transfer equipment.
    - 1) Identification must be in form of engraved, laminated acrylic or melamine label.
      - a) Line 1 – Equipment tag
      - b) Line 2 – Amp rating, voltage, number of poles, 3 or 4 wire
      - c) Line 3 – Source that the equipment is fed from
      - d) Line 4 – Available fault current and the date it was calculated
      - e) Line 5 – Equipment short circuit rating as installed.
  - g. Contactors.
    - 1) Identification must be in form of engraved, laminated acrylic or melamine label.
      - a) Line 1 – Equipment tag
      - b) Line 2 – Motor HP
  - h. Monitoring and control equipment.
    - 1) Main identification must be in form of engraved, laminated acrylic or melamine label.
      - a) Line 1 – Equipment tag

- 2) Individual device identification must be in form of engraved, laminated acrylic or melamine label.
  - a) Line 1 – Equipment tag of associated device

END OF SECTION 260553

## SECTION 260573.13 - SHORT-CIRCUIT STUDIES

## PART 1 - GENERAL

## 1.1 SUMMARY

## A. Section Includes:

1. Computer-based, fault-current study to determine minimum interrupting capacity of circuit protective devices.

## B. Related Requirements:

1. Section 260010 "Supplemental Requirements for Electrical" for additional abbreviations, definitions, submittals, qualifications, testing agencies, and other Project requirements applicable to Work specified in this Section.
2. Section 260011 "Facility Performance Requirements for Electrical" for field conditions applicable to Work specified in this Section.
3. Section 260573.16 "Coordination Studies" for overcurrent protective device coordination studies.
4. Section 260573.19 "Arc-Flash Hazard Analysis" for arc-flash studies.

## 1.2 DEFINITIONS

- A. Existing to Remain: Existing items of construction that are not to be removed and that are not otherwise indicated to be removed and salvaged, or removed and reinstalled. Existing to remain items must remain functional throughout construction period.
- B. One-Line Diagram: A diagram that shows, by means of single lines and graphic symbols, the course of an electric circuit or system of circuits and the component devices or parts used therein.
- C. Protective Device: A device that senses when an abnormal current flow exists and then removes the affected portion of the circuit from the system.
- D. SCCR: Short-circuit current rating.
- E. Service: The conductors and equipment for delivering electric energy from the serving utility to the wiring system of the premises served.
- F. Single-Line Diagram: See "One-Line Diagram."

### 1.3 ACTION SUBMITTALS

#### A. Product Data:

1. For power system analysis software to be used for studies.

#### B. Short-Circuit Study Report:

1. Submit the following after approval of system protective devices submittals. Submittals maybe in digital form.
  - a. Short-circuit study input data, including completed computer program input data sheets.
  - b. Revised one-line diagram, reflecting field investigation results and results of short-circuit study.
2. Submit electronic native file of model used for analysis. Include the library or any other files required to open the model.
3. The report must be submitted to the engineer of record for review.
4. The report must be signed and sealed by a profession engineer licensed in the state of Virginia.

### 1.4 INFORMATIONAL SUBMITTALS

- A. Product Certificates: For short-circuit study software, certifying compliance with IEEE 399.

### 1.5 QUALIFICATIONS

- A. Electrical Professional Engineer: Professional engineer possessing active professional engineer's license in the state of Virginia with expertise in electrical engineering, including electrical power system modeling and analysis of electrical safety in accordance with NFPA 70E.

### 1.6 QUALITY ASSURANCE

- A. Study must be performed using commercially developed and distributed software designed specifically for power system analysis.
- B. Software algorithms must comply with requirements of standards and guides specified in this Section.
- C. Manual calculations are unacceptable.

## PART 2 - PRODUCTS

## 2.1 POWER SYSTEM ANALYSIS SOFTWARE

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
  - 1. ETAP - Digital Twin Platform.
  - 2. SKM Systems Analysis, Inc.
- B. Comply with IEEE 399 and IEEE 551.
- C. Analytical features of power systems analysis software program must have capability to calculate "mandatory," "very desirable," and "desirable" features as listed in IEEE 399.
- D. Computer software program must be capable of plotting and diagramming time-current-characteristic curves as part of its output.
- E. Computer program must be designed to perform short-circuit studies or have function, component, or add-on module designed to perform short-circuit studies.
- F. Computer program must be developed under supervision of licensed professional engineer who holds IEEE Computer Society's Certified Software Development Professional certification.

## 2.2 SHORT-CIRCUIT STUDY REPORT CONTENTS

- A. Executive summary of study findings.
- B. Study descriptions, purpose, basis, and scope. Include case descriptions, definition of terms, and guide for interpretation of results.
- C. One-line diagram of modeled power system, showing the following:
  - 1. Protective device designations and ampere ratings.
  - 2. Conductor types, sizes, and lengths.
  - 3. Transformer kVA and voltage ratings.
  - 4. Motor and generator designations and kVA ratings.
  - 5. Switchgear, switchboard, motor-control center, and panelboard designations and ratings.
  - 6. Derating factors and environmental conditions.
  - 7. Any revisions to electrical equipment required by study.
- D. Protective Device Evaluation:
  - 1. Evaluate equipment and protective devices and compare to available short-circuit currents. Verify that equipment withstand ratings exceed available short-circuit current at equipment installation locations.

2. Tabulations of circuit breaker, fuse, and other protective device ratings versus calculated short-circuit duties.
3. For 600 V overcurrent protective devices, ensure that interrupting ratings are equal to or higher than calculated 1/2-cycle symmetrical fault current.
4. For devices and equipment rated for asymmetrical fault current, apply multiplication factors listed in standards to 1/2-cycle symmetrical fault current.
5. Verify adequacy of phase conductors at maximum three-phase bolted fault currents; verify adequacy of equipment grounding conductors and grounding electrode conductors at maximum ground-fault currents. Ensure that short-circuit withstand ratings are equal to or higher than calculated 1/2-cycle symmetrical fault current.

E. Short-Circuit Study Input Data:

1. One-line diagram of system being studied.
2. Power sources available.
3. Manufacturer, model, and interrupting rating of protective devices.
4. Conductors.
5. Transformer data.

F. Short-Circuit Study Output Reports:

1. Low-Voltage Fault Report: Three-phase and unbalanced fault calculations, showing the following for each overcurrent device location:
  - a. Voltage.
  - b. Calculated fault-current magnitude and angle.
  - c. Fault-point X/R ratio.
  - d. Equivalent impedance.
2. Momentary Duty Report: Three-phase and unbalanced fault calculations, showing the following for each overcurrent device location:
  - a. Voltage.
  - b. Calculated symmetrical fault-current magnitude and angle.
  - c. Fault-point X/R ratio.
  - d. Calculated asymmetrical fault currents:
    - 1) Based on fault-point X/R ratio.
    - 2) Based on calculated symmetrical value multiplied by 1.6.
    - 3) Based on calculated symmetrical value multiplied by 2.7.
3. Interrupting Duty Report: Three-phase and unbalanced fault calculations, showing the following for each overcurrent device location:
  - a. Voltage.
  - b. Calculated symmetrical fault-current magnitude and angle.
  - c. Fault-point X/R ratio.
  - d. No AC Decrement (NACD) ratio.



- e. Equivalent impedance.
- f. Multiplying factors for 2-, 3-, 5-, and 8-cycle circuit breakers rated on symmetrical basis.
- g. Multiplying factors for 2-, 3-, 5-, and 8-cycle circuit breakers rated on total basis.

## PART 3 - EXECUTION

### 3.1 POWER SYSTEM DATA

- A. Obtain data necessary for conduct of study.
  - 1. Verify completeness of data supplied on one-line diagram. Call discrepancies to Engineer's attention.
  - 2. For equipment included as Work of this Project, use characteristics submitted under provisions of action submittals and information submittals for this Project.
  - 3. For equipment that is existing to remain, obtain required electrical distribution system data by field investigation and surveys, conducted by qualified technicians and engineers in accordance with NFPA 70E.
- B. Gather and tabulate required input data to support short-circuit study. Comply with requirements in Section 017839 "Project Record Documents" for recording circuit protective device characteristics. Record data on Record Document copy of one-line diagram. Comply with recommendations in IEEE 551 as to amount of detail that is required to be acquired in field. Field data gathering must be by, or under supervision of, qualified electrical professional engineer. Data include, but are not limited to, the following:
  - 1. Product Data for Project's overcurrent protective devices involved in overcurrent protective device coordination studies. Use equipment designation tags that are consistent with electrical distribution system diagrams, overcurrent protective device submittals, input and output data, and recommended device settings.
  - 2. Obtain electrical power utility impedance at service.
  - 3. Power sources and ties.
  - 4. For transformers, include kVA, primary and secondary voltages, connection type, impedance, X/R ratio, taps measured in percent, and phase shift.
  - 5. For circuit breakers and fuses, provide manufacturer and model designation. List type of breaker, type of trip, SCCR, current rating, and breaker settings.
  - 6. Generator short-circuit current contribution data, including short-circuit reactance, rated kVA, rated voltage, and X/R ratio.
  - 7. Motor horsepower and NEMA MG 1 code letter designation.
  - 8. Conductor sizes, lengths, number, conductor material and conduit material (magnetic or nonmagnetic).
  - 9. Derating factors.

### 3.2 SHORT-CIRCUIT STUDY

- A. Perform study following general study procedures contained in IEEE 399.
- B. Calculate short-circuit currents according to IEEE 551.
- C. Base study on device characteristics supplied by device manufacturer.
- D. Begin short-circuit current analysis at service, extending down to system overcurrent protective devices as follows:
  - 1. To normal system low-voltage load buses where fault current is 5 kA or less.
  - 2. Exclude equipment supplied by single transformer smaller than 30 kVA.
- E. Study electrical distribution system from normal and alternate power sources throughout electrical distribution system for Project. Study cases of system-switching configurations and alternate operations that could result in maximum fault conditions.
- F. Include ac fault-current decay from induction motors, synchronous motors, and asynchronous generators and apply to low- and medium-voltage, three-phase ac systems. Also account for fault-current dc decrement to address asymmetrical requirements of interrupting equipment.
- G. Calculate short-circuit momentary and interrupting duties for three-phase bolted fault and single line-to-ground fault at each equipment indicated on one-line diagram.
  - 1. For grounded systems, provide bolted line-to-ground fault-current study for areas as defined for three-phase bolted fault short-circuit study.
- H. Include in report identification of protective device applied outside its capacity.

END OF SECTION 260573.13

## SECTION 260573.16 - COORDINATION STUDIES

## PART 1 - GENERAL

## 1.1 SUMMARY

## A. Section Includes:

1. Computer-based, overcurrent protective device coordination studies to determine overcurrent protective devices and to determine overcurrent protective device settings for selective tripping.
  - a. Series-rated devices are not permitted.
2. Begin coordination study at the main incoming service and extend downstream to all panelboards, disconnect switches, and overcurrent protective devices. The study includes all new and existing equipment located in the Water Treatment Facility and remote Garage.

## B. Related Requirements:

1. Section 260010 "Supplemental Requirements for Electrical" for additional abbreviations, definitions, submittals, qualifications, testing agencies, and other Project requirements applicable to Work specified in this Section.
2. Section 260011 "Facility Performance Requirements for Electrical" for field conditions applicable to Work specified in this Section.
3. Section 260573.13 "Short-Circuit Studies" for fault-current studies.
4. Section 260573.19 "Arc-Flash Hazard Analysis" for arc-flash studies.

## 1.2 DEFINITIONS

- A. Existing to Remain: Existing items of construction that are not to be removed and that are not otherwise indicated to be removed, removed and salvaged, or removed and reinstalled. Existing to remain items must remain functional throughout construction period.
- B. One-Line Diagram: A diagram that shows, by means of single lines and graphic symbols, the course of electric circuit or system of circuits and the component devices or parts used therein.
- C. Protective Device: A device that senses when abnormal current flow exists and then removes the affected portion of the circuit from the system.
- D. SCCR: Short-circuit current rating.

- E. Service: The conductors and equipment for delivering electric energy from the serving utility to the wiring system of the premises served.
- F. Single-Line Diagram: See "One-Line Diagram."

### 1.3 ACTION SUBMITTALS

#### A. Product Data:

- 1. For power system analysis software to be used for studies.

#### B. Coordination Study Report:

- 1. Submit the following after approval of system protective devices submittals. Submittals may be in digital form.
  - a. Coordination-study input data, including completed computer program input data sheets.
  - b. Study and equipment evaluation reports.
  - c. Revised one-line diagram, reflecting field investigation results and results of coordination study.
- 2. Submit electronic native file of model used for analysis. Include the library or any other files required to open the model.
- 3. The report must be signed and sealed by a professional engineer licensed in the state of Virginia.

### 1.4 INFORMATIONAL SUBMITTALS

- A. Product Certificates: For overcurrent protective device coordination study software, certifying compliance with IEEE 399.

### 1.5 QUALITY ASSURANCE

- A. Studies must be performed using commercially developed and distributed software designed specifically for power system analysis.
- B. Software algorithms must comply with requirements of standards and guides specified in this Section.
- C. Manual calculations are unacceptable.

## PART 2 - PRODUCTS

## 2.1 POWER SYSTEM ANALYSIS SOFTWARE

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. ETAP - Digital Twin Platform.
  2. SKM Systems Analysis, Inc.
- B. Comply with IEEE 242 and IEEE 399.
- C. Analytical features of device coordination study computer software program must have capability to calculate "mandatory," "very desirable," and "desirable" features as listed in IEEE 399.
- D. Computer software program must be capable of plotting and diagramming time-current-characteristic curves as part of its output. Computer software program must report device settings and ratings of overcurrent protective devices and must demonstrate selective coordination by computer-generated, time-current coordination plots.
1. Optional Features:
    - a. Arcing faults.
    - b. Simultaneous faults.
    - c. Explicit negative sequence.
    - d. Mutual coupling in zero sequence.
- E. Computer program must be designed to perform coordination studies or have function, component, or add-on module designed to perform coordination studies.
- F. Computer program must be developed under supervision of licensed professional engineer who holds IEEE Computer Society's Certified Software Development Professional certification.

## 2.2 COORDINATION STUDY REPORT CONTENTS

- A. Executive summary of study findings.
- B. Study descriptions, purpose, basis, and scope. Include case descriptions, definition of terms, and guide for interpretation of results.
- C. One-line diagram of modeled power system, showing the following:
1. Protective device designations and ampere ratings.
  2. Conductor types, sizes, and lengths.
  3. Transformer kVA and voltage ratings.

4. Motor and generator designations and kVA ratings.
5. Switchgear, switchboard, motor-control center, and panelboard designations.
6. Revisions to electrical equipment required by study.
7. Study Input Data: As described in "Power System Data" Article.
  - a. Short-Circuit Study Output: As specified in "Short-Circuit Study Output Reports" Paragraph in "Short-Circuit Study Report Contents" Article in Section 260573.13 "Short-Circuit Studies."

D. Protective Device Coordination Study:

1. Report recommended settings of protective devices, ready to be applied in field. Use manufacturer's data sheets for recording recommended setting of overcurrent protective devices when available.
  - a. Phase and Ground Relays:
    - 1) Device tag.
    - 2) Relay current transformer ratio and tap, time dial, and instantaneous pickup value.
    - 3) Recommendations on improved relaying systems, if applicable.
  - b. Circuit Breakers:
    - 1) Adjustable pickups and time delays (long time, short time, and ground).
    - 2) Adjustable time-current characteristic.
    - 3) Adjustable instantaneous pickup.
    - 4) Recommendations on improved trip systems, if applicable.
  - c. Fuses: Show current rating, voltage, and class.

E. Time-Current Coordination Curves: Determine settings of overcurrent protective devices to achieve selective coordination to the greatest extent possible for non-emergency system. Emergency systems, as defined by NEC Article 700, must achieve selective coordination as required by NEC Article 700. Graphically illustrate that adequate time separation exists between devices installed in series, including power utility company's upstream devices. Prepare separate sets of curves for switching schemes and for emergency periods where power source is local generation. Show the following information:

1. Device tag and title, one-line diagram with legend identifying portion of system covered.
2. Terminate device characteristic curves at point reflecting maximum symmetrical or asymmetrical fault current to which device is exposed.
3. Identify device associated with each curve by manufacturer type, function, and, if applicable, tap, time delay, and instantaneous settings recommended.
4. Plot the following listed characteristic curves, as applicable:
  - a. Power utility's overcurrent protective device.
  - b. Medium-voltage equipment overcurrent relays.

- c. Medium- and low-voltage fuses including manufacturer's minimum melt, total clearing, tolerance, and damage bands.
  - d. Low-voltage equipment circuit-breaker trip devices, including manufacturer's tolerance bands.
  - e. Transformer full-load current, magnetizing inrush current, and ANSI through-fault protection curves.
  - f. Cables and conductors damage curves.
  - g. Ground-fault protective devices.
  - h. Motor-starting characteristics and motor damage points.
  - i. Generator short-circuit decrement curve and generator damage point.
  - j. Largest feeder circuit breaker in each motor-control center and panelboard.
- 5. Maintain selectivity for tripping currents caused by overloads.
  - 6. Provide adequate time margins between device characteristics such that selective operation is achieved.

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. Examine Project overcurrent protective device submittals for compliance with electrical distribution system coordination requirements and other conditions affecting performance of the Work. Devices to be coordinated are indicated on Drawings.
  - 1. Proceed with coordination study only after relevant equipment submittals have been assembled. Overcurrent protective devices that have not been submitted and approved prior to coordination study may not be used in study.

#### 3.2 POWER SYSTEM DATA

- A. Obtain data necessary for conduct of overcurrent protective device study.
  - 1. Verify completeness of data supplied in one-line diagram on Drawings. Call discrepancies to Engineer's attention.
  - 2. For equipment included as Work of this Project, use characteristics submitted under provisions of action submittals and information submittals for this Project.
  - 3. For equipment that is existing to remain, obtain required electrical distribution system data by field investigation and surveys, conducted by qualified technicians and engineers. Qualifications of technicians and engineers must be in accordance with NFPA 70E.
- B. Gather and tabulate required input data to support coordination study. List below is guide. Comply with recommendations in IEEE 551 for amount of detail required to be acquired in field. Field data gathering must be by, or under supervision of, qualified electrical professional engineer. Data include, but are not limited to, the following:

1. Product Data for overcurrent protective devices specified in other Sections and involved in overcurrent protective device coordination studies. Use equipment designation tags that are consistent with electrical distribution system diagrams, overcurrent protective device submittals, input and output data, and recommended device settings.
2. Electrical power utility impedance at service.
3. Power sources and ties.
4. Short-circuit current at each system bus (three phase and line to ground).
5. Full-load current of loads.
6. Voltage level at each bus.
7. For transformers, include kVA, primary and secondary voltages, connection type, impedance, X/R ratio, taps measured in percent, and phase shift.
8. For circuit breakers and fuses, provide manufacturer and model designation. List type of breaker, type of trip and available range of settings, SCCR, current rating, and breaker settings.
9. Generator short-circuit current contribution data, including short-circuit reactance, rated kVA, rated voltage, and X/R ratio.
10. For relays, provide manufacturer and model designation, current transformer ratios, potential transformer ratios, and relay settings.
11. Motor horsepower and NEMA MG 1 code letter designation.
12. Low-voltage cable sizes, lengths, number, conductor material, and conduit material (magnetic or nonmagnetic).
13. Data sheets to supplement electrical distribution system one-line diagram, cross-referenced with tag numbers on diagram, showing the following:
  - a. Special load considerations, including starting inrush currents and frequent starting and stopping.
  - b. Transformer characteristics, including primary protective device, magnetic inrush current, and overload capability.
  - c. Motor full-load current, locked rotor current, service factor, starting time, type of start, and thermal-damage curve.
  - d. Generator thermal-damage curve.
  - e. Ratings, types, and settings of utility company's overcurrent protective devices.
  - f. Special overcurrent protective device settings or types stipulated by utility company.
  - g. Time-current-characteristic curves of devices indicated to be coordinated.
  - h. Manufacturer, frame size, interrupting rating in amperes root mean square (rms) symmetrical, ampere or current sensor rating, long-time adjustment range, short-time adjustment range, and instantaneous adjustment range for circuit breakers.
  - i. Manufacturer and type, ampere-tap adjustment range, time-delay adjustment range, instantaneous attachment adjustment range, and current transformer ratio for overcurrent relays.
  - j. Switchgear, switchboards, motor-control centers, and panelboards ampacity, and SCCR in amperes rms symmetrical.



### 3.3 COORDINATION STUDY

- A. Comply with IEEE 242 for calculating short-circuit currents and determining coordination time intervals.
- B. Comply with IEEE 399 for general study procedures.
- C. Base study on device characteristics supplied by device manufacturer.
- D. Begin analysis at service, extending down to system overcurrent protective devices as follows:
  - 1. To normal system low-voltage load buses where fault current is 5 kA or less.
  - 2. Exclude equipment supplied by single transformer smaller than 30 kVA.
  - 3. Include existing panelboards.
- E. Perform site survey to identify full extents of coordination study. The study must include existing panelboards, disconnect switches, and overcurrent protective devices. Trace out the existing system to determine connection of existing equipment.
- F. Study electrical distribution system from normal and alternate power sources throughout electrical distribution system for Project. Study cases of system-switching configurations and alternate operations that could result in maximum fault conditions.
- G. Transformer Primary Overcurrent Protective Devices:
  - 1. Device must not operate in response to the following:
    - a. Inrush current when first energized.
    - b. Self-cooled, full-load current or forced-air-cooled, full-load current, whichever is specified for that transformer.
    - c. Permissible transformer overloads according to IEEE C57.96 if required by unusual loading or emergency conditions.
  - 2. Device settings must protect transformers according to IEEE C57.12.00, for fault currents.
- H. Motor Protection:
  - 1. Select protection for low-voltage motors according to IEEE 242 and NFPA 70.
- I. Conductor Protection: Protect cables against damage from fault currents according to ICEA P-32-382, ICEA P-45-482, and protection recommendations in IEEE 242. Demonstrate that equipment withstands maximum short-circuit current for time equivalent to tripping time of primary relay protection or total clearing time of fuse. To determine temperatures that damage insulation, use curves from cable manufacturers or from listed standards indicating conductor size and short-circuit current.

- J. Generator Protection: Select protection according to manufacturer's instructions and to IEEE 242.
- K. Include ac fault-current decay from induction motors, synchronous motors, and asynchronous generators and apply to low- and medium-voltage, three-phase ac systems. Also account for fault-current dc decrement, to address asymmetrical requirements of interrupting equipment.
- L. Calculate short-circuit momentary and interrupting duties for three-phase bolted fault and single line-to-ground fault at each equipment indicated on one-line diagram.
  - 1. For grounded systems, provide bolted line-to-ground fault-current study for areas as defined for three-phase bolted fault short-circuit study.
- M. Protective Device Evaluation:
  - 1. Evaluate equipment and protective devices and compare to short-circuit ratings.
  - 2. Adequacy of switchgear, motor-control centers, and panelboard bus bars to withstand short-circuit stresses.
  - 3. Include in report identification of protective device applied outside its capacity.

### 3.4 FIELD ADJUSTING

- A. Adjust relay and protective device settings according to recommended settings provided by coordination study. Field adjustments must be completed by engineering service division of equipment manufacturer under "Startup and Acceptance Testing" contract portion.
- B. Make minor modifications to equipment as required to accomplish compliance with short-circuit and protective device coordination studies.
- C. Testing and adjusting must be by qualified low-voltage electrical testing and inspecting agency.
  - 1. Perform each visual and mechanical inspection and electrical test stated in NETA ATS. Certify compliance with test parameters. Perform NETA tests and inspections for adjustable overcurrent protective devices.

END OF SECTION 260573.16

## SECTION 260573.19 - ARC-FLASH HAZARD ANALYSIS

## PART 1 - GENERAL

## 1.1 SUMMARY

## A. Section Includes:

1. Computer-based, arc-flash study to determine arc-flash hazard distance and incident energy to which personnel could be exposed during work on or near electrical equipment.
2. Perform arc-flash hazard analysis on new and existing equipment.

## B. Related Requirements:

1. Section 260010 "Supplemental Requirements for Electrical" for additional abbreviations, definitions, submittals, qualifications, testing agencies, and other Project requirements applicable to Work specified in this Section.
2. Section 260011 "Facility Performance Requirements for Electrical" for field conditions applicable to Work specified in this Section.
3. Section 260573.13 "Short-Circuit Studies" for fault-current studies.
4. Section 260573.16 "Coordination Studies" for overcurrent protective device coordination studies.

## 1.2 DEFINITIONS

- A. Existing to Remain: Existing items of construction that are not to be removed and that are not otherwise indicated to be removed, removed and salvaged, or removed and reinstalled.
- B. One-Line Diagram: A diagram that shows, by means of single lines and graphic symbols, the course of an electric circuit or system of circuits and the component devices or parts used therein.
- C. Protective Device: A device that senses when an abnormal current flow exists and then removes the affected portion from the system.
- D. p.u.: Per unit. The reference unit, established as a calculating convenience, for expressing all power system electrical parameters on a common reference base.
- E. SCCR: Short-circuit current rating.
- F. Service: The conductors and equipment for delivering electric energy from the serving utility to the wiring system of the premises served.
- G. Single-Line Diagram: See "One-Line Diagram."

### 1.3 ACTION SUBMITTALS

#### A. Product Data:

1. For power system analysis software to be used for studies.

#### B. Study Submittals:

1. Submit the following after approval of system protective devices submittals. Submittals may be in digital form:
  - a. Arc-flash study input data, including completed computer program input data sheets.
  - b. Revised one-line diagram, reflecting field investigation results and results of arc-flash study.
2. Submit electronic native file of model used for analysis. Include the library or any other files required to open the model.

### 1.4 INFORMATIONAL SUBMITTALS

- A. Product Certificates: For arc-flash hazard analysis software, certifying compliance with IEEE 1584 and NFPA 70E.

### 1.5 QUALITY ASSURANCE

- A. Study must be performed using commercially developed and distributed software designed specifically for power system analysis.
- B. Software algorithms must comply with requirements of standards and guides specified in this Section.
- C. Manual calculations are unacceptable.

## PART 2 - PRODUCTS

### 2.1 COMPUTER SOFTWARE

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  1. ETAP - Digital Twin Platform.
  2. SKM Systems Analysis, Inc.
- B. Comply with IEEE 1584 and NFPA 70E.

- C. Analytical features of device coordination study computer software program must have capability to calculate "mandatory," "very desirable," and "desirable" features as listed in IEEE 399.
- D. Computer program must be designed to perform arc-flash analysis or have function, component, or add-on module designed to perform arc-flash analysis.
- E. Computer program must be developed under supervision of licensed professional engineer who holds IEEE Computer Society's Certified Software Development Professional certification.

## 2.2 ARC-FLASH STUDY REPORT CONTENT

- A. Executive summary of study findings.
- B. Study descriptions, purpose, basis, and scope. Include case descriptions, definition of terms, and guide for interpretation of results.
- C. One-line diagram, showing the following:
  - 1. Protective device designations and ampere ratings.
  - 2. Conductor types, sizes, and lengths.
  - 3. Transformer kVA and voltage ratings, including derating factors and environmental conditions.
  - 4. Motor and generator designations and kVA ratings.
  - 5. Switchgear, switchboard, motor-control center, panelboard designations, and ratings.
- D. Study Input Data: As described in "Power System Data" Article.
- E. Short-Circuit Study Output Data: As specified in "Short-Circuit Study Output Reports" Paragraph in "Short-Circuit Study Report Contents" Article in Section 260573.13 "Short-Circuit Studies."
- F. Protective Device Coordination Study Report Contents: As specified in "Coordination Study Report Contents" Article in Section 260573.16 "Coordination Studies."
- G. Arc-Flash Study Output Reports:
  - 1. Interrupting Duty Report: Three-phase and unbalanced fault calculations, showing the following for each equipment location included in report:
    - a. Voltage.
    - b. Calculated symmetrical fault-current magnitude and angle.
    - c. Fault-point X/R ratio.
    - d. No AC Decrement (NACD) ratio.
    - e. Equivalent impedance.
    - f. Multiplying factors for 2-, 3-, 5-, and 8-cycle circuit breakers rated on symmetrical basis.

g. Multiplying factors for 2-, 3-, 5-, and 8-cycle circuit breakers rated on total basis.

H. Incident Energy and Flash Protection Boundary Calculations:

1. Arcing fault magnitude.
2. Protective device clearing time.
3. Duration of arc.
4. Arc-flash boundary.
5. Restricted approach boundary.
6. Limited approach boundary.
7. Working distance.
8. Incident energy.
9. Hazard risk category.
10. Recommendations for arc-flash energy reduction.

I. Fault study input data, case descriptions, and fault-current calculations including definition of terms and guide for interpretation of computer printout.

## 2.3 ARC-FLASH WARNING LABELS

A. Comply with requirements in Section 260553 "Identification for Electrical Systems" for self-adhesive equipment labels. Produce 3.5 by 5 inch self-adhesive equipment label for each work location included in analysis.

B. Label must have orange header with wording, "WARNING, ARC-FLASH HAZARD," and must include the following information taken directly from arc-flash hazard analysis:

1. Device.
2. Shock hazard voltage.
3. Protection boundaries.
  - a. Arc-flash boundary.
  - b. Restricted approach boundary.
  - c. Limited approach boundary.
4. PPE Requirements.
5. Available incident energy.
6. Flash hazard distance.
7. Glove Class.
8. Issue date.

C. Labels must be machine printed, with no field-applied markings.

## PART 3 - EXECUTION

## 3.1 EXAMINATION

- A. Examine Project overcurrent protective device submittals. Proceed with arc-flash study only after relevant equipment submittals have been assembled. Overcurrent protective devices that have not been submitted and approved prior to arc-flash study may not be used in study.

## 3.2 ARC-FLASH HAZARD ANALYSIS

- A. Comply with NFPA 70E and its Annex D for hazard analysis study.
- B. Preparatory Studies: Perform Short-Circuit and Protective Device Coordination studies prior to starting Arc-Flash Hazard Analysis.
  - 1. Short-Circuit Study Output: As specified in "Short-Circuit Study Output Reports" Paragraph in "Short-Circuit Study Report Contents" Article in Section 260573.13 "Short-Circuit Studies."
  - 2. Coordination Study Report Contents: As specified in "Coordination Study Report Contents" Article in Section 260573.16 "Coordination Studies."
- C. Calculate maximum and minimum contributions of fault-current size.
  - 1. Maximum calculation must assume maximum contribution from utility and must assume motors to be operating under full-load conditions.
  - 2. Calculate arc-flash energy at 85 percent of maximum short-circuit current in accordance with IEEE 1584 recommendations.
  - 3. Calculate arc-flash energy at 38 percent of maximum short-circuit current in accordance with NFPA 70E recommendations.
  - 4. Calculate arc-flash energy with utility contribution at minimum and assume no motor contribution.
  - 5. Calculate arc-flash energy of system with available short-circuit current
- D. Calculate arc-flash protection boundary and incident energy at locations in electrical distribution system where personnel could perform work on energized parts.
- E. Include medium- and low-voltage equipment locations, except equipment fed from transformers smaller than 30 kVA.
- F. Include existing equipment.
- G. Calculate limited, restricted, and prohibited approach boundaries for each location.
- H. Incident energy calculations must consider accumulation of energy over time when performing arc-flash calculations on buses with multiple sources. Iterative calculations must take into

account changing current contributions, as sources are interrupted or decremented with time. Fault contribution from motors and generators must be decremented as follows:

1. Fault contribution from induction motors must not be considered beyond three to five cycles.
  2. Fault contribution from synchronous motors and generators must be decayed to match actual decrement of each as closely as possible (for example, contributions from permanent magnet generators will typically decay from 10 p.u. to 3 p.u. after 10 cycles).
- I. Arc-flash energy must generally be reported for maximum of line or load side of circuit breaker. However, arc-flash computation must be performed and reported for both line and load side of circuit breaker as follows:
1. When circuit breaker is in separate enclosure.
  2. When line terminals of circuit breaker are separate from work location.
- J. Base arc-flash calculations on actual overcurrent protective device clearing time. Cap maximum clearing time at two seconds based on IEEE 1584, Section B.1.2.

### 3.3 POWER SYSTEM DATA

- A. Obtain data necessary for conduct of arc-flash hazard analysis.
1. Verify completeness of data supplied on one-line diagram on Drawings and under “Preparatory Studies” Paragraph in “Arc-Flash Hazard Analysis” Article. Call discrepancies to Engineer’s attention.
  2. For new equipment, use characteristics from approved submittals under provisions of action submittals and information submittals for this Project.
  3. For existing equipment, whether or not relocated, obtain required electrical distribution system data by field investigation and surveys conducted by qualified technicians and engineers.
- B. Electrical Survey Data: Gather and tabulate the following input data to support study. Comply with recommendations in IEEE 1584 and NFPA 70E as to amount of detail that is required to be acquired in field. Field data gathering must be under direct supervision and control of engineer in charge of performing study, and must be by, or under supervision of, qualified electrical professional engineer. Data include, but are not limited to, the following:
1. Product Data for overcurrent protective devices specified in other Sections and involved in overcurrent protective device coordination studies. Use equipment designation tags that are consistent with electrical distribution system diagrams, overcurrent protective device submittals, input and output data, and recommended device settings.
  2. Obtain electrical power utility impedance or available short circuit current at service.
  3. Power sources and ties.
  4. Short-circuit current at each system bus (three phase and line to ground).
  5. Full-load current of loads.
  6. Voltage level at each bus.



7. For transformers, include kVA, primary and secondary voltages, connection type, impedance, X/R ratio, taps measured in percent, and phase shift.
8. For circuit breakers and fuses, provide manufacturer and model designation. List type of breaker, type of trip and available range of settings, SCCR, current rating, and breaker settings.
9. Generator short-circuit current contribution data, including short-circuit reactance, rated kVA, rated voltage, and X/R ratio.
10. For relays, provide manufacturer and model designation, current transformer ratios, potential transformer ratios, and relay settings.
11. Motor horsepower and NEMA MG 1 code letter designation.
12. Low-voltage conductor sizes, lengths, number, conductor material and conduit material (magnetic or nonmagnetic).

### 3.4 LABELING

- A. Apply one arc-flash label on front cover and on side or rear covers with accessible live parts and hinged doors or removable plates for each equipment included in study. Base arc-flash label data on highest values calculated at each location.
- B. Each piece of new or existing equipment listed below must have arc-flash label applied to it:
  1. Panelboards.
  2. Low voltage transformers.
  3. Safety switches.
  4. Disconnect switches.
  5. Motor Starters.
  6. Automatic Transfer Switches.

### 3.5 APPLICATION OF WARNING LABELS

- A. Install arc-flash warning labels under direct supervision and control of qualified electrical professional engineer.

END OF SECTION 260573.19

## SECTION 260913 - ELECTRICAL POWER MONITORING

## PART 1 - GENERAL

## 1.1 SUMMARY

## A. Section Includes:

1. Power meters.
2. System operator interfaces.
3. Raceways and boxes.
4. Wires and cables.

## B. Related Requirements:

1. Section 260010 "Supplemental Requirements for Electrical" for additional abbreviations, definitions, submittals, qualifications, testing agencies, and other Project requirements applicable to Work specified in this Section.
2. Section 260011 "Facility Performance Requirements for Electrical" for field conditions applicable to Work specified in this Section.
3. Section 406343 "Programmable Logic Controllers (PLC)".

## 1.2 DEFINITIONS

- A. Active Power: The average power consumed by a unit. Also known as "real power."
- B. Analog: A continuously varying signal value, such as current, flow, pressure, or temperature.
- C. Apparent (Phasor) Power: " $S = VI$ " where "S" is the apparent power, "V" is the RMS value of the voltage, and "I" is the RMS value of the current.
- D. Firmware: Software (programs or data) that has been written onto read-only memory (ROM). Firmware is a combination of software and hardware. Storage media with ROMs that have data or programs recorded on them are firmware.
- E. KY Pulse: A method of measuring consumption of electricity that is based on a relay operating like a SPST switch.
- F. KYZ Pulse: A method of measuring consumption of electricity based on a relay operating like a SPDT switch.
- G. L-G: Line to ground.
- H. L-L: Line to line.
- I. L-N: Line to neutral.

- J. MODBUS TCP/IP: An open protocol for exchange of process data.
- K. Monitoring: Acquisition, processing, communication, and display of equipment status data, metered electrical parameter values, power quality evaluation data, event and alarm signals, tabulated reports, and event logs.
- L. N-G: Neutral to ground.
- M. Power Factor: The ratio of active power to apparent power, sometimes expressed in percentage.

### 1.3 ACTION SUBMITTALS

- A. Product Data:
  - 1. Power meters.
  - 2. Network configuration software.
  - 3. Wires and cables.
- B. Shop Drawings: For power monitoring and control equipment.
  - 1. Include plans, elevations, sections, and attachment details.
  - 2. Include details of equipment assemblies. Indicate dimensions, method of field assembly, components, and location and size of each field connection.
    - a. Attach copies of approved Product Data submittals for products (such as switchboards, switchgear, and motor-control centers) that describe the following:
      - 1) Location of the meters and gateways, and routing of the connecting wiring.
      - 2) Details of power monitoring and control features to illustrate coordination among related equipment and power monitoring and control.
  - 3. Block Diagram: Show interconnections between components specified in this Section and devices furnished with power distribution system components. Indicate data communication paths and identify networks, data buses, data gateways, concentrators, and other devices to be used. Describe characteristics of network and other data communication lines.
  - 4. Include diagrams for power, signal, and control wiring. Coordinate nomenclature and presentation with a block diagram.
  - 5. Include interconnection requirements for connection to SCADA system. Identify cabling, termination points, communication protocols, etc. as required to facilitate transfer of the indicated inputs/outputs. Provide points list.

### 1.4 INFORMATIONAL SUBMITTALS

- A. Field quality-control reports.
- B. Design Data:

1. Manufacturer's system installation and setup guides, with data forms to plan and record options and setup decisions.
  - a. Project Record Drawings of as-built versions of submittal Shop Drawings provided in electronic PDF format on compact disk or portable storage device with a USB interface.
  - b. Testing and commissioning reports and checklists of completed final versions of reports, checklists, and trend logs.
  - c. As-built versions of submittal Product Data.
  - d. Names, addresses, e-mail addresses, and 24-hour telephone numbers of Installer and service representatives for the system and products.
  - e. Operator's manual with procedures for operating control systems including logging on and off, handling alarms, producing point reports, trending data, overriding computer control, and changing set points and variables.
  - f. Programming manuals with description of programming language and syntax, of statements for algorithms and calculations used, of point database creation and modification, of program creation and modification, and of editor use.
  - g. Engineering, installation, and maintenance manuals that explain how to do the following:
    - 1) Design and install new points, panels, and other hardware.
    - 2) Perform preventive maintenance and calibration.
    - 3) Debug hardware problems.
    - 4) Repair or replace hardware.
  - h. Documentation of programs created using custom programming language including set points, tuning parameters, and object database.
  - i. Backup copy of graphic files, programs, and database on compact disk or portable storage device with a USB interface.
  - j. Complete original-issue documentation, installation, and maintenance information for furnished third-party hardware including computer equipment and sensors.
  - k. Complete original-issue copies of furnished software, including operating systems, custom programming language, workstation software, and graphics software on compact disk or portable storage device with a USB interface.
  - l. Recommended preventive maintenance procedures for system components, including schedule of tasks such as inspection, cleaning, and calibration; time between tasks; and task descriptions.
  - m. Owner training materials.

## 1.5 COORDINATION

- A. Coordinate features of distribution equipment and power monitoring and control components to form an integrated interconnection of compatible components.
  1. Match components and interconnections for optimum performance of specified functions.

- B. Coordinate Work of this Section with those in Sections specifying distribution components that are monitored or controlled by power monitoring and control equipment.
- C. Coordinate Work of this Section with monitoring and control equipment.

## PART 2 - PRODUCTS

### 2.1 POWER METERS

- A. Description: Separately mounted, modular, permanently installed, solid-state, digital I/O instrument for power monitoring and control; complying with UL 61010-1.
  - 1. Capable of metering four-wire wye, three-wire wye, three-wire delta, and single-phase power systems.
  - 2. Equipped with security lock to protect revenue related metering from unauthorized and accidental changes.
- B. Comply with IEC 60529 degree of protection code of IP51 for the front of the meter, and code of IP30 for the body.
- C. Overvoltage: Comply with UL 61010-1 overvoltage withstand rating for CAT III.
- D. Accuracy:
  - 1. Comply with ANSI C12.20, Class 0.5.
  - 2. Neutral Current Measurement: Not more than 0.65 percent.
  - 3. Power: 0.6 percent.
  - 4. Power Factor: 0.5 percent.
  - 5. Active Energy: 0.6 percent.
  - 6. Reactive Energy: 2.5 percent.
  - 7. Frequency: 0.05 percent.
  - 8. THD: 1.0 percent.
  - 9. Waveform Sampling: 32 per cycle.
- E. Data Link:
  - 1. MODBUS TIA-485 RTU protocol, 2-wire connection.
    - a. Provide for firmware and software updates through the communications port.
- F. Meter Physical Characteristics:
  - 1. Display: Backlit LCD with antiglare and scratch-resistant lens.
  - 2. Display of Metered Values: One screen to show at least four lines of user-selected values on one screen at the same time. Provide graphical representation of user-selected values. The screen selections available at the display must include the following:

- a. Meters, including those listed under the following:
  - 1) Measurements.
  - 2) THD.
  - 3) Energy.
  - 4) Demand.
  - 5) Minimum and maximum values.
  - 6) Power demand.
- G. Sampling Rate: Continuously sample and record voltage and current at a rate not less than 32 samples per cycle, simultaneously on voltage and current channels of the meter.
- H. Meters:
  - 1. Measurements: Instantaneous, in real time, RMS to the 15th harmonic.
    - a. Voltage: L-L each phase, L-N each phase, and three-phase average.
    - b. Current: Each phase, three-phase average, and neutral.
    - c. Unbalanced current, L-L V(ac) and L-N V(ac).
    - d. Active Power (+/- kW): Each phase and three-phase total.
    - e. Reactive Power (+/- kVAR): Each phase and three-phase total.
    - f. Apparent Power (+/- kVA): Each phase and three-phase total.
    - g. Displacement Power Factor: Each phase and three-phase total.
    - h. Distortion Power Factor: Each phase and three-phase total.
    - i. Frequency.
  - 2. THD from measurements simultaneously from the same cycle, through 15th harmonic.
    - a. Voltage THD: L-L each phase, L-N each phase, and three-phase average.
    - b. Current THD: Each phase and three-phase average.
    - c. Total demand distortion.
  - 3. Energy: Accumulated, indicate whether in-flow or out-flow, net and absolute values. Store the values in instrument's nonvolatile memory.
    - a. Active kWh.
    - b. Reactive kVARh.
    - c. Apparent kVAh.
  - 4. Demand: Present, last, predicted, peak.
    - a. Three-phase average current.
    - b. Three-phase total active power (kW).
    - c. Reactive power (kVAR).
    - d. Apparent power (kVA).
  - 5. Minimum and Maximum Values:

- a. L-L and L-N voltages.
  - b. Current in each phase.
  - c. Power factor.
  - d. Active power total.
  - e. Reactive power total.
  - f. Apparent power total.
  - g. THD L-L and L-N voltages.
  - h. THD current in each phase.
  - i. Frequency.
- I. Power Demand, User Selectable:
  1. Block Interval with Optional Subintervals: Adjustable for 1-minute intervals, from 1 to 60 minutes. User-defined parameters for the following block intervals:
    - a. Sliding block that calculates demand every second, with intervals less than 15 minutes, and every 15 seconds with an interval between 15 and 60 minutes.
    - b. Fixed block that calculates demand at end of the interval.
    - c. Rolling block subinterval that calculates demand at end of each subinterval and displays it at end of the interval.
- J. Data Recording: Store the listed values in instrument's nonvolatile memory, indicate which of the three phases relates to the value. Attach a date and time stamp to the peak values and the alarms.
  1. Minimum and maximum of real-time RMS measurement.
  2. Energy.
  3. Demand values.
- K. Meter Face:
  1. Display: Backlit LCD display, six lines, with antiglare and scratch-resistant lens.
  2. Display of Metered Values: One screen to show at least four user-selected values on one screen at the same time.
  3. Provide for the reset of metered peak values.
- L. Capacities and Characteristics:
  1. Circuit Connections:
    - a. Voltage: Measurements autoranging, 60 to 400 V(ac) L-N. Connect directly to low-voltage (600 V and less) without using voltage transformers. Meter impedance must be 2 megohm L-L or greater. Overload Tolerance: 1500 V(ac), RMS, continuously.
    - b. Current: Connect to instrument grade current transformer with a metering range of 5 mA to 6 A. Overcurrent tolerance of the instrument must be 10 A continuous, 50 A for 10 seconds once per hour, and 120 A for one second per hour.
    - c. Frequency: 45 to 65 Hz.

- d. Time: Input from a GPS receiver to synchronize the internal clock of the instrument and to time-synchronize this instrument with the network to a deviation of not greater than 1 ms.

## 2.2 RACEWAYS AND BOXES

- A. Comply with requirements in Section 260533.13 "Conduits for Electrical Systems" for raceways for electrical power wiring and NFPA 70 Class 1 remote-control and signaling circuits.

## 2.3 WIRES AND CABLES

- A. Electrical Power Wiring: Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables."
  - 1. Copper conductors are Type THHN/THWN-2.
    - a. Sheath: PVC; except in plenum-type spaces, use sheath listed for plenums.
    - b. Ordinary Switching Circuits: Three conductors unless otherwise indicated.
    - c. Switching Circuits with Pilot Lights or Locator Feature: Five conductors unless otherwise indicated.

# PART 3 - EXECUTION

## 3.1 EXAMINATION

- A. Examine pathway elements intended for cables. Check raceways, cable trays, and other elements for compliance with space allocations, installation tolerances, hazards to cable installation, and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

## 3.2 INSTALLATION OF POWER MONITORING AND CONTROL SYSTEMS

- A. Wiring Method: Install cables in raceways and cable trays except within consoles, cabinets, desks, and counters. Conceal raceway and cables except in unfinished spaces.
- B. Wiring within Enclosures: Bundle, lace, and train conductors to terminal points with no excess and without exceeding manufacturer's limitations on bending radii. Install lacing bars and distribution spools.
- C. Connect power monitoring to the SCADA system.
- D. Wiring and Cabling Installation:



1. Comply with Section 260519 "Low-Voltage Electrical Power Conductors and Cables" for electrical power wiring.
2. Comply with Section 260523 "Control-Voltage Electrical Power Cables" for control wiring.

E. Raceways Installation:

1. Comply with Section 260533.13 "Conduits for Electrical Systems" for electrical power wiring and NFPA 70 Class 1 remote-control and signaling circuits.

F. Identification Installation:

1. Comply with Section 260519 "Low-Voltage Electrical Power Conductors and Cables" for electrical power wiring.

### 3.3 GROUNDING

- A. For control-voltage wiring and cabling, comply with requirements in Section 260526 "Grounding and Bonding for Electrical Systems."

### 3.4 FIELD QUALITY CONTROL

A. Tests and Inspections:

1. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
2. Visually inspect cable placement, cable termination, grounding and bonding, equipment and patch cords, and labeling of components.
3. Verify functionality of control and status points connected to SCADA system.

B. Nonconforming Work:

1. Wiring and cabling will be considered defective if they do not pass tests and inspections.

### 3.5 SOFTWARE SERVICE AGREEMENT

- A. Upgrade Service: At Substantial Completion, update software to latest version. Install and program software upgrades that become available within two years from date of Substantial Completion. Upgrading software must include operating system and new or revised licenses for using software.

1. Upgrade Notice: At least 30 days to allow Owner to schedule and access the system and to upgrade computer equipment if necessary.

### 3.6 TRAINING

- A. Training:
  - 1. Perform onsite training to train Owner on operation of system.
- B. At Completion of Training: Staff familiar with the system installed are capable of demonstrating operation of the system during final review.
- C. Demonstration must include, but not be limited to, the following:
  - 1. Trends, summaries, logs, and reports set-up for Project.
  - 2. Software's ability to communicate with controllers, workstations, and uploading and downloading of control programs.
  - 3. Online user guide and help functions.
  - 4. For Each Meter:
    - a. Memory: Programmed data, parameters, trend, and alarm history collected during normal operation is not lost during power failure.
    - b. Operator Interface: Ability to connect directly to each meter with a portable workstation.
    - c. Nameplates and Tags: Accurate and permanently attached to control panel doors, instrument, actuators, and devices.

END OF SECTION 260913

## SECTION 262213 - LOW-VOLTAGE DISTRIBUTION TRANSFORMERS

## PART 1 - GENERAL

## 1.1 SUMMARY

## A. Section Includes:

1. Distribution, dry-type transformers with nominal primary and secondary rating of 600 V and less, with capacities up to 1500 kVA.

## B. Related Requirements:

1. Section 260010 "Supplemental Requirements for Electrical" for additional abbreviations, definitions, submittals, qualifications, testing agencies, and other Project requirements applicable to Work specified in this Section.
2. Section 260011 "Facility Performance Requirements for Electrical" for field conditions applicable to Work specified in this Section.

## 1.2 ACTION SUBMITTALS

## A. Product Data:

1. For each type of product.
  - a. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type and size of transformer.
  - b. Include rated nameplate data, capacities, weights, dimensions, minimum clearances, installed devices and features, and performance for each type and size of transformer.

## B. Shop Drawings:

1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of field connections.

## 1.3 DELIVERY, STORAGE, AND HANDLING

## A. Inspection: On receipt, inspect for and note shipping damage to packaging and transformer.

1. If manufacturer packaging is removed for inspection, and transformer will be stored after inspection, re-package transformer using original or new packaging materials that provide protection equivalent to manufacturer's packaging.

- B. Storage: Store in warm, dry, and temperature-stable location in original shipping packaging.
- C. Temporary Heating: Apply temporary heat in accordance with manufacturer's published instructions within enclosure of ventilated-type units, throughout periods during which equipment is not energized and when transformer is not in space that is continuously under normal control of temperature and humidity.
- D. Handling: Follow manufacturer's instructions for lifting and transporting transformers.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Source Limitations: Obtain each type of transformer from single source from single manufacturer.

### 2.2 GENERAL TRANSFORMER REQUIREMENTS

- A. Description: Factory-assembled and -tested, air-cooled units for 60 Hz service.
- B. Electrical Components, Devices, and Accessories: Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.
- C. Transformers Rated 15 kVA and Larger:
  - 1. Comply with 10 CFR 431 (DOE 2016) efficiency levels.
  - 2. Marked as compliant with DOE 2016 efficiency levels by qualified electrical testing laboratory recognized by authorities having jurisdiction.

### 2.3 DISTRIBUTION TRANSFORMERS

- A. Cores: Electrical grade, non-aging silicon steel with high permeability and low hysteresis losses.
  - 1. One leg per phase.
  - 2. Grounded to enclosure.
- B. Coils: Continuous windings without splices except for taps.
  - 1. Coil Material: Copper.
  - 2. Internal Coil Connections: Brazed or pressure type.
  - 3. Terminal Connections: Bolted.
- C. Enclosure: Ventilated.
  - 1. KVA Ratings: Based on convection cooling only and not relying on auxiliary fans.
  - 2. Wiring Compartment: Sized for conduit entry and wiring installation.

3. Environmental Protection:
  - a. Indoor: UL 50E, Type 2.
4. Finish Color: ANSI 49 gray weather-resistant enamel.
- D. Taps for Transformers 25 kVA and Larger: Two 2.5 percent taps above and two 2.5 percent taps below normal full capacity.
- E. Insulation Class, 30 kVA and Larger: 220 deg C, UL-component-recognized insulation system with maximum of 150 deg C rise above 40 deg C ambient temperature.
- F. Grounding: Provide ground-bar kit or ground bar installed on inside of transformer enclosure.

## 2.4 IDENTIFICATION

- A. Nameplates:
  1. Engraved, laminated-acrylic or melamine plastic signs for distribution transformers, mounted with corrosion-resistant screws. Nameplates and label products are specified in Section 260553 "Identification for Electrical Systems."
- B. Factory Tests and Inspections: Test and inspect assembled system, by, or under supervision of, qualified electrical testing laboratory recognized by authorities having jurisdiction, in accordance with IEEE C57.12.01 and IEEE C57.12.91 before delivering to site. Affix label with name and date of manufacturer's certification of system compliance on control units.
  1. Ratio tests at rated voltage connections and at tap connections.
  2. Phase relation and polarity tests at rated voltage connections.
  3. No load losses, and excitation current and rated voltage at rated voltage connections.
  4. Applied and induced tensile tests.
- C. Nonconforming Work:
  1. System equipment that does not pass tests and inspections will be considered defective.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine conditions for compliance with enclosure- and ambient-temperature requirements for transformers.
- B. Verify that field measurements are as needed to maintain working clearances required by NFPA 70 and manufacturer's published instructions.
- C. Examine walls, floors, roofs, and concrete bases for suitable mounting conditions where transformers will be installed.

- D. Verify that ground connections are in place and requirements in Section 260526 "Grounding and Bonding for Electrical Systems" have been met. Maximum ground resistance must be 5  $\Omega$  at location of transformer.
- E. Environment: Enclosures must be rated for environment in which they are located.
- F. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 INSTALLATION

- A. Construct concrete bases and anchor floor-mounted transformers in accordance with manufacturer's published instructions and requirements in Section 260529 "Hangers and Supports for Electrical Systems."
  - 1. Coordinate size and location of concrete bases with actual transformer provided. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified with concrete.
- B. Secure transformer to concrete base in accordance with manufacturer's published instructions.
- C. Secure covers to enclosure and tighten bolts to manufacturer-recommended torques to reduce noise generation.
- D. Remove shipping bolts, blocking, and wedges.

### 3.3 CONNECTIONS

- A. Ground equipment in accordance with Section 260526 "Grounding and Bonding for Electrical Systems."
- B. Connect wiring in accordance with Section 260519 "Low-Voltage Electrical Power Conductors and Cables."
- C. Tighten electrical connectors and terminals in accordance with manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A-486B.
- D. Provide flexible connections at conduit and conductor terminations and supports to eliminate sound and vibration transmission to building structure.

### 3.4 FIELD QUALITY CONTROL

- A. Tests and Inspections:
  - 1. Small (Up to 167 kVA Single-Phase or 500 kVA Three-Phase) Dry-Type Transformer Field Tests:

- a. Visual and Mechanical Inspection.
  - 1) Inspect physical and mechanical condition.
  - 2) Inspect anchorage, alignment, and grounding.
  - 3) Verify that resilient mounts are free and that shipping brackets have been removed.
  - 4) Verify that unit is clean.
  - 5) Perform specific inspections and mechanical tests recommended by manufacturer.
- b. Electrical Tests:
  - 1) Measure resistance at windings, taps, and bolted connections.
  - 2) Verify correct secondary voltage, phase-to-phase and phase-to-neutral, after energization and prior to loading.

B. Nonconforming Work:

- 1. Transformer will be considered defective if it does not pass tests and inspections.
- 2. Remove and replace units that do not pass tests or inspections and retest as specified above.

### 3.5 CLEANING

- A. Vacuum dirt and debris; do not use compressed air to assist in cleaning.

END OF SECTION 262213

## SECTION 262416 - PANELBOARDS

## PART 1 - GENERAL

## 1.1 SUMMARY

## A. Section Includes:

1. Power panelboards.
2. Lighting and appliance branch-circuit panelboards.
3. Disconnecting and overcurrent protective devices.

## B. Related Requirements:

1. Section 260010 "Supplemental Requirements for Electrical" for additional abbreviations, definitions, submittals, qualifications, testing agencies, and other Project requirements applicable to Work specified in this Section.
2. Section 260011 "Facility Performance Requirements for Electrical" for field conditions applicable to Work specified in this Section.

## 1.2 DEFINITIONS

- A. GFEP: Ground-fault equipment protection.
- B. MCCB: Molded-case circuit breaker.
- C. VPR: Voltage protection rating.

## 1.3 ACTION SUBMITTALS

## A. Product Data:

1. Power panelboards.
2. Lighting and appliance branch-circuit panelboards.
3. Disconnecting and overcurrent protective devices.
4. Include materials, switching and overcurrent protective devices, SPDs, accessories, and components indicated.
5. Include dimensions and manufacturers' technical data on features, performance, electrical characteristics, ratings, and finishes.

## B. Shop Drawings: For each panelboard and related equipment.

1. Include dimensioned plans, elevations, sections, and details.
2. Show tabulations of installed devices with nameplates, conductor termination sizes, equipment features, and ratings.



3. Detail enclosure types including mounting and anchorage, environmental protection, knockouts, corner treatments, covers and doors, gaskets, hinges, and locks.
4. Detail bus configuration, current, and voltage ratings.
5. Short-circuit current rating of panelboards and overcurrent protective devices.
6. Include evidence of listing, by qualified electrical testing laboratory recognized by authorities having jurisdiction, for SPD as installed in panelboard.
7. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.
8. Include wiring diagrams for power, signal, and control wiring.

#### 1.4 CLOSEOUT SUBMITTALS

- A. Warranty documentation.

#### 1.5 MAINTENANCE MATERIAL SUBMITTALS

- A. Spare Parts: Furnish to Owner spare parts, for repairing panelboards, that are packaged with protective covering for storage on-site and identified with labels describing contents. Include the following:
  1. Keys: Two spares for each type of panelboard cabinet lock.
  2. Circuit Breakers Including GFCI and GFEP Types: Two spares for each panelboard.

#### 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Remove loose packing and flammable materials from inside panelboards; install temporary electric heating (250 W per panelboard) to prevent condensation.
- B. Handle and prepare panelboards for installation in accordance with NEMA PB 1.

#### 1.7 WARRANTY

- A. Special Installer Extended Warranty: Installer warrants that fabricated and installed panelboards perform in accordance with specified requirements and agrees to repair or replace components or products that fail to perform as specified within extended-warranty period.
  1. Extended-Warranty Period: Two years from date of Substantial Completion; full coverage for labor, materials, and equipment.

## PART 2 - PRODUCTS

## 2.1 PANELBOARDS COMMON REQUIREMENTS

- A. Electrical Components, Devices, and Accessories: Listed and labeled in accordance with NFPA 70, by qualified electrical testing agency recognized by authorities having jurisdiction, and marked for intended location and application.
- B. Comply with NEMA PB 1.
- C. Comply with NFPA 70.
- D. Enclosures: Flush and Surface-mounted, dead-front cabinets.
  - 1. Rated for environmental conditions at installed location.
    - a. Indoor Dry and Clean Locations: UL 50E, Type 1.
    - b. Outdoor Locations: UL 50E, Type 3R.
    - c. Pump Room Areas: UL 50E, Type 4X, stainless steel.
    - d. Other Wet or Damp Indoor Locations: UL 50E, Type 4X, stainless steel.
    - e. Indoor Locations Subject to Dust, Falling Dirt, and Dripping Noncorrosive Liquids: UL 50E, Type 12.
  - 2. Height: 7 ft maximum.
  - 3. Hinged Front Cover: Entire front trim hinged to box and with standard door within hinged trim cover. Trims must cover live parts and may have no exposed hardware.
  - 4. Finishes:
    - a. Panels and Trim: galvanized steel, factory finished immediately after cleaning and pretreating with manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat.
    - b. Back Boxes: Stainless steel for Pump Room and wet or damp locations. Galvanized steel for indoor dry and clean locations.
    - c. Fungus Proofing: Permanent fungicidal treatment for overcurrent protective devices and other components.
- E. Incoming Mains:
  - 1. Location: As identified on floor plans.
  - 2. Main Breaker: Main lug interiors up to 400 A must be field convertible to main breaker.
- F. Phase, Neutral, and Ground Buses:
  - 1. Material: Hard-drawn copper, 98 percent conductivity.
    - a. Bus must be fully rated for entire length.
  - 2. Interiors must be factory assembled into unit. Replacing switching and protective devices may not disturb adjacent units or require removing main bus connectors.

3. Equipment Ground Bus: Adequate for feeder and branch-circuit equipment grounding conductors; bonded to box.
4. Full-Sized Neutral: Equipped with full-capacity bonding strap for service entrance applications. Mount electrically isolated from enclosure.
5. Do not mount neutral bus in gutter.

G. Conductor Connectors: Suitable for use with conductor material and sizes.

1. Material: Hard-drawn copper, 98 percent conductivity.
2. Terminations must allow use of 75 deg C rated conductors without derating.
3. Size: Lugs suitable for indicated conductor sizes, with additional gutter space, if required, for larger conductors.
4. Main and Neutral Lugs: Mechanical type, with lug on neutral bar for each pole in panelboard.
5. Ground Lugs and Bus-Configured Terminators: Mechanical type, with lug on bar for each pole in panelboard.
6. Feed-Through Lugs: Mechanical type, suitable for use with conductor material. Locate at opposite end of bus from incoming lugs or main device.
7. Subfeed (Double) Lugs: Mechanical type suitable for use with conductor material. Locate at same end of bus as incoming lugs or main device.

H. Future Devices: Panelboards must have mounting brackets, bus connections, filler plates, and necessary appurtenances required for future installation of devices.

1. Percentage of Future Space Capacity: As indicated on drawings.

I. Panelboard Short-Circuit Current Rating:

1. Fully rated to interrupt symmetrical short-circuit current available at terminals. Assembly listed, by qualified electrical testing laboratory recognized by authorities having jurisdiction, for 100 percent interrupting capacity.
  - a. Panelboards and overcurrent protective devices rated 240 V or less must have short-circuit ratings as shown on Drawings, but not less than 10 000 A(rms) symmetrical.
  - b. Panelboards and overcurrent protective devices rated above 240 V and less than 600 V must have short-circuit ratings as shown on Drawings, but not less than 14 000 A(rms) symmetrical.

## 2.2 POWER PANELBOARDS

- A. Listing Criteria: NEMA PB 1, distribution type.
- B. Doors: Secured with vault-type latch with tumbler lock; keyed alike.
  1. For doors more than 36 inch high, provide two latches, keyed alike.
- C. Mains: Circuit breaker or main lugs only as indicated on construction drawings.

- D. Branch Overcurrent Protective Devices for Circuit-Breaker Frame Sizes 125 A and Smaller: Bolt-on circuit breakers Plug-in circuit breakers where individual positive-locking device requires mechanical release for removal.
- E. Branch Overcurrent Protective Devices for Circuit-Breaker Frame Sizes Larger Than 125 A: Bolt-on circuit breakers Plug-in circuit breakers where individual positive-locking device requires mechanical release for removal.

## 2.3 LIGHTING AND APPLIANCE BRANCH-CIRCUIT PANELBOARDS

- A. Listing Criteria: NEMA PB 1, lighting and appliance branch-circuit type.
- B. Mains: Circuit breaker or lugs only as indicated on drawings.
- C. Branch Overcurrent Protective Devices: Bolt-on circuit breakers, replaceable without disturbing adjacent units.
- D. Doors: Door-in-door construction with concealed hinges; secured with flush latch with tumbler lock; keyed alike. Outer door must permit full access to panel interior. Inner door must permit access to breaker operating handles and labeling, but current carrying terminals and bus must remain concealed.

## 2.4 DISCONNECTING AND OVERCURRENT PROTECTIVE DEVICES

- A. MCCB: Comply with UL 489, with interrupting capacity to meet available fault currents.
  - 1. Thermal-Magnetic Circuit Breakers:
    - a. Inverse time-current element for low-level overloads.
    - b. Instantaneous magnetic trip element for short circuits.
    - c. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.
  - 2. Adjustable Instantaneous-Trip Circuit Breakers: Magnetic trip element with front-mounted, field-adjustable trip setting.
  - 3. MCCB Features and Accessories:
    - a. Standard frame sizes, trip ratings, and number of poles.
    - b. Breaker handle indicates tripped status.
    - c. UL listed for reverse connection without restrictive line or load ratings.
    - d. Lugs: Mechanical style, suitable for number, size, trip ratings, and conductor materials.
    - e. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HID for feeding fluorescent and HID lighting circuits.
    - f. Handle Clamp: Loose attachment, for holding circuit-breaker handle in on position.

- g. Rating Plugs: Three-pole breakers with ampere ratings greater than 150 A must have interchangeable rating plugs or electronic adjustable trip units.
- h. Multipole units enclosed in single housing with single handle.

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. Verify actual conditions with field measurements prior to ordering panelboards to verify that equipment fits in allocated space in, and comply with, minimum required clearances specified in NFPA 70.
- B. Receive, inspect, handle, and store panelboards in accordance with NEMA PB 1.1.
- C. Examine panelboards before installation. Reject panelboards that are damaged, rusted, or have been subjected to water saturation.
- D. Examine elements and surfaces to receive panelboards for compliance with installation tolerances and other conditions affecting performance of the Work.
- E. Proceed with installation only after unsatisfactory conditions have been corrected.

#### 3.2 INSTALLATION

- A. Comply with manufacturer's published instructions.
- B. Reference Standards:
  - 1. Panelboards: Unless more stringent requirements are specified in Contract Documents or manufacturers' published instructions, comply with NEMA PB 1.1.
  - 2. Consult Architect/Engineer for resolution of conflicting requirements.
- C. Special Techniques:
  - 1. Equipment Mounting:
    - a. Attach panelboard to vertical finished or structural surface behind panelboard.
    - b. Mount surface-mounted panelboards to steel slotted supports 7/8 inch in depth. Orient steel slotted supports horizontally.
  - 2. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from panelboards.
  - 3. Mount top of trim 7.5 ft above finished floor unless otherwise indicated.
  - 4. Mount panelboard cabinet plumb and rigid without distortion of box.
  - 5. Mount recessed panelboards with fronts uniformly flush with wall finish and mating with back box.
  - 6. Install overcurrent protective devices and controllers not already factory installed.

- a. Set field-adjustable, circuit-breaker trip ranges.
  - b. Tighten bolted connections and circuit breaker connections using calibrated torque wrench or torque screwdriver in accordance with manufacturer's published instructions.
7. Make grounding connections and bond neutral for services and separately derived systems to ground. Make connections to grounding electrodes, separate grounds for isolated ground bars, and connections to separate ground bars.
  8. Install filler plates in unused spaces.

D. Interfaces with Other Work:

1. Coordinate layout and installation of panelboards and components with other construction that penetrates walls or is supported by them, including electrical and other types of equipment, raceways, piping, encumbrances to workspace clearance requirements, and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

### 3.3 IDENTIFICATION

- A. Identify field-installed conductors, interconnecting wiring, and components; install warning signs complying with requirements in Section 260553 "Identification for Electrical Systems."
- B. Panelboard Nameplates: Label each panelboard with nameplate complying with requirements for identification specified in Section 260553 "Identification for Electrical Systems."
- C. Install warning signs complying with requirements in Section 260553 "Identification for Electrical Systems" identifying source of remote circuit.
- D. Panelboard Label: Manufacturer's name and trademark, voltage, amperage, number of phases, and number of poles must be located on interior of panelboard door.
- E. Breaker Labels: Faceplate must list current rating, UL and IEC certification standards, and AIC rating.
- F. Circuit Directory:
  1. Provide computer-generated circuit directory mounted inside panelboard door with transparent plastic protective cover.
    - a. Circuit directory must identify specific purpose with detail sufficient to distinguish it from other circuits.
  2. Create directory to indicate installed circuit loads after balancing panelboard loads; incorporate Owner's final room designations. Obtain approval before installing. Handwritten directories are not acceptable. Install directory inside panelboard door.

### 3.4 FIELD QUALITY CONTROL

#### A. Tests and Inspections:

1. Perform each visual and mechanical inspection and electrical test for low-voltage air circuit breakers and low-voltage surge arrestors stated in NETA ATS, Paragraph 7.6 Circuit Breakers and Paragraph 7.19.1 Surge Arrestors, Low-Voltage. Do not perform optional tests. Certify compliance with test parameters.
2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.

#### B. Nonconforming Work:

1. Panelboards will be considered defective if they do not pass tests and inspections.
2. Remove and replace defective units and retest.

### 3.5 ADJUSTING

#### A. Adjust moving parts and operable components to function smoothly, and lubricate as recommended by manufacturer.

#### B. Set field-adjustable circuit-breaker trip ranges as specified in Section 260573.16 "Coordination Studies."

#### C. Load Balancing: After Substantial Completion, but not more than 60 days after Final Acceptance, measure load balancing and make circuit changes. Prior to making circuit changes to achieve load balancing, inform Architect/Engineer of effect on phase color coding.

1. Measure loads during period of normal facility operations.
2. Perform circuit changes to achieve load balancing outside normal facility operation schedule or at times directed by Architect/Engineer. Avoid disrupting services such as fax machines and on-line data processing, computing, transmitting, and receiving equipment.
3. After changing circuits to achieve load balancing, recheck loads during normal facility operations. Record load readings before and after changing circuits to achieve load balancing.
4. Tolerance: Maximum difference between phase loads, within panelboard, may not exceed 20 percent.

END OF SECTION 262416

## SECTION 262816 - ENCLOSED SWITCHES AND CIRCUIT BREAKERS

## PART 1 - GENERAL

## 1.1 SUMMARY

## A. Section Includes:

1. Nonfusible switches.
2. Molded-case circuit breakers (MCCBs).
3. Molded-case switches
4. Enclosures.

## B. Related Requirements:

1. Section 260010 "Supplemental Requirements for Electrical" for additional abbreviations, definitions, submittals, qualifications, testing agencies, and other Project requirements applicable to Work specified in this Section.
2. Section 260011 "Facility Performance Requirements for Electrical" for field conditions applicable to Work specified in this Section.

## 1.2 DEFINITIONS

## A. SPDT: Single pole, double throw.

## 1.3 ACTION SUBMITTALS

## A. Product Data:

1. For each type of enclosed switch, circuit breaker, accessory, and component indicated. Include nameplate ratings, dimensioned elevations, sections, weights, and manufacturers' technical data on features, performance, electrical characteristics, ratings, accessories, and finishes.
2. Enclosure types and details for types other than UL 50E, Type 1.
3. Current and voltage ratings.
4. Short-circuit current ratings (interrupting and withstand, as appropriate).
5. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices, accessories, and auxiliary components.
6. Include time-current coordination curves (average melt) for each type and rating of overcurrent protective device; include selectable ranges for each type of overcurrent protective device. Provide in PDF electronic format.

## B. Shop Drawings: For enclosed switches and circuit breakers.



1. Include plans, elevations, sections, details, and attachments to other work.
2. Include wiring diagrams for power, signal, and control wiring.

#### 1.4 CLOSEOUT SUBMITTALS

- A. Warranty documentation.

#### 1.5 WARRANTY

- A. Special Installer Extended Warranty: Installer warrants that fabricated and installed enclosed switches and circuit breakers perform in accordance with specified requirements and agrees to repair or replace components or products that fail to perform as specified within extended-warranty period.
  1. Extended-Warranty Period: Two years from date of Substantial Completion; full coverage for labor, materials, and equipment.

### PART 2 - PRODUCTS

#### 2.1 GENERAL REQUIREMENTS

- A. Source Limitations: Obtain products from single manufacturer.
- B. Electrical Components, Devices, and Accessories: Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.

#### 2.2 NONFUSIBLE SWITCHES

- A. Type HD, Heavy Duty, Three Pole, Single Throw, 600 V(ac), 1200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.
- B. Accessories:
  1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
  2. Lugs: Mechanical type, suitable for number, size, and conductor material.

#### 2.3 MOLDED-CASE CIRCUIT BREAKERS

- A. Circuit breakers must be constructed using glass-reinforced insulating material. Current carrying components must be completely isolated from handle and accessory mounting area.

- B. Circuit breakers must have toggle operating mechanism with common tripping of all poles, which provides quick-make, quick-break contact action. Circuit-breaker handle must be over center, be trip free, and reside in tripped position between on and off to provide local trip indication. Circuit-breaker escutcheon must be clearly marked on and off in addition to providing international I/O markings. Equip circuit breaker with push-to-trip button, located on face of circuit breaker to mechanically operate circuit-breaker tripping mechanism for maintenance and testing purposes.
- C. Maximum ampere rating and UL, IEC, or other certification standards with applicable voltage systems and corresponding interrupting ratings must be clearly marked on face of circuit breaker.
- D. MCCBs must be equipped with device for locking in isolated position.
- E. Lugs must be suitable for 60 deg C rated wire on 125 A circuit breakers and below.
- F. Standard: Comply with UL 489 with required interrupting capacity for available fault currents.
- G. Thermal-Magnetic Circuit Breakers: Inverse time-current thermal element for low-level overloads and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.
- H. Adjustable, Instantaneous-Trip Circuit Breakers: Magnetic trip element with front-mounted, field-adjustable trip setting.
- I. Features and Accessories:
  - 1. Standard frame sizes, trip ratings, and number of poles.
  - 2. Lugs: Mechanical type, suitable for number, size, trip ratings, and conductor material.

## 2.4 MOLDED-CASE SWITCHES

- A. Description: MCCB with fixed, high-set instantaneous trip only, and short-circuit withstand rating equal to equivalent breaker frame size interrupting rating.
- B. Standard: Comply with UL 489 with interrupting capacity to comply with available fault currents.
- C. Features and Accessories:
  - 1. Standard frame sizes and number of poles.
  - 2. Lugs:
    - a. Mechanical type, suitable for number, size, trip ratings, and conductor material.
    - b. Lugs must be suitable for 75 deg C rated wire.

## 2.5 ENCLOSURES

- A. Enclosed Switches and Circuit Breakers: UL 489, NEMA KS 1, UL 50E, and UL 50, to comply with environmental conditions at installed location.
- B. Enclosure Finish: Enclosure must be finished with gray baked enamel paint, electrodeposited on cleaned, phosphatized steel (UL 50E Type 1), or gray baked enamel paint, electrodeposited on cleaned, phosphatized galvanized steel (UL 50E Types 3R, 12), or a brush finish on Type 304 stainless steel (UL 50E Type 4-4X stainless steel).
- C. Conduit Entry: UL 50E Types 4, 4X, and 12 enclosures may not contain knockouts. UL 50E Types 7 and 9 enclosures must be provided with threaded conduit openings in both endwalls.
- D. Operating Mechanism: Circuit-breaker operating handle must be directly operable through front cover of enclosure (UL 50E Type 1) or directly operable through dead front trim of enclosure (UL 50E Type 3R). Cover interlock mechanism must have externally operated override. Override may not permanently disable interlock mechanism, which must return to locked position once override is released. Tool used to override cover interlock mechanism must not be required to enter enclosure in order to override interlock.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine elements and surfaces to receive enclosed switches and circuit breakers for compliance with installation tolerances and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.
  - 1. Commencement of work will indicate Installer's acceptance of areas and conditions as satisfactory.

### 3.2 SELECTION OF ENCLOSURES

- A. Indoor, Dry and Clean Locations: UL 50E, Type 1.
- B. Outdoor Locations: UL 50E, Type 3R.
- C. Other Wet or Damp, Pump Room, Indoor Locations: UL 50E, Type 4X.
- D. Indoor Locations Subject to Dust, Falling Dirt, and Dripping Noncorrosive Liquids: UL 50E, Type 12.

### 3.3 INSTALLATION

- A. Comply with manufacturer's published instructions.
- B. Special Techniques:
  - 1. Coordinate layout and installation of switches, circuit breakers, and components with equipment served and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.
  - 2. Install fuses in fusible devices.

### 3.4 IDENTIFICATION

- A. Comply with requirements in Section 260553 "Identification for Electrical Systems."
  - 1. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs.
  - 2. Label each enclosure with engraved metal or laminated-plastic nameplate.

### 3.5 FIELD QUALITY CONTROL

- A. Tests and Inspections for Switches:
  - 1. Visual and Mechanical Inspection:
    - a. Inspect physical and mechanical condition.
    - b. Inspect anchorage, alignment, grounding, and clearances.
    - c. Verify that unit is clean.
    - d. Verify blade alignment, blade penetration, travel stops, and mechanical operation.
    - e. Verify that fuse sizes and types match the Specifications and Drawings.
    - f. Verify that each fuse has adequate mechanical support and contact integrity.
    - g. Inspect bolted electrical connections for high resistance using one of the following methods:
      - 1) Use low-resistance ohmmeter.
        - a) Compare bolted connection resistance values to values of similar connections. Investigate values that deviate from those of similar bolted connections by more than 50 percent of lowest value.
      - 2) Verify tightness of accessible bolted electrical connections by calibrated torque-wrench method in accordance with manufacturer's published data or NETA ATS Table 100.12.

- a) Bolt-torque levels must be in accordance with manufacturer's published data. In absence of manufacturer's published data, use NETA ATS Table 100.12.
    - h. Verify that operation and sequencing of interlocking systems is as described in the Specifications and shown on Drawings.
    - i. Verify correct phase barrier installation.
    - j. Verify lubrication of moving current-carrying parts and moving and sliding surfaces.
  - 2. Electrical Tests:
    - a. Measure contact resistance across each switchblade fuseholder. Drop values may not exceed high level of manufacturer's published data. If manufacturer's published data are not available, investigate values that deviate from adjacent poles or similar switches by more than 50 percent of lowest value.
    - b. Perform insulation-resistance tests for one minute on each pole, phase-to-phase and phase-to-ground with switch closed, and across each open pole. Apply voltage in accordance with manufacturer's published data. In absence of manufacturer's published data, use Table 100.1 from NETA ATS. Investigate values of insulation resistance less than those published in Table 100.1 or as recommended in manufacturer's published data.
    - c. Measure fuse resistance. Investigate fuse-resistance values that deviate from each other by more than 15 percent.
- B. Tests and Inspections for Molded-Case Circuit Breakers:
- 1. Visual and Mechanical Inspection:
    - a. Verify that equipment nameplate data are as described in the Specifications and shown on Drawings.
    - b. Inspect physical and mechanical condition.
    - c. Inspect anchorage, alignment, grounding, and clearances.
    - d. Verify that unit is clean.
    - e. Operate circuit breaker to ensure smooth operation.
    - f. Inspect bolted electrical connections for high resistance using one of the following methods:
      - 1) Use low-resistance ohmmeter.
        - a) Compare bolted connection resistance values to values of similar connections. Investigate values that deviate from those of similar bolted connections by more than 50 percent of lowest value.
      - 2) Verify tightness of accessible bolted electrical connections by calibrated torque-wrench method in accordance with manufacturer's published data or NETA ATS Table 100.12.

- a) Bolt-torque levels must be in accordance with manufacturer's published data. In absence of manufacturer's published data, use NETA ATS Table 100.12.
    - g. Inspect operating mechanism, contacts, and chutes in unsealed units.
  - 2. Electrical Tests:
    - a. Perform insulation-resistance tests for one minute on each pole, phase-to-phase and phase-to-ground with circuit breaker closed, and across each open pole. Apply voltage in accordance with manufacturer's published data. In absence of manufacturer's published data, use Table 100.1 from NETA ATS. Investigate values of insulation resistance less than those published in Table 100.1 or as recommended in manufacturer's published data.
  - C. Nonconforming Work:
    - 1. Enclosed switches and circuit breakers will be considered defective if they do not pass tests and inspections.
    - 2. Remove and replace defective units and retest.
  - D. Collect, assemble, and submit test and inspection reports.
    - 1. Test procedures used.
    - 2. Include identification of each enclosed switch and circuit breaker tested and describe test results.
    - 3. List deficiencies detected, remedial action taken, and observations after remedial action.
- 3.6 ADJUSTING
- A. Adjust moving parts and operable components to function smoothly and lubricate as recommended by manufacturer.
- 3.7 PROTECTION
- A. After installation, protect enclosed switches and circuit breakers from construction activities. Remove and replace items that are contaminated, defaced, damaged, or otherwise caused to be unfit for use prior to acceptance by Owner.

END OF SECTION 262816

## SECTION 262913.06 - SOFT-START MOTOR CONTROLLERS

## 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 RELATED REQUIREMENTS

- A. Section 406343 "Programmable Logic Controllers (PLC)".

## 1.3 SUMMARY

- A. Section includes soft-start motor controllers that are designed for reduced-voltage start and full-voltage run duty.
  - 1. Enclosed soft-start controllers.
  - 2. Enclosures.
  - 3. Accessories.
  - 4. Identification.

## 1.4 DEFINITIONS

- A. CPT: Control power transformer.
- B. FLA: Full-load current.
- C. MCCB: Molded-case circuit breaker.
- D. MCP: Motor circuit protector.
- E. NC: Normally closed.
- F. NO: Normally open.
- G. OCPD: Overcurrent protective device.
- H. SCCR: Short-circuit current rating.
- I. SCPD: Short-circuit protective device.
- J. SCR: Silicon-controlled rectifier.

## 1.5 ACTION SUBMITTALS

### A. Product Data: For each type of product.

1. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

### B. Shop Drawings: For each type of controller.

1. Include plans, elevations, sections, and mounting details.
2. Indicate dimensions, weights, required clearances, and location and size of each field connection.
3. Wire Termination Diagrams and Schedules: Include diagrams for signal and control wiring. Identify terminals and wiring designations and color-codes to facilitate installation, operation, and maintenance. Indicate recommended types, wire sizes, and circuiting arrangements for field-installed wiring, and show circuit protection features. Differentiate between manufacturer-installed and field-installed wiring.
4. Include features, characteristics, ratings, and factory settings of individual OCPD and auxiliary components.
5. Include interconnection requirements for connection to SCADA system. Identify cabling, termination points, communication protocols, etc. as required to facilitate transfer of the indicated inputs/outputs. Provide points list.

### C. Product Schedule: For each enclosed controller.

1. Each installed soft-start controller type.
2. NRTL listing.
3. Factory-installed accessories.
4. Nameplate legends.
5. SCCR of integrated unit.
  - a. For each combination soft-start controller, include features, characteristics, ratings, and factory setting of the SCPD and OCPD.
    - 1) Listing document proving Type 2 coordination.

## 1.6 CLOSEOUT SUBMITTALS

### A. Operation and Maintenance Data: For soft-start controllers to include in operation and maintenance manuals.

1. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:
  - a. Routine maintenance requirements for soft-start controllers and installed components.
  - b. Manufacturer's written instructions for testing and adjusting circuit-breaker and MCP trip settings.



- c. Manufacturer's written instructions for testing, adjusting, and reprogramming reduced-voltage soft-start controllers.
- d. Load-Current and List of Settings of Adjustable Overload Relays: Compile after motors have been installed, and arrange to demonstrate that switch settings for motor running overload protection suit actual motors to be protected.

## 1.7 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  - 1. Control Power Fuses: Equal to 10 percent of quantity installed for each size and type, but no fewer than two of each size and type.
  - 2. Indicating Lights: Two of each type and color installed.
  - 3. Auxiliary Contacts: Furnish one spare(s) for each size and type of magnetic controller installed.
  - 4. Power Contacts: Furnish three spares for each size and type of magnetic contactor installed.

## 1.8 DELIVERY, STORAGE, AND HANDLING

- A. Store soft-start controllers indoors in clean, dry space with uniform temperature to prevent condensation. Protect soft-start controllers from exposure to dirt, fumes, water, corrosive substances, and physical damage.

## 1.9 FIELD CONDITIONS

- A. Environmental Limitations: Rate equipment for continuous operation under the following conditions unless otherwise indicated:
  - 1. Ambient Temperature: Not less than 32 deg F and not exceeding 104 deg F, humidity noncondensing.
  - 2. Altitude: Not exceeding 3300 feet.

## 1.10 COORDINATION

- A. Coordinate Work of this Section with monitoring and control equipment.

# PART 2 - PRODUCTS

## 2.1 MOTOR CONTROLLER PERFORMANCE REQUIREMENTS

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.

- B. UL Compliance: Fabricate and label enclosed controllers to comply with UL 508.

## 2.2 SOFT-START MOTOR CONTROLLERS

- A. Description: Factory-assembled, reduced-voltage soft-start controller with a SCPD, in a single enclosure. The reduced-voltage soft-start controller shall consist of an integrated unit with power SCRs, heat sink, microprocessor logic board, door-mounted digital display and user interface module, run-bypass contactor, and overload relay(s); suitable for use with NEMA MG 1, Design B, polyphase, medium induction motors.
1. Run-Bypass Contactor: Magnetic contactor in parallel with the SCR of the soft-start controller, bypassing the SCR when full voltage is achieved.
- B. Standard: Comply with NEMA ICS 2, general purpose, Class A.
- C. Configuration: Standard duty.
1. At least two SCRs per phase to control the starting and stopping of the motor.
  2. Microprocessor control shall continuously monitor current and proper operation of the SCRs.
  3. Bypass Contactor: Operates automatically when full voltage is applied to motor, and bypasses the SCRs. Soft-start controller protective features and deceleration controls shall remain active when this contactor is in the bypass mode.
  4. Logic Board: Identical for all ampere ratings and voltage classes, with environmental protective coating.
  5. Surge Protection: Comply with NEMA ICS 2 requirements for surge suppression.
- D. Control Power:
1. For on-board control power, obtain from line circuit or from integral CPT. The CPT shall have capacity to operate integral devices and remotely located pilot, indicating, and control devices.
- E. Controller Diagnostics and Protection:
1. Microprocessor-based thermal-protection system for monitoring SCR and motor thermal characteristics, and providing controller overtemperature and motor-overload alarm and trip; settings selectable via the keypad.
  2. Protection from line-side reverse phasing; line-side and motor-side phase loss; motor jam, stall, and under-load conditions; and line frequency over or under normal.
  3. Input isolation contactor that opens when the controller diagnostics detect a faulted soft-start component or when the motor is stopped.
- F. Cover mounted-controller status panel with LED lights or alphanumeric display to show the following:
1. Starter Status: "Ready," "starting," "stopping," or "run."
  2. Motor current in amperes.

3. Faults:
  - a. Motor overcurrent trip.
  - b. Motor thermal overload.
  - c. Starter thermal fault.
  - d. Low line voltage.
  - e. Loss of a phase.
  - f. Phases reversed.
  - g. Maximum starting time exceeded.
  - h. Serial communications error.

G. Interface Panel: Mounted on controller door.

1. Guarded adjustable set points, not readily accessible.
  - a. Motor FLA, adjustable from 40 to 110 percent of the controller's rating.
  - b. Current limitation on starting, adjustable from 200 to 500 percent of FLA, typically set at 300 percent.
  - c. NEMA ICS 2 overload class. Selections shall include the following tripping classes: Class 5, Class 10, Class 15, Class 20, and Class 30.
2. Adjustable set points, readily accessible, password protected.
  - a. Linear acceleration, adjustable from 1 to 60 s.
  - b. Maximum start time, adjustable from 1 to 250 s.
  - c. Selector switch; select coast to stop or soft stop.
  - d. Linear deceleration, adjustable from 1 to 60 s.

H. Remote Output Features: All outputs shall be prewired to terminal blocks.

1. Analog output for field-selectable assignment of motor operating characteristics; 4- to 20-mA dc.
2. Form C status contacts that change state when controller is running.
3. Form C alarm contacts that change state when a fault condition occurs.

I. Digital Communication Module: RS-485 Modbus, RTU protocol, 2-wire connection to host devices with a compatible port to transmit the following to the existing SCADA system:

1. Instantaneous rms current each phase, and three-phase average.
2. Voltage: L-L for each phase, L-L three-phase average, L-N each phase, and L-N three-phase average - rms.
3. Active Energy (kilowatt-hour): Three-phase total.

J. MCP Disconnecting Means:

1. UL 489 and NEMA AB 3 (with interrupting capacity to comply with available fault currents) instantaneous-only circuit breaker with front-mounted, field-adjustable, short-circuit trip coordinated with motor locked-rotor amperes.
2. Lockable Handle: Accepts three padlocks and interlocks with cover in closed position.

3. Auxiliary contacts "a" and "b" arranged to activate with MCP handle.
4. NC alarm contact that operates and sends signal to existing SCADA system only when MCP has tripped.

## 2.3 ENCLOSURES

- A. Comply with NEMA 250, Type designations as indicated on Drawings, to comply with environmental conditions at installed location.

## 2.4 ACCESSORIES

- A. General Requirements for Control Circuit and Pilot Devices: NEMA ICS 5; factory installed in controller enclosure cover unless otherwise indicated.
  1. Push Buttons, Pilot Lights, and Selector Switches: Standard duty, except as needed to match enclosure type. Heavy-duty or oiltight where indicated on drawings.
  2. Elapsed Time Meters: Heavy duty with digital readout in hours; nonresettable.

## 2.5 IDENTIFICATION

- A. Controller Nameplates: Laminated acrylic or melamine plastic signs, as described in Section 260553 "Identification for Electrical Systems," for each compartment, mounted with corrosion-resistant screws.
- B. Arc-Flash Warning Labels:
  1. Comply with requirements in Section 260573.19 "Arc-Flash Hazard Analysis." Produce a 3-1/2-by-5-inch self-adhesive label for each work location included in the analysis.
    - a. The label shall have an orange header with the wording, "WARNING, ARC-FLASH HAZARD," and shall include the following information taken directly from the arc-flash hazard analysis:
      - 1) Location designation.
      - 2) Nominal voltage.
      - 3) Flash protection boundary.
      - 4) Hazard risk category.
      - 5) Incident energy.
      - 6) Working distance.
      - 7) Engineering report number, revision number, and issue date.
    - b. Labels shall be machine printed, with no field-applied markings.

## PART 3 - EXECUTION

## 3.1 EXAMINATION

- A. Examine areas and space conditions for compliance with requirements for motor controllers, their relationship with the motors, and other conditions affecting performance of the Work.

## 3.2 INSTALLATION

- A. Comply with NECA 1.
- B. Wall-Mounted Controllers: Install controllers on walls with tops at uniform height indicated, and by bolting units to wall or mounting on slotted support systems complying with Section 260529 "Hangers and Supports for Electrical Systems," and bolted to wall.
- C. Freestanding Controllers: Provide slotted support systems complying with Section 260529 "Hangers and Supports for Electrical Systems."
- D. Maintain minimum clearances and workspace at equipment according to manufacturer's written instructions and NFPA 70.
- E. Control Wiring: Separate control wiring from power wiring.
- F. Wiring within Enclosures: Bundle, lace, and train conductors to terminal points with no excess and without exceeding manufacturer's limitations on bending radii. Install lacing bars and distribution spools.
- G. Setting of Overload Relays: Select and set overloads on the basis of FLA rating as shown on motor nameplate. Adjust setting value for special motors as required by NFPA 70 for high-torque, high-efficiency, and so on motors.
- H. Connect indicated control and status points to the SCADA system.

## 3.3 IDENTIFICATION

- A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

## 3.4 FIELD QUALITY CONTROL

- A. Perform tests and inspections with the assistance of a factory-authorized service representative.
- B. Tests and Inspections:
  - 1. Comply with provisions of NFPA 70B, Chapter "Testing and Test Methods."
  - 2. Visual and Mechanical Inspection:

- a. Compare equipment nameplate data with Drawings and the Specifications.
  - b. Inspect physical and mechanical condition.
  - c. Inspect anchorage, alignment, and grounding.
  - d. Verify that the unit is clean.
  - e. Ensure that vent path openings are free from debris and that heat-transfer surfaces are clean.
  - f. Verify correct connections of circuit boards, wiring, disconnects, and ribbon cables.
  - g. Inspect Contactors:
    - 1) Verify mechanical operation.
    - 2) Verify that contact gap, wipe, alignment, and pressure are according to manufacturer's published data.
  - h. Motor-Running Protection:
    - 1) Verify that motor FLA is at, or under, the controller current rating.
    - 2) Verify that overload element setting is correct for its application.
    - 3) Apply minimum- and maximum-speed set points. Verify that set points are within limitations of the load coupled to the motor.
    - 4) If motor-running protection is provided by fuses, verify correct fuse rating.
  - i. Inspect bolted electrical connections for high resistance using one of the following two methods:
    - 1) Use a low-resistance ohmmeter. Compare bolted-connection-resistance values to values of similar connections. Investigate values that deviate from those of similar bolted connections by more than 50 percent of the lowest value.
    - 2) Verify tightness of accessible bolted electrical connections by calibrated torque-wrench method according to manufacturer's published data or NETA ATS, Table 100.12. Bolt-torque levels shall be according to manufacturer's published data. In the absence of manufacturer's published data, use NETA ATS, Table 100.12.
  - j. Verify appropriate lubrication on moving current-carrying parts and on moving and sliding surfaces.
3. Electrical Tests:
- a. For the contactor and circuit breaker, perform insulation-resistance tests for one minute on each pole, phase-to-phase and phase-to-ground with switch closed, and across each open pole. Insulation-resistance values shall be according to manufacturer's published data or NETA ATS, Table 100.1. In the absence of manufacturer's published data, use Table 100.5. Values of insulation resistance less than this table or manufacturer's written instructions shall be investigated and corrected.
  - b. Measure fuse resistance. Investigate fuse-resistance values that deviate from each other by more than 15 percent.

- c. Test motor protection devices according to manufacturer's published data.
- d. Test circuit breakers as follows:
  - 1) Operate the circuit breaker to ensure smooth operation.
  - 2) For adjustable circuit breakers, adjust protective device settings according to the coordination study. Comply with coordination study recommendations.
- e. Test the electronic motor overload relay elements by injecting primary current through the overload circuit and monitoring trip time of the overload element.
- f. Test the following parameters according to NETA relay calibration procedures, or as recommended by manufacturer:
  - 1) ANSI No. 49R, Overtemperature Protection:
    - a) Determine time delay at 300 percent of setting.
    - b) Determine a second point on the operating curve.
  - 2) ANSI No. 47, Input Phase Loss and Reversed Phases Protection:
    - a) Determine positive sequence voltage to close the NO contact.
    - b) Determine positive sequence voltage to open the NC contact (undervoltage trip).
    - c) Verify negative sequence trip.
    - d) Determine time delay to close the NO contact with sudden application of 120 percent of pickup.
    - e) Determine time delay to close the NC contact on removal of voltage when previously set to rated system voltage.
  - 3) ANSI No. 81, Overfrequency Protection:
    - a) Verify frequency set points.
    - b) Determine time delay.
    - c) Determine undervoltage cutoff.
  - 4) Fault Alarm Outputs: Verify that each relay contact performs its intended function in the control scheme including breaker trip tests, close inhibit tests, lockout tests, and alarm functions.
- g. Perform operational tests by initiating control devices.

- C. Motor controllers will be considered defective if they do not pass tests and inspections.

### 3.5 SYSTEM FUNCTION TESTS

- A. System function tests shall prove the correct interaction of sensing, processing, and action devices. Perform system function tests after field quality-control tests have been completed and all components have passed specified tests.

1. Develop test parameters and perform tests for the purpose of evaluating performance of integral components and their functioning as a complete unit within design requirements and manufacturer's published data.
  2. Verify the correct operation of interlock safety devices for fail-safe functions in addition to design function.
  3. Verify the correct operation of sensing devices, alarms, and indicating devices.
  4. Verify functionality of control and status points connected to SCADA system.
- B. Motor controllers will be considered defective if they do not pass the system function tests and inspections.

### 3.6 DEMONSTRATION

- A. Train Owner's maintenance personnel to adjust, operate, and maintain motor controllers.

END OF SECTION 262913.06



## SECTION 263213.13 - DIESEL-ENGINE-DRIVEN GENERATOR SETS

## PART 1 - GENERAL

## 1.1 SUMMARY

## A. Section Includes:

1. Diesel-engine-driven generator sets.
2. Diesel engine.
3. Diesel fuel-oil system.
4. Control and monitoring.
5. Generator overcurrent and fault protection.
6. Generator, exciter, and voltage regulator.
7. Outdoor engine generator enclosure.
8. Vibration isolation devices.

## B. Related Requirements:

1. Section 260010 "Supplemental Requirements for Electrical" for additional abbreviations, definitions, submittals, qualifications, testing agencies, and other Project requirements applicable to Work specified in this Section.
2. Section 260011 "Facility Performance Requirements for Electrical" for field conditions applicable to Work specified in this Section.
3. Section 263600 "Transfer Switches".
4. Section 406343 "Programmable Logic Controllers (PLC)".

## 1.2 DEFINITIONS

- A. EPS: Emergency power supply.
- B. EPSS: Emergency power supply system.
- C. 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.

## 1.3 ACTION SUBMITTALS

## A. Product Data: For each type of product.

1. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.
2. Include thermal damage curve for generator.

3. Include time-current characteristic curves for generator protective device.
4. Include fuel consumption in gallons per hour at 0.8 power factor at 0.5, 0.75-, and 1.0-times generator capacity.
5. Include generator efficiency at 0.8 power factor at 0.5, 0.75-, and 1.0-times generator capacity.
6. Include generator characteristics, including, but not limited to, kilowatt rating, efficiency, reactances, and short-circuit current capability.

B. Shop Drawings:

1. Include plans and elevations for engine generator and other components specified. Indicate access requirements affected by height of subbase fuel tank.
2. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
3. Identify fluid drain ports and clearance requirements for proper fluid drain.
4. Design calculations for selecting vibration isolators and seismic restraints and for designing vibration isolation bases.
5. Vibration Isolation Base Details: Detail fabrication including anchorages and attachments to structure and to supported equipment. Include base weights.
6. Include diagrams for power, signal, and control wiring. Complete schematic, wiring, and interconnection diagrams showing terminal markings for engine generators and functional relationship between all electrical components.
7. Include interconnection requirements for connection to SCADA system. Identify cabling, termination points, communication protocols, etc. as required to facilitate transfer of the indicated inputs/outputs. Provide points list.

#### 1.4 INFORMATIONAL SUBMITTALS

- A. Source Quality-Control Reports: Including, but not limited to, the following:
1. Report of factory test on units to be shipped for this Project, showing evidence of compliance with specified requirements.
  2. Report of sound generation.
  3. Report of exhaust emissions showing compliance with applicable regulations.
  4. Certified Torsional Vibration Compatibility: Comply with NFPA 110.
- B. Field quality-control reports.
- C. Warranty: For special warranty.

#### 1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For packaged engine generators to include in emergency, operation, and maintenance manuals.
1. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:

- a. List of tools and replacement items recommended to be stored at Project for ready access. Include part and drawing numbers, current unit prices, and source of supply.
- b. Operating instructions laminated and mounted adjacent to generator location.
- c. Training plan.

## 1.6 QUALITY ASSURANCE

- A. Installer Qualifications: An authorized representative who is trained and approved by manufacturer.

## 1.7 COORDINATION

- A. Coordinate features of related distribution equipment and control components to form an integrated interconnection of compatible components.
- B. Coordinate Work of this Section with monitoring and control equipment.

## 1.8 WARRANTY

- A. Manufacturer's Warranty: Manufacturer agrees to repair or replace components of packaged engine generators and associated auxiliary components that fail in materials or workmanship within specified warranty period.
  1. Warranty Period: Five years from date of Substantial Completion.

# PART 2 - PRODUCTS

## 2.1 DIESEL-ENGINE-DRIVEN GENERATOR SETS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the work include, but are not limited to the following:
  1. Caterpillar, Inc. – CAT C7.1 (Basis of Design).
  2. Kohler Power Systems.
  3. Cummins Power Generation.
  4. Generac Power Systems, Inc.
- B. Source Limitations: Obtain packaged engine generators and auxiliary components from single source from single manufacturer.

## 2.2 PERFORMANCE REQUIREMENTS

- A. B11 Compliance: Comply with B11.19.

- B. NFPA Compliance:
  - 1. Comply with NFPA 37.
  - 2. Comply with NFPA 70.
  - 3. Comply with NFPA 110 requirements for Level 2 EPSS.
- C. UL Compliance: Comply with UL 2200.
- D. Engine Exhaust Emissions: Comply with EPA Tier 3 requirements and applicable state and local government requirements.
- E. Noise Emission: Comply with applicable state and local government requirements for maximum noise level at adjacent property boundaries due to sound emitted by engine generator including engine, engine exhaust, engine cooling-air intake and discharge, and other components of installation.
- F. Environmental Conditions: Engine generator system shall withstand the following environmental conditions without mechanical or electrical damage or degradation of performance capability:
  - 1. Ambient Temperature: 5 to 104 deg F.
  - 2. Altitude: Sea level to 1000 feet.

## 2.3 ENGINE GENERATOR ASSEMBLY DESCRIPTION

- A. Factory-assembled and -tested, water-cooled engine, with brushless generator and accessories.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.
- C. Power Rating: Standby.
- D. EPSS Class: Engine generator shall be classified as a Class 24 according to NFPA 110.
- E. Service Load: 250 kVA minimum with ability to start and run the following block loads:
  - 1. Step 1:
    - a. (1) 25 hp, across the line starting, 3-phase motor, starts underload.
    - b. 21 kW, lighting load and receptacle load.
    - c. (1) 10 hp, soft start, 3-phase motor.
  - 2. Step 2:
    - a. (1) 50 hp, soft start, 3-phase motor, intermittent starting.
    - b. 64 kW, resistive load, 3-phase.
  - 3. Step 3:
    - a. (1) 50 hp, soft start, 3-phase motor, intermittent starting.

4. Step 4:
  - a. (1) 15 hp, soft start, 3-phase motor, intermittent starting.
- F. Power Factor: 0.8, lagging.
- G. Frequency: 60 Hz.
- H. Voltage: 480/277-V ac.
- I. Phase: Three-phase, four wire, wye.
- J. Induction Method: Turbocharged.
- K. Governor: Adjustable isochronous, with speed sensing.
- L. Mounting Frame: Structural steel framework to maintain alignment of mounted components without depending on concrete foundation. Provide lifting attachments sized and spaced to prevent deflection of base during lifting and moving.
  1. Rigging Diagram: Inscribed on metal plate permanently attached to mounting frame to indicate location and lifting capacity of each lifting attachment and engine generator center of gravity.
- M. Capacities and Characteristics:
  1. Power Output Ratings: Nominal ratings as indicated at 0.8 power factor excluding power required for the continued and repeated operation of the unit and auxiliaries.
  2. Nameplates: For each major system component to identify manufacturer's name and address, and model and serial number of components.
- N. Engine Generator Performance:
  1. Steady-State Voltage Operational Bandwidth: 3 percent of rated output voltage from no load to full load.
  2. Transient Voltage Performance: Not more than 20 percent variation for 50 percent step-load increase or decrease. Voltage shall recover and remain within the steady-state operating band within three 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: Less than 6 percent variation for 50 percent step-load increase or decrease. Frequency shall recover and remain within the steady-state operating band within five seconds.
  6. Output Waveform: At no load, harmonic content measured line to line or line to neutral shall not exceed 5 percent total and 3 percent for single harmonics. Telephone influence factor, determined according to NEMA MG 1, shall not exceed 50 percent.

7. Sustained Short-Circuit Current: For a three-phase, bolted short circuit at system output terminals, system shall supply a minimum of 250 percent of rated full-load current for not less than 10 seconds and then clear the fault automatically, without damage to generator system components.
8. Start Time:
  - a. Comply with NFPA 110, Type 10 system requirements.

## 2.4 DIESEL ENGINE

- A. Fuel: ASTM D975, diesel fuel oil, Grade 2-D S15.
- B. Rated Engine Speed: 1800 rpm.
- C. Lubrication System: Engine or skid-mounted.
  1. Filter and Strainer: Rated to remove 90 percent of particles 5 micrometers and smaller while passing full flow.
  2. Thermostatic Control Valve: Control flow in system to maintain optimum oil temperature. Unit shall be capable of full flow and is designed to be fail-safe.
  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. Jacket Coolant Heater: Electric-immersion type, factory installed in coolant jacket system. Comply with UL 499.
- E. Integral Cooling System: Closed loop, liquid cooled, with radiator factory mounted on engine generator set mounting frame and integral engine-driven coolant pump.
  1. Coolant: Solution of 50 percent ethylene-glycol-based antifreeze and 50 percent water, with anticorrosion additives as recommended by engine manufacturer.
  2. Size of Radiator: Adequate to contain expansion of total system coolant from cold start to 110 percent load condition.
  3. Temperature Control: Self-contained, thermostatic-control valve modulates coolant flow automatically to maintain optimum constant coolant temperature as recommended by engine manufacturer.
  4. Coolant Hose: Flexible assembly with inside surface of nonporous rubber and outer covering of aging-, UV-, and abrasion-resistant fabric.
    - a. Rating: 50-psig maximum working pressure with coolant at 180 deg F, and noncollapsible under vacuum.
    - b. End Fittings: Flanges or steel pipe nipples with clamps to suit piping and equipment connections.
- F. Muffler/Silencer:

1. Critical type sized as recommended by engine manufacturer and selected with exhaust piping system to not exceed engine manufacturer's engine backpressure requirements.
  - a. Minimum sound attenuation of 25 dB at 500 Hz.
  - b. Sound level measured at a distance of 25 feet from exhaust discharge after installation is complete shall be 78 dBA or less.
- G. Air-Intake Filter: Heavy-duty, engine-mounted air cleaner with replaceable dry-filter element and "blocked filter" indicator.
- H. Starting System: 24-V electric, with negative ground.
  1. Components: Sized so they are not damaged during a full engine-cranking cycle with ambient temperature at maximum specified in "Performance Requirements" Article.
  2. Cranking Motor: Heavy-duty unit that automatically engages and releases from engine flywheel without binding.
  3. Cranking Cycle: As required by NFPA 110 for system level specified.
  4. Battery: Nickel cadmium, with capacity within ambient temperature range specified in "Performance Requirements" Article to provide specified cranking cycle at least three times without recharging.
  5. Battery Cable: Size as recommended by engine manufacturer for cable length indicated. Include required interconnecting conductors and connection accessories.
  6. Battery Compartment: Factory fabricated of metal with acid-resistant finish and thermal insulation. Thermostatically controlled heater shall be arranged to maintain battery above 50 deg F regardless of external ambient temperature within range specified in "Performance Requirements" Article. Include accessories required to support and fasten batteries in place. Provide ventilation to exhaust battery gases.
  7. Battery Stand: Factory-fabricated, two-tier metal with acid-resistant finish designed to hold the quantity of battery cells required and to maintain the arrangement to minimize lengths of battery interconnections.
  8. Battery-Charging Alternator: Factory mounted on engine with solid-state voltage regulation and 35-A minimum continuous rating.
  9. Battery Charger: Current-limiting, automatic-equalizing, and float-charging type designed for nickel-cadmium batteries. Unit shall comply with UL 1236 and include the following features:
    - a. Operation: Equalizing-charging rate of 10 A 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 40 to 140 deg F 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. Ammeter and Voltmeter: Flush mounted in door. Meters shall indicate charging rates.
    - e. 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.

## 2.5 DIESEL FUEL-OIL SYSTEM

- A. Comply with NFPA 37.
- B. Piping: Fuel-oil piping shall be Schedule 40 black steel. Cast iron, aluminum, copper, and galvanized steel shall not be used in the fuel-oil system.
- C. Main Fuel Pump: Mounted on engine to provide primary fuel flow under starting and load conditions.
- D. Fuel Filtering: Remove water and contaminants larger than 1 micron.
- E. Relief-Bypass Valve: Automatically regulates pressure in fuel line and returns excess fuel to source.
- F. Subbase-Mounted, Double-Wall, Fuel-Oil Tank: Factory installed and piped, complying with UL 142 fuel-oil tank. Features include the following:
  - 1. Tank level indicator.
  - 2. Fuel-Tank Capacity: Minimum capacity for 24 hours of continuous operation at 100% loading of generator.
  - 3. Leak detection in interstitial space.
  - 4. Vandal-resistant fill cap.
  - 5. Containment Provisions: Comply with requirements of authorities having jurisdiction.

## 2.6 CONTROL AND MONITORING

- A. 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 engine generator. When mode-selector switch is switched to the on position, engine generator starts. The off position of same switch initiates engine generator shutdown. When engine generator is running, specified system or equipment failures or derangements automatically shut down engine generator and initiate alarms.
- B. Provide minimum run time control set for 15 minutes with override only by operation of a remote emergency-stop switch.
- C. Comply with UL 508A.
- D. Configuration:



1. Operating and safety indications, protective devices, basic system controls, and engine gages shall be grouped in a common control and monitoring panel mounted on the engine generator. Mounting method shall isolate the control panel from engine generator vibration. Panel shall be powered from the engine generator battery.

E. Control and Monitoring Panel:

1. Digital engine generator controller with integrated LCD display, controls, and microprocessor, capable of local and remote control, monitoring, and programming, with battery backup.
2. Controls and Protective Devices: Controls, shutdown devices, and common alarm indication, including the following:
  - a. Cranking control equipment.
  - b. Run-Off-Auto switch.
  - c. Control switch not in automatic position alarm.
  - d. Overcrank alarm.
  - e. Overcrank shutdown device.
  - f. Low-water temperature alarm.
  - g. High engine temperature.
  - h. High engine temperature shutdown device.
  - i. Overspeed alarm.
  - j. Overspeed shutdown device.
  - k. Low fuel main tank.
    - 1) Low-fuel-level alarm shall be initiated when the level falls below that required for operation for duration required 8 hours.
  - l. Coolant low-level alarm.
  - m. EPS load indicator.
  - n. Battery high-voltage alarm.
  - o. Low cranking voltage alarm.
  - p. Battery-charger malfunction alarm.
  - q. Battery low-voltage alarm.
  - r. Lamp test.
  - s. Contacts for local and remote common alarm.
  - t. Remote manual stop shutdown device.
  - u. Air shutdown damper alarm when used.
  - v. Air shutdown damper shutdown device when used.
  - w. Generator overcurrent-protective-device not-closed alarm.
  - x. Hours of operation.
  - y. Engine generator metering, including voltage, current, hertz, kilowatt, kilovolt ampere, and power factor.

F. Engine Generator Metering: Comply with Section 260913 "Electrical Power Monitoring and Control."

G. Connection to Datalink:

1. A separate terminal block, factory wired to Form C dry contacts, for each alarm and status indication.
  2. Provide connections for datalink transmission of indications to remote data terminals via Ethernet. Data system connections to terminals are covered in Section 260913 "Electrical Power Monitoring and Control."
- H. Common Remote Panel with Common Audible Alarm: Include necessary contacts and terminals in control and monitoring panel. Remote panel shall be powered from the engine generator battery.
- I. Remote Alarm Annunciator: An LED indicator light labeled with proper alarm conditions shall identify each alarm event, and a common audible signal shall sound for each alarm condition. Silencing switch in face of panel shall silence signal without altering visual indication. Connect so that after an alarm is silenced, clearing of initiating condition will reactivate alarm until silencing switch is reset. Cabinet and faceplate are surface- or flush-mounting type to suit mounting conditions indicated.
1. Overcrank alarm.
  2. Low water-temperature alarm.
  3. High engine temperature alarm.
  4. Low lube oil pressure alarm.
  5. Overspeed alarm.
  6. Low fuel main tank alarm.
  7. Low coolant level alarm.
  8. Low cranking voltage alarm.
  9. Contacts for local and remote common alarm.
  10. Audible-alarm silencing switch.
  11. Air shutdown damper when used.
  12. Run-Off-Auto switch.
  13. Control switch not in automatic position alarm.
  14. Lamp test.
- J. Supporting Items: Include sensors, transducers, terminals, relays, and other devices and include wiring required to support specified items. Locate sensors and other supporting items on engine or generator unless otherwise indicated.
- K. Remote Emergency-Stop Switch: Flush; wall mounted unless otherwise indicated; and labeled. Push button shall be protected from accidental operation.
- 2.7 GENERATOR OVERCURRENT AND FAULT PROTECTION
- A. Overcurrent protective devices shall be coordinated to optimize selective tripping when a short circuit occurs.
1. Overcurrent protective devices for the entire EPSS shall be coordinated to optimize selective tripping when a short circuit occurs. Coordination of protective devices shall consider both utility and EPSS as the voltage source.

2. Overcurrent protective devices for the EPSS shall be accessible only to authorized personnel.

B. Generator Overcurrent Protective Device:

1. Molded-case circuit breaker, electronic-trip type; 100 percent rated; complying with UL 489:
  - a. Tripping Characteristics: Adjustable long-time and short-time delay and instantaneous.
  - b. Trip Settings: Selected to coordinate with generator thermal damage curve.
  - c. Mounting: Adjacent to, or integrated with, control and monitoring panel.

2.8 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 or Class F.
- D. Stator-Winding Leads: Brought out to terminal box to permit future reconnection for other voltages if required. Provide six-lead alternator.
- E. Range: Provide limited range of output voltage by adjusting the excitation level.
- F. Construction shall prevent mechanical, electrical, and thermal damage due to vibration, overspeed up to 125 percent of rating, and heat during operation at 110 percent of rated capacity.
- G. Enclosure: Dripproof.
- H. Instrument Transformers: Mounted within generator enclosure.
- I. Voltage Regulator: Solid-state type, separate from exciter, providing performance as specified and as required by NFPA 110.
  1. Adjusting Rheostat on Control and Monitoring Panel: Provide plus or minus 5 percent adjustment of output-voltage operating band.
  2. Maintain voltage within 30 percent on one step, full load.
  3. Provide anti-hunt provision to stabilize voltage.
  4. Maintain frequency within 15 percent and stabilize at rated frequency within 5 seconds.
- J. Strip Heater: Thermostatically controlled unit arranged to maintain stator windings above dew point.

## 2.9 OUTDOOR ENGINE GENERATOR ENCLOSURE

### A. Description:

1. Vandal-resistant, sound-attenuating, weatherproof steel housing; wind resistant up to 100 mph. Multiple panels shall be lockable and provide adequate access to components requiring maintenance. Panels shall be removable by one person without tools. Instruments and control shall be mounted within enclosure.

- a. Sound Attenuation Level: 2.

2. Prefabricated or pre-engineered, galvanized-steel-clad, integral structural-steel-framed; erected on concrete foundation.

### B. Structural Design and Anchorage: Comply with ASCE/SEI 7 for wind loads up to 100 mph.

### C. Hinged Doors: With padlocking provisions.

### D. Thermal Insulation: Manufacturer's standard materials and thickness to maintain winter interior temperature within operating limits required by engine generator components.

### E. Muffler Location: Within enclosure.

### F. Engine-Cooling Airflow through Enclosure: Maintain temperature rise of system components within required limits when unit operates at 110 percent of rated load for two hours with ambient temperature at top of range specified in system service conditions.

1. Ventilation: Provide temperature-controlled exhaust fan interlocked to prevent operation when engine is running.

## 2.10 FINISHES

### A. Indoor and Outdoor Enclosures and Components: Manufacturer's standard finish over corrosion-resistant pretreatment and compatible primer.

## 2.11 SOURCE QUALITY CONTROL

### A. Prototype Testing: Factory test engine generator using same engine model, constructed of identical or equivalent components, and equipped with identical or equivalent accessories.

1. Tests: Comply with IEEE 115.

### B. Project-Specific Equipment Tests: Before shipment, factory test engine generator and other system components and accessories manufactured specifically for this Project. Perform tests at rated load and power factor. Include the following tests:

1. Test components and accessories furnished with installed unit that are not identical to those on tested prototype to demonstrate compatibility and reliability.
2. Test generator, exciter, and voltage regulator as a unit.
3. Full load run.
4. Maximum power.
5. Voltage regulation.
6. Transient and steady-state governing.
7. Single-step load pickup.
8. Safety shutdown.

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. Examine areas, equipment bases, and conditions, with Installer present, for compliance with requirements for installation and other conditions affecting packaged engine generator performance.
- B. Examine roughing-in for piping systems and electrical connections. Verify actual locations of connections before packaged engine generator installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

#### 3.2 PREPARATION

- A. Interruption of Existing Electrical Service: Do not interrupt electrical service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary electrical service according to requirements indicated:
  1. Notify Owner no fewer than seven working days in advance of proposed interruption of electrical service.
  2. Do not proceed with interruption of electrical service without Owner's written permission.

#### 3.3 INSTALLATION

- A. Comply with NECA 1 and NECA 404.
- B. Comply with packaged engine generator manufacturers' written installation and alignment instructions and with NFPA 110.
- C. Equipment Mounting:
  1. Install packaged engine generators on cast-in-place concrete equipment bases.

- D. Install packaged engine generator to provide access, without removing connections or accessories, for periodic maintenance.
- E. Exhaust System: Install Schedule 40 black steel piping with welded joints and connect to engine muffler. Install thimble at wall. Piping shall be same diameter as muffler outlet.
- F. Drain Piping: Install condensate drain piping to muffler drain outlet full size of drain connection with a shutoff valve, stainless-steel flexible connector, and Schedule 40 black steel pipe with welded joints.
- G. Fuel Piping:
  - 1. Copper and galvanized steel shall not be used in the fuel-oil piping system.
- H. Install electrical devices furnished by equipment manufacturers but not specified to be factory mounted.

### 3.4 CONNECTIONS

- A. Connect fuel, cooling-system, and exhaust-system piping adjacent to packaged engine generator to allow space for service and maintenance.
- B. Connect engine exhaust pipe to engine with flexible connector.
- C. Connect fuel piping to engines with a gate valve and union and flexible connector.
- D. Ground equipment according to Section 260526 "Grounding and Bonding for Electrical Systems."
- E. Connect wiring according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables." Provide a minimum of one 90-degree bend in flexible conduit routed to the engine generator from a stationary element.
- F. Balance single-phase loads to obtain a maximum of 10 percent unbalance between any two phases.
- G. Connect indicated control and status points to the SCADA system.

### 3.5 IDENTIFICATION

- A. Install a sign indicating the generator neutral is bonded to the main service neutral at the main service location.

### 3.6 FIELD QUALITY CONTROL

- A. Testing Agency:

1. Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.

B. Tests and Inspections:

1. Perform tests recommended by manufacturer and each visual and mechanical inspection and electrical and mechanical test listed in first two subparagraphs below, as specified in NETA ATS. Certify compliance with test parameters.
  - a. Visual and Mechanical Inspection:
    - 1) Compare equipment nameplate data with Drawings and the Specifications.
    - 2) Inspect physical and mechanical condition.
    - 3) Inspect anchorage, alignment, and grounding.
    - 4) Verify that the unit is clean.
  - b. Electrical and Mechanical Tests:
    - 1) Perform insulation-resistance tests according to IEEE 43.
      - a) Machines Larger Than 200 hp (150 kW): Test duration shall be 10 minutes. Calculate polarization index.
    - 2) Test protective relay devices.
    - 3) Verify phase rotation, phasing, and synchronized operation as required by the application.
    - 4) Functionally test engine shutdown for low oil pressure, overtemperature, overspeed, and other protection features as applicable.
    - 5) Verify correct functioning of the governor and regulator.
2. NFPA 110 Acceptance Tests: Perform tests required by NFPA 110 that are additional to those specified here, including, but not limited to, single-step full-load pickup test.
3. Battery Tests: Equalize charging of battery cells according to manufacturer's written instructions. Record individual cell voltages.
  - a. Measure charging voltage and voltages between available battery terminals for full-charging and float-charging conditions. Check electrolyte level and specific gravity under both conditions.
  - b. Test for contact integrity of all connectors. Perform an integrity load test and a capacity load test for the battery.
  - c. Verify acceptance of charge for each element of the battery after discharge.
  - d. Verify that measurements are within manufacturer's specifications.
4. Battery-Charger Tests: Verify specified rates of charge for both equalizing and float-charging conditions.
5. System Integrity Tests: Methodically verify proper installation, connection, and integrity of each element of engine generator system before and during system operation. Check for air, exhaust, and fluid leaks.
6. Exhaust Emissions Test: Comply with applicable government test criteria.

7. Voltage and Frequency Transient Stability Tests: Use recording oscilloscope to measure voltage and frequency transients for 50 and 100 percent step-load increases and decreases and verify that performance is as specified.
- C. Test instruments shall have been calibrated within the past 12 months, traceable to NIST Calibration Services, and adequate for making positive observation of test results. Make calibration records available for examination on request.
- D. Leak Test: After installation, charge exhaust, coolant, and fuel systems and test for leaks. Repair leaks and retest until no leaks exist.
- E. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation for generator and associated equipment.
- F. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- G. Verify functionality of control and status points connected to SCADA system.
- H. Remove and replace malfunctioning units and retest as specified above.
- I. Retest: Correct deficiencies identified by tests and observations, and retest until specified requirements are met.
- J. Report results of tests and inspections in writing. Record adjustable relay settings and measured insulation resistances, time delays, and other values and observations. Attach a label or tag to each tested component indicating satisfactory completion of tests.

### 3.7 MAINTENANCE SERVICE

- A. Initial Maintenance Service: Beginning at Substantial Completion, maintenance service shall include 12 months' full maintenance by skilled employees of manufacturer's authorized service representative. Include quarterly preventive maintenance and exercising to check for proper starting, load transfer, and running under load. Include routine preventive maintenance as recommended by manufacturer and adjusting as required for proper operation. Parts shall be manufacturer's authorized replacement parts and supplies.

### 3.8 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain packaged engine generators.

END OF SECTION 263213.13



## SECTION 263600 - TRANSFER SWITCHES

## PART 1 - GENERAL

## 1.1 SUMMARY

## A. Section Includes:

1. Contactor-type automatic transfer switches.
2. Molded-case-type automatic transfer switches.
3. Nonautomatic transfer switches.
4. Transfer switch accessories.

## B. Related Requirements:

1. Section 260010 "Supplemental Requirements for Electrical" for additional abbreviations, definitions, submittals, qualifications, testing agencies, and other Project requirements applicable to Work specified in this Section.
2. Section 260011 "Facility Performance Requirements for Electrical" for field conditions applicable to Work specified in this Section.
3. Section 263213.13 "Diesel-Engine-Driven Generator Sets".
4. Section 406343 "Programmable Logic Controllers (PLC)".

## 1.2 ACTION SUBMITTALS

## A. Product Data:

1. Contactor-type automatic transfer switches.
2. Molded-case-type automatic transfer switches.
3. Nonautomatic transfer switches.
4. Transfer switch accessories.

## B. Product Data Submittals: For each product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for transfer switches.
2. Include rated capacities, operating characteristics, electrical characteristics, and accessories.

## C. Shop Drawings:

1. Include plans, elevations, sections, details showing minimum clearances, conductor entry provisions, gutter space, and installed features and devices.
2. Include material lists for each switch specified.

3. Single-Line Diagram: Show connections between transfer switch, power sources, and load; and show interlocking provisions for each combined transfer switch and bypass/isolation switch.
4. Riser Diagram: Show interconnection wiring between transfer switches, bypass/isolation switches, annunciators, and control panels.
5. Include interconnection requirements for connection to SCADA system. Identify cabling, termination points, communication protocols, etc. as required to facilitate transfer of the indicated inputs/outputs. Provide points list.

### 1.3 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For manufacturer-authorized service representative.
- B. Field quality-control reports.

### 1.4 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For each type of product to include in emergency, operation, and maintenance manuals.
  1. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:
    - a. Features and operating sequences, both automatic and manual.
    - b. List of all factory settings of relays; provide relay-setting and calibration instructions, including software, where applicable.

### 1.5 QUALITY ASSURANCE

- A. Testing Agency Qualifications:
  1. Member company of NETA.
    - a. Testing Agency's Field Supervisor: Certified by NETA to supervise on-site testing.

### 1.6 FIELD CONDITIONS

- A. Interruption of Existing Electrical Service: Do not interrupt electrical service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary electrical service:
  1. Notify Owner no fewer than seven days in advance of proposed interruption of electrical service.
  2. Do not proceed with interruption of electrical service without Owner's written permission.

## 1.7 COORDINATION

- A. Coordinate features of related distribution equipment and control components to form an integrated interconnection of compatible components.
- B. Coordinate Work of this Section with monitoring and control equipment.

## 1.8 WARRANTY

- A. Manufacturer's Warranty: Manufacturer agrees to repair or replace components of transfer switch or transfer switch components that fail in materials or workmanship within specified warranty period.
  - 1. Warranty Period: 18 months from date of Substantial Completion.

## PART 2 - PRODUCTS

## 2.1 PERFORMANCE REQUIREMENTS

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Comply with NEMA ICS 1.
- C. Comply with NFPA 110.
- D. Comply with UL 1008 unless requirements of these Specifications are stricter.
- E. Indicated Current Ratings: Apply as defined in UL 1008 for continuous loading and total system transfer, including tungsten filament lamp loads not exceeding 30 percent of switch ampere rating, unless otherwise indicated.
- F. Tested Fault-Current Closing and Short-Circuit Ratings: Adequate for duty imposed by protective devices at installation locations in Project under the fault conditions indicated, based on testing according to UL 1008.
- G. Repetitive Accuracy of Solid-State Controls: All settings shall be plus or minus 2 percent or better over an operating temperature range of minus 20 to plus 70 deg C.
- H. Resistance to Damage by Voltage Transients: Components shall meet or exceed voltage-surge withstand capability requirements when tested according to IEEE C62.62. Components shall meet or exceed voltage-impulse withstand test of NEMA ICS 1.
- I. Electrical Operation: Accomplish by a nonfused, momentarily energized solenoid or electric-motor-operated mechanism. Switches for emergency or standby purposes shall be mechanically and electrically interlocked in both directions to prevent simultaneous connection to both power sources unless closed transition.

- J. Neutral Terminal: Solid and fully rated unless otherwise indicated.
- K. Battery Charger: For generator starting batteries.
  - 1. Ammeter to display charging current.
  - 2. Fused ac inputs and dc outputs.
- L. Annunciation, Control, and Programming Interface Components: Devices at transfer switches for communicating with remote programming devices, annunciators, or annunciator and control panels shall have communication capability matched with remote device.
- M. Factory Wiring: Train and bundle factory wiring and label, consistent with Shop Drawings, by color-code or by numbered or lettered wire and cable markers at terminations.
  - 1. Designated Terminals: Pressure type, suitable for types and sizes of field wiring indicated.
  - 2. Power-Terminal Arrangement and Field-Wiring Space: Suitable for top, side, or bottom entrance of feeder conductors as indicated.
  - 3. Control Wiring: Equipped with lugs suitable for connection to terminal strips.
  - 4. Accessible via front access.
- N. Enclosures: General-purpose NEMA 250, Type 1, complying with NEMA ICS 6 and UL 508, unless otherwise indicated.

## 2.2 CONTACTOR-TYPE AUTOMATIC TRANSFER SWITCHES

- A. Comply with Level 1 equipment according to NFPA 110.
- B. Switch Characteristics: Designed for continuous-duty repetitive transfer of full-rated current between active power sources.
  - 1. Switch Action: Double throw; mechanically held in both directions.
  - 2. Contacts: Silver composition or silver alloy for load-current switching. Contactor-style automatic transfer-switch units, rated 600 A and higher, shall have separate arcing contacts.
  - 3. Conductor Connectors: Suitable for use with conductor material and sizes.
  - 4. Material: Hard-drawn copper, 98 percent conductivity.
  - 5. Main and Neutral Lugs: Mechanical type.
  - 6. Ground Lugs and Bus-Configured Terminators: Mechanical type.
  - 7. Connectors shall be marked for conductor size and type according to UL 1008.
- C. Automatic Open-Transition Transfer Switches: Interlocked to prevent the load from being closed on both sources at the same time.
  - 1. Sources shall be mechanically and electrically interlocked to prevent closing both sources on the load at the same time.
- D. Manual Switch Operation, Load-Breaking: Under load, with door closed and with either or both sources energized. Transfer time is same as for electrical operation. Control circuit automatically disconnects from electrical operator during manual operation.

- E. Signal-Before-Transfer Contacts: A set of normally open/normally closed dry contacts operates in advance of retransfer to normal source. Interval shall be adjustable from 1 to 30 seconds.
- F. Digital Communication Interface: Matched to capability of remote annunciator or annunciator and control panel.
- G. Automatic Transfer-Switch Controller Features:
  - 1. Controller operates through a period of loss of control power.
  - 2. Undervoltage Sensing for Each Phase of Normal and Alternate Source: Sense low phase-to-ground voltage on each phase. Pickup voltage shall be adjustable from 85 to 100 percent of nominal, and dropout voltage shall be adjustable from 75 to 98 percent of pickup value. Factory set for pickup at 90 percent and dropout at 85 percent.
  - 3. Voltage/Frequency Lockout Relay: Prevent premature transfer to generator. Pickup voltage shall be adjustable from 85 to 100 percent of nominal. Factory set for pickup at 90 percent. Pickup frequency shall be adjustable from 90 to 100 percent of nominal. Factory set for pickup at 95 percent.
  - 4. Time Delay for Retransfer to Normal Source: Adjustable from zero to 30 minutes, and factory set for 10 minutes. Override shall automatically defeat delay on loss of voltage or sustained undervoltage of emergency source, provided normal supply has been restored.
  - 5. Test Switch: Simulate normal-source failure.
  - 6. Switch-Position Pilot Lights: Indicate source to which load is connected.
  - 7. Source-Available Indicating Lights: Supervise sources via transfer-switch normal- and emergency-source sensing circuits.
    - a. Normal Power Supervision: Green light with nameplate engraved "Normal Source Available."
    - b. Emergency Power Supervision: Red light with nameplate engraved "Emergency Source Available."
  - 8. Unassigned Auxiliary Contacts: Two normally open, single-pole, double-throw contacts for each switch position, rated 10 A at 240-V ac.
  - 9. Transfer Override Switch: Overrides automatic retransfer control so transfer switch will remain connected to emergency power source regardless of condition of normal source. Pilot light indicates override status.
  - 10. Engine Starting Contacts: One isolated and normally closed, and one isolated and normally open; rated 10 A at 32-V dc minimum.
  - 11. Engine Shutdown Contacts:
    - a. Time delay adjustable from zero to five minutes, and factory set for five minutes. Contacts shall initiate shutdown at remote engine-generator controls after retransfer of load to normal source.
  - 12. Engine-Generator Exerciser: Solid-state, programmable-time switch starts engine generator and transfers load to it from normal source for a preset time, then retransfers and shuts down engine after a preset cool-down period. Initiates exercise cycle at preset intervals adjustable from 7 to 30 days. Running periods shall be adjustable from 10 to 30 minutes. Factory settings shall be for 7-day exercise cycle, 20-minute running period, and 5-minute cool-down period. Exerciser features include the following:

- a. Exerciser Transfer Selector Switch: Permits selection of exercise with and without load transfer.
- b. Push-button programming control with digital display of settings.
- c. Integral battery operation of time switch when normal control power is unavailable.

H. Large-Motor-Load Power Transfer:

1. In-Phase Monitor: Factory-wired, internal relay controls transfer so contacts close only when the two sources are synchronized in phase and frequency. Relay shall compare phase relationship and frequency difference between normal and emergency sources and initiate transfer when both sources are within 15 electrical degrees, and only if transfer can be completed within 60 electrical degrees. Transfer shall be initiated only if both sources are within 2 Hz of nominal frequency and 70 percent or more of nominal voltage.
2. Motor Disconnect and Timing Relay Controls: Designated starters in loss of power scenario shall disconnect motors before transfer and reconnect them selectively at an adjustable time interval after transfer. Control connection to motor starters shall be through wiring external to automatic transfer switch. Provide adjustable time delay between 1 and 60 seconds for reconnecting individual motor loads. Provide relay contacts rated for motor-control circuit inrush and for actual seal currents to be encountered.
3. Programmed Neutral Switch Position: Switch operator with programmed neutral position arranged to provide a midpoint between the two working switch positions, with an intentional, time-controlled pause at midpoint during transfer. Adjustable pause from 0.5 to 30 seconds minimum, and factory set for 0.5 second unless otherwise indicated. Time delay occurs for both transfer directions. Disable pause unless both sources are live.

## 2.3 TRANSFER SWITCH ACCESSORIES

A. Remote Annunciator System:

1. Source Limitations: Same manufacturer as transfer switch in which installed.
2. Functional Description: Remote annunciator panel shall annunciate conditions for indicated transfer switches.
3. Annunciation panel display shall include the following indicators:
  - a. Sources available, as defined by actual pickup and dropout settings of transfer-switch controls.
  - b. Switch position.
  - c. Switch in test mode.
  - d. Failure of communication link.
4. Annunciator Panel: LED-lamp type with audible signal and silencing switch.
  - a. Indicating Lights: Grouped for each transfer switch monitored.
  - b. Label each group, indicating transfer switch it monitors, location of switch, and identity of load it serves.
  - c. Mounting: Flush, modular, steel cabinet unless otherwise indicated.
  - d. Lamp Test: Push-to-test or lamp-test switch on front panel.

**B. Remote Annunciator and Control System:**

1. Source Limitations: Same manufacturer as transfer switch in which installed.
2. Include the following functions for indicated transfer switches:
  - a. Indication of sources available, as defined by actual pickup and dropout settings of transfer-switch controls.
  - b. Indication of switch position.
  - c. Indication of switch in test mode.
  - d. Indication of failure of digital communication link.
  - e. Key-switch or user-code access to control functions of panel.
  - f. Control of switch-test initiation.
  - g. Control of switch operation in either direction.
  - h. Control of time-delay bypass for transfer to normal source.
3. Malfunction of annunciator, annunciation and control panel, or communication link shall not affect functions of automatic transfer switch. In the event of failure of communication link, automatic transfer switch automatically shall revert to standalone, self-contained operation. Automatic transfer-switch sensing, controlling, or operating function shall not depend on remote panel for proper operation.
4. Remote Annunciation and Control Panel: Solid-state components. Include the following features:
  - a. Controls and indicating lights grouped together for each transfer switch.
  - b. Label each indicating light control group. Indicate transfer switch it controls, location of switch, and load it serves.
  - c. Digital Communication Capability: Matched to that of transfer switches supervised.
  - d. Mounting: Flush, modular, steel cabinet unless otherwise indicated.

**2.4 NONAUTOMATIC TRANSFER SWITCHES WITH INTEGRAL PORTABLE GENERATOR AND LOAD BANK CONNECTIONS**

- A. Dual purpose quick connect power panel with two sets of 16 series Camlocks (Male and Female) and isolation breaker with trap key interlock.
  1. Male camlocks enclosed behind trap key interlocked door.
  2. Isolation breaker mounted in separate compartment behind pad-lockable door.
  3. Listed for UL891
- B. Enclosure type: NEMA 3R, wall-mounted.
  1. Enclosure type rating shall be maintained with temporary cables installed.
  2. Cables shall enter and exit the wiring chamber via access holes specifically designed for conductors and shall be provided with a bushing or shall be formed such that there are no sharp edges with which conductor insulation may come in contact.
  3. Connections shall be arranged such that cables drape downward when connected.
  4. Color: ANSI 61 gray.

- C. Quick connection panel with isolation breaker shall have input and output connections rated up to 600-V ac.
- D. Ampacity rating as indicated on construction drawings.
- E. Electrical connectors shall be cam type single pole connectors and available color coded as per industry standard practice:
  - 1. 440-480 V ac: phase A = brown, phase B = orange, phase C = yellow.
  - 2. Neutral = gray or white.
  - 3. Ground = green.
- F. Portable generator connectors shall be camlock male type connectors.
- G. Load bank connectors shall be camlock female type connectors.
- H. Minimum of 25% ground shall be provided.
- I. Lug terminals provided for permanently installed conductors.
- J. Withstand Current Rating (WCR) shall not be less than 14kA verified by testing supervised by a nationally recognized testing laboratory. Enclosure WCR shall not be less than 65kA.
- K. Accessories: Phase rotation monitor, auto start terminal post, load dump receptacle, auto start destination switch.

## 2.5 SOURCE QUALITY CONTROL

- A. Factory Tests: Test and inspect components, assembled switches, and associated equipment according to UL 1008. Ensure proper operation. Check transfer time and voltage, frequency, and time-delay settings for compliance with specified requirements. Perform dielectric strength test complying with NEMA ICS 1.
  - 1. For each of the tests required by UL 1008, performed on representative devices, for emergency systems. Include results of test for the following conditions:
    - a. Overvoltage.
    - b. Undervoltage.
    - c. Loss of supply voltage.
    - d. Reduction of supply voltage.
    - e. Alternative supply voltage or frequency is at minimum acceptable values.
    - f. Temperature rise.
    - g. Dielectric voltage-withstand; before and after short-circuit test.
    - h. Overload.
    - i. Contact opening.
    - j. Endurance.
    - k. Short circuit.
    - l. Short-time current capability.
    - m. Receptacle withstand capability.



- n. Insulating base and supports damage.

### PART 3 - EXECUTION

#### 3.1 INSTALLATION

- A. Wall-Mounting Switch: Anchor to floor and wall on strut by bolting.
  - 1. Provide workspace and clearances required by NFPA 70.
- B. Annunciator and Control Panel Mounting: Surface-mounted on wall unless otherwise indicated.
- C. Identify components according to Section 260553 "Identification for Electrical Systems."
- D. Set field-adjustable intervals and delays, relays, and engine exerciser clock.
- E. Comply with NECA 1.

#### 3.2 CONNECTIONS

- A. Wiring to Remote Components: Match type and number of cables and conductors to generator sets, 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. Wiring Method: Install cables in raceways except within electrical enclosures..
  - 1. Comply with requirements for raceways specified in Section 260533.13 "Conduits for Electrical Systems."
- C. Wiring within Enclosures: Bundle, lace, and train conductors to terminal points with no excess and without exceeding manufacturer's limitations on bending radii.
- D. Ground equipment according to Section 260526 "Grounding and Bonding for Electrical Systems."
- E. Connect wiring according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables."
- F. Connect twisted pair cable according to Section 260523 "Control-Voltage Electrical Power Cables."
- G. Route and brace conductors according to manufacturer's written instructions and Section 260529 "Hangers and Supports for Electrical Systems." Do not obscure manufacturer's markings and labels.
- H. Connect indicated control and status points to the SCADA system.

### 3.3 FIELD QUALITY CONTROL

#### A. Administrant for Tests and Inspections:

1. Administer and perform tests and inspections with assistance of factory-authorized service representative.

#### B. Tests and Inspections:

1. After installing equipment, test for compliance with requirements according to NETA ATS.
2. Visual and Mechanical Inspection:
  - a. Compare equipment nameplate data with Drawings and Specifications.
  - b. Inspect physical and mechanical condition.
  - c. Inspect anchorage, alignment, grounding, and required clearances.
  - d. Verify that the unit is clean.
  - e. Verify appropriate lubrication on moving current-carrying parts and on moving and sliding surfaces.
  - f. Verify that manual transfer warnings are attached and visible.
  - g. Verify tightness of all control connections.
  - h. Inspect bolted electrical connections for high resistance using one of the following methods, or both:
    - 1) Use of low-resistance ohmmeter.
    - 2) Verify tightness of accessible bolted electrical connections by calibrated torque-wrench method according to manufacturer's published data.
  - i. Perform manual transfer operation.
  - j. Verify positive mechanical interlocking between normal and alternate sources.
  - k. Perform visual and mechanical inspection of surge arresters.
  - l. Inspect control power transformers.
    - 1) Inspect for physical damage, cracked insulation, broken leads, tightness of connections, defective wiring, and overall general condition.
    - 2) Verify that primary and secondary fuse or circuit-breaker ratings match Drawings.
    - 3) Verify correct functioning of drawout disconnecting contacts, grounding contacts, and interlocks.
3. Electrical Tests:
  - a. Perform insulation-resistance tests on all control wiring with respect to ground.
  - b. Perform a contact/pole-resistance test. Compare measured values with manufacturer's acceptable values.
  - c. Verify settings and operation of control devices.
  - d. Calibrate and set all relays and timers.
  - e. Verify phase rotation, phasing, and synchronized operation.
  - f. Perform automatic transfer tests.
  - g. Verify correct operation and timing of the following functions:

- 1) Normal source voltage-sensing and frequency-sensing relays.
  - 2) Engine start sequence.
  - 3) Time delay on transfer.
  - 4) Alternative source voltage-sensing and frequency-sensing relays.
  - 5) Automatic transfer operation.
  - 6) Interlocks and limit switch function.
  - 7) Time delay and retransfer on normal power restoration.
  - 8) Engine cool-down and shutdown feature.
4. Measure insulation resistance phase-to-phase and phase-to-ground with insulation-resistance tester. Include external annunciation and control circuits. Use test voltages and procedure recommended by manufacturer. Comply with manufacturer's specified minimum resistance.
- a. Check for electrical continuity of circuits and for short circuits.
  - b. Inspect for physical damage, proper installation and connection, and integrity of barriers, covers, and safety features.
  - c. Verify that manual transfer warnings are properly placed.
  - d. Perform manual transfer operation.
5. After energizing circuits, perform each electrical test for transfer switches stated in NETA ATS and demonstrate interlocking sequence and operational function for each switch at least three times.
- a. Simulate power failures of normal source to automatic transfer switches and retransfer from emergency source with normal source available.
  - b. Verify time-delay settings.
  - c. Verify pickup and dropout voltages by data readout or inspection of control settings.
  - d. Test bypass/isolation unit functional modes and related automatic transfer-switch operations.
  - e. 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.
- C. Coordinate tests with tests of generator and run them concurrently.
- D. Verify functionality of control and status points connected to SCADA system.
- E. Report results of tests and inspections in writing. Record adjustable relay settings and measured insulation and contact resistances and time delays. Attach a label or tag to each tested component indicating satisfactory completion of tests.
- F. Transfer switches will be considered defective if they do not pass tests and inspections.
- G. Remove and replace malfunctioning units and retest as specified above.
- H. Prepare test and inspection reports.

3.4 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain transfer switches and related equipment.
- B. Training shall include testing ground-fault protective devices and instructions to determine when the ground-fault system shall be retested. Include instructions on where ground-fault sensors are located and how to avoid negating the ground-fault protection scheme during testing and circuit modifications.
- C. Coordinate this training with that for generator equipment.

END OF SECTION 263600

## SECTION 406343 - PROGRAMMABLE LOGIC CONTROLLERS (PLC)

## PART 1 – GENERAL

## 1.1 SUMMARY

- A. Furnish, test, install and place in satisfactory operation all programmable logic controllers (PLC), with all spare parts, accessories, and appurtenances as herein specified and as shown on the Drawings.

## 1.2 RELATED SECTIONS

- A. Section 260519 Low-Voltage Electrical Power Conductors and Cables
- B. Section 260523 Control-Voltage Electrical Power Cables
- C. Section 260526 Grounding and Bonding For Electrical Systems
- D. Section 260529 Hangers and Supports For Electrical Systems
- E. Section 260913 Electrical Power Monitoring
- F. Section 262913.06 Soft-Start Motor Controllers
- G. Section 262913.06 Diesel-Engine-Driven Generator Sets
- H. Section 263600 Transfer Switches

## 1.3 ACTION SUBMITTALS

- A. Product Data:
  - 1. Programmable Logic Controller.
  - 2. Input/Output Modules.
  - 3. Power Supplies.
  - 4. Communications Equipment.
  - 5. Uninterruptible Power Supplies.
  - 6. Enclosure.
  - 7. Circuit Breakers.
- B. Product Data Submittals: For each product.
  - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for enclosure.

2. Include rated capacities, operating characteristics, electrical characteristics, and accessories.

C. Shop Drawings:

1. Include plans, elevations, sections, details showing equipment layout, minimum clearances, conductor entry provisions, gutter space, and installed features and devices.
2. Include material lists for each component.
3. Wiring Diagrams: Show connections within PLC enclosure as well as connections to external input, output, and networked devices and existing SCADA system. Show power sources and integral overcurrent protection.
4. Provide points list and sequence of operations.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: Provide for PLC system designer/programmer/integrator.
- B. Field quality-control reports.

1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For each type of product to include in operation and maintenance manuals.
  1. Include the following:
    - a. Features and operating sequences.
    - b. List of all factory settings and instructions, including software, where applicable.
  2. Electronic copy of ladder logic in format as required by Owner and printout of ladder logic.

1.6 FIELD CONDITIONS

- A. Interruption of existing SCADA control system: Do not interrupt existing SCADA system except for integration of upgrades to existing system.
  1. Notify Owner no fewer than seven days in advance of proposed interruption.
  2. Do not proceed with interruption without Owner's written permission.

1.7 WARRANTY

- A. Manufacturer's Warranty: Manufacturer agrees to repair or replace components of PLC system that fail in materials or workmanship within specified warranty period.
  1. Warranty Period: 18 months from date of Substantial Completion.

## 2.1 PROGRAMMABLE LOGIC CONTROLLERS - GENERAL

- A. Comply with UL 508A Standard for Industrial Control Panels.
- B. Construct panel to minimum 10kAIC.
- C. Furnish programmable controllers (PLCs) as specified herein and as shown on the Drawings. PLCs shall be provided complete with backplane, power supply, I/O cards, special function cards, instructions, memory, input/output capacity, and appurtenances to provide all features and functions as described herein.
- D. All components of the PLC system shall be of the same manufacturer and compatible with the existing Micrologix 1400 system. Components shall be fully tested units suitable for an industrial environment with associated electrical noise. The PLC system shall have been tested to meet the requirements of NEMA Standard ICS 2-230 (Arc Test) and IEEE C37.90.1 (SWC). The processing unit shall perform the operations functionally described herein based on the program stored in memory and the status of the inputs and outputs.
- E. Programmable controllers shall be designed to operate in an industrial environment. The PLC shall operate in an ambient temperature range of 0 -60 C and a relative humidity of 5-95 percent, non-condensing. The PLC shall operate on supply voltages of 90-132 VAC at 47-63 Hz or 24 VDC if provided with a battery backup system. An integral fuse shall be provided on the power supply for short circuit protection and shall be front panel accessible. Integral overcurrent and undervoltage protection shall be provided on the power supply.
- F. Where applicable, the minimum PLC backplane size shall be 7 slots, not including power supply slots.
- G. Memory and processor shall be adequate for all control functions specified.

## 2.2 PROCESSORS

- A. The processor and its associated memory shall be enclosed in a modular enclosure. A multiple-position selector switch or equivalent shall be used to select processor operating mode. LED-type indicating lights shall be provided to indicate processor, memory, and battery status. Errors in memory shall be recognized and shall activate the memory error indicating lights. The PLC processor shall monitor the internal operation of the PLC for failure and provide an alarm output. Nonvolatile memory in the form of a manufacturer supplied industrial CompactFlash card or equivalent technology shall be required to maintain the entire current program and firmware of the controller in the event of power loss. The program shall be updated onto the flash memory each time a program change such as an online edit or tag value is changed. When nonvolatile memory (flash memory) is not available for certain controller models as offered by the PLC manufacturer, lithium batteries shall be used to maintain process RAM memory for at least one year in the event of power loss. The lithium battery unit shall be an externally mounted battery assembly with the highest available capacity. The PLC shall send an alarm to the plant control system if battery level is low.

- B. The instruction set for the PLC shall conform to the requirements of IEC 61131-3. Each PLC shall have the capability to run all five of the standard IEC 61131-3 languages simultaneously. These five languages shall be:
  - 1. Ladder Diagram.
  - 2. Structured Text.
  - 3. Instruction List.
  - 4. Function Block Diagram.
  - 5. Sequential Function Chart.
- C. Additional co-processors or modules may be necessary and shall be furnished as required to meet the functions specified herein and the indicated control functions.
- D. PLC processors shall be provided with substantial user program, data and logic memory to allow for future expansion of the overall system. The total memory used on each processor shall be less than 60% of available memory at project completion.

## 2.3 COMMUNICATIONS

- A. PLC communications shall be provided as indicated on the control systems drawing.
- B. In addition to a communications port for the control system network, communication ports shall be provided for any other devices required.
- C. The PLC shall be able to support various types of fieldbus communication systems for data links to field instruments in addition to connected equipment such as power monitors, motor controllers, generator, transfer switches, etc. As a minimum, Profibus DP, Foundation Fieldbus, Modbus RTU Master and Slave, TCP/IP Ethernet shall be supported. The Contractor shall coordinate the efforts of the necessary parties to accomplish the required device and data table addressing between each PLC and the associated connected equipment.
- D. Additional communication modules or protocol gateways may be required to support specific communication protocols required under this Contract and shall be provided as required to provide a complete and functional system.

## 2.4 INPUT/OUTPUT SUBSYSTEMS

- A. Input/output hardware shall be plug-in modules in associated I/O backplane/chassis or DIN-rail mounting assemblies. Each unit shall handle the required number of inputs and outputs plus a minimum of 15 percent active pre-wired spares for each I/O type furnished, plus indicated future I/O module space.



- B. Discrete inputs shall be 24 VDC or 120 VAC signals from dry field contacts. Discrete outputs shall be 24 VDC or 120 VAC outputs sourced from the PLC, or dry relay contacts (2A minimum) as required. The PLC shall provide momentary and latched outputs as required to interface with motor controls and external devices. Interposing relays shall be provided where required to interface with field equipment. Electrical isolation shall be provided where required. Maximum density for discrete I/O modules shall be 32 per input module and 16 per output module.
- C. Analog input circuits shall be isolated, minimum 16-bit resolution type. Analog input hardware shall be provided as required for all types of analog inputs being transmitted to the PLC. In general, analog input modules shall be capable of receiving 4-20 mA signals. Analog outputs shall be coordinated with the receivers but shall generally be isolated 24 VDC 4-20 mA outputs powered from the PLC. Each input/output circuit shall have optical isolation to protect the equipment against high voltage transients.
- D. Input/output modules shall be configured for ease of wiring and maintenance. The modules shall be connected to wiring arms that can be disconnected to permit removal of a module without disturbing field wiring. Covers shall be provided to prevent operator personnel from inadvertently touching the terminals. The process interface modules shall be provided with screw-type terminal blocks with barriers between adjacent terminals for connection of field inputs. Terminals shall be suitable for accepting up to and including No. 14 AWG wire. All DC output circuits to the field shall include fuses, either integral or at the terminal strip. Output failure mode shall be selectable so that upon station or communication system failure all outputs shall be placed either in the non-conducting mode or remain as were prior to failure. Light-emitting diodes shall be provided for status indication for each input and output point.
- E. External power supplies shall be provided with the PLC as required to meet specified installed I/O power requirements plus spares. Power supplies shall be modular units, shall be fully redundant and shall alarm the PLC upon failure. Power supplies shall have a line regulation of 0.05% and meet the environmental and power requirements specified herein for the PLC.

## 2.5 REMOTE I/O SUBSYSTEMS

- A. Remote I/O shall be either PLC backplane type I/O or field modules as manufactured by the PLC manufacturer. Field modules shall meet the requirements herein. Remote I/O processor or communication modules shall be modular and individually replaceable.
- B. Remote I/O shall communicate with the PLC using the PLC manufacturer's standard protocol or an open standard network such as DeviceNet, Ethernet IP, ProfiNet, Foundation Fieldbus, Modbus TCP/IP, or equal.

## 2.6 INPUT/OUTPUT CIRCUIT ARRANGEMENT

- A. Signal and control circuitry to individual input/output boards shall be arranged such that board failure shall not disable more than one half of the control loops within any group of controlled equipment (e.g., one pump out of a group of three pumps, two pumps out of four, etc.). Where possible, individual control loops and equipment shall be assigned to individual boards such that failure of the board will disable only one loop or piece of equipment.

## 2.7 PROGRAMMING SOFTWARE

- A. The PLC programming and configuration software shall be the manufacturer's latest, full-featured version, Windows-based, and shall be fully compliant with IEC 61131-3 standards. The software package shall consist of all programming, configuration, and documentation software needed to place the control and information system in satisfactory operation. The software shall allow on-line and off-line program development and documentation. PLC programming software shall include documentation on optical media.
- B. Provide PLC programming software and registered to the Owner.

## 2.8 SOURCE QUALITY CONTROL

- A. Factory Tests: Test and inspect components and assemblies in accordance with manufacturer's standard requirements and UL 508A. Include results of tests.

## 3.1 INSTALLATION

- A. Anchor control enclosure to wall and floor by bolting. Provide workspace and clearances required by NFPA 70.
- B. Identify components according to Section 260553 "Identification for Electrical Systems."
- C. Wiring Method: Install cables in raceways except within electrical enclosures.
  - 1. Comply with requirements for raceways specified in Section 260533.13 "Conduits for Electrical Systems."
- D. Wiring within Enclosures: Bundle, lace, and train conductors to terminal points with no excess and without exceeding manufacturer's limitations on bending radii.
- E. Ground equipment according to Section 260526 "Grounding and Bonding for Electrical Systems."
- F. Connect wiring according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables."
- G. Connect twisted pair cable according to Section 260523 "Control-Voltage Electrical Power Cables."
- H. Route and brace conductors according to manufacturer's written instructions and Section 260529 "Hangers and Supports for Electrical Systems." Do not obscure manufacturer's markings and labels.

### 3.2 FIELD QUALITY CONTROL

#### A. Administrant for Tests and Inspections:

1. Administer and perform tests and inspections per manufacturer requirements.

#### B. Tests and Inspections:

1. After installing equipment, test for compliance with requirements.
2. Visual and Mechanical Inspection:
  - a. Compare equipment nameplate data with Drawings and Specifications.
  - b. Inspect physical and mechanical condition.
  - c. Inspect anchorage, alignment, grounding, and required clearances.
  - d. Verify that the unit is clean.
  - e. Verify tightness of all connections.
    - 1) Inspect for physical damage, cracked insulation, broken leads, tightness of connections, defective wiring, and overall general condition.
    - 2) Verify that fuse or circuit-breaker ratings match Drawings.
  - f. Check for electrical continuity of circuits and for short circuits.
  - g. Inspect for physical damage, proper installation and connection, and integrity of barriers, covers, and safety features.
3. Demonstrate functionality of all programming including that existing programming was not impacted by work. Demonstrate operator interface integration.
4. Report results of tests and inspections in writing. Record settings of adjustable components.

### 3.3 REQUIREMENTS

- A. Program PLC programming and operator interface to perform all indicated functions. In addition, PLCs shall be programmed to provide additional functions described in other Sections.
- B. PLC programming shall make use of the various IEC languages as appropriate to the specific task and shall be performed in a modular style making extensive use of program blocks (subroutines) and program variables to be passed to the program blocks for specific equipment. It is the intent of this requirement to allow for enhanced readability and ease of modification of the program code through the elimination of multiple instances of repeated code for the same function in a "hard-coded" style.
- C. Extensive comments shall be placed in the program code to describe the functions of all elements of the program code. PLC code that does not contain comments shall be rejected.

### 3.4 DEMONSTRATION

- A. Train Owner's maintenance personnel to adjust, operate, and maintain PLC system and related equipment. Coordinate training with training modules of other equipment.

END OF SECTION 406343

**ATTACHMENT 1**  
**Escrow Agreement (Retainage)**

## ATTACHMENT 1 ESCROW AGREEMENT

THIS AGREEMENT, made this \_\_\_\_\_ day of \_\_\_\_\_, 2025, among the **BEDFORD REGIONAL WATER AUTHORITY** ("BRWA") and \_\_\_\_\_ ("Contractor") and \_\_\_\_\_ a trust company, bank, or savings and loan institution with its principal office located in Virginia ("hereinafter referred to collectively as "Bank"); and \_\_\_\_\_ ("Surety"), provides:

### I.

The BRWA and the Contractor have entered into a Contract with respect to the **Central WTP Electrical Improvements Phase 1** ("Contract"). This Agreement is pursuant to, but in no way amends or modifies, the Contract. Payments made hereunder or the release of funds from escrow shall not be deemed approval or acceptance of performance of the Contractor.

### II.

In order to assure full and satisfactory performance by the Contractor of its obligations under the Contract, the BRWA is required thereby to retain certain amounts otherwise due the Contractor. The Contractor has, with the approval of the BRWA, elected to have these retained amounts held in escrow by the Bank. This agreement sets forth the terms of the escrow. The Bank shall not be deemed a party to, bound by, or required to inquire into the terms of the Contract or any other instrument or agreement between the BRWA and the Contractor.

### III.

The BRWA shall from time to time pursuant to the Contract pay to the Bank amounts retained by it under the Contract. Except as to amounts actually withdrawn from escrow by the BRWA, the Contractor shall look solely to the Bank for the payment of funds retained under the Contract and paid by the BRWA to the Bank.

The risk of loss by the diminution of the principal of any funds invested under the terms of the Contract shall be solely upon the Contractor.

Funds and securities held by the Bank pursuant to this escrow agreement shall not be subject to levy, garnishment, attachment, lien, or other process whatsoever. Contractor agrees not to assign, pledge, discount, sell or otherwise transfer or dispose of its interest in the escrow account or any part thereof, except to the Surety.

#### IV.

Upon receipt of checks or warrants drawn by the BRWA and made payable to it as escrow agent, the Bank shall promptly notify the Contractor, negotiate the same deposit or invest and reinvest the proceeds in approved securities in accordance with the written instructions of the Contractor. In no event shall the Bank invest the escrowed funds in any security not approved.

#### V.

The following securities, and none other, are approved securities for all purposes of this Agreement:

- (1) United States Treasury Bonds, United States Treasury Notes, United States Treasury Certificates of Indebtedness or United States Treasury Bills.
- (2) Bonds, notes and other evidence of indebtedness unconditionally guaranteed as to the payment of principal and interest by the United States,
- (3) Bonds or notes of the BRWA,
- (4) Bonds of any political subdivision of the Commonwealth of Virginia, if such bonds carried, at the time of purchase by the Bank or deposit by the Contractor, a Standard and Poor's or Moody's Investors Service rating of at least "A," and
- (5) Certificates of deposit issued by commercial Banks located within the Commonwealth of Virginia, including, but not limited to, those insured by the Bank and its affiliates,
- (6) Any bonds, notes or other evidences of indebtedness listed in Sections (1) through (3) may be purchased pursuant to a repurchase agreement with a bank, within or without the Commonwealth of Virginia having a combined capital, surplus and undivided profit of not less than \$25,000,000, provided the obligation of the Bank to repurchase is within the time limitations established for investments as set forth herein. The repurchase agreement shall be considered a purchase of such securities even if title, and/or possession of such securities is not transferred to the Escrow Agent, so long as the repurchase obligation of the Bank is collateralized by the securities themselves, and the securities have on the date of the repurchase agreement a fair market value equal to at least 100% of the amount of the repurchase obligation of the Bank, and the securities are held by a third party, and segregated from other securities owned by the Bank.

No security is approved hereunder which matures more than five (5) years after the date of its purchase by the Bank or deposit by the Contractor.

#### VI.

The Contractor may from time to time withdraw the whole or any portion of the escrowed funds by depositing with the Bank approved securities in an amount equal to, or in excess of, the amount so withdrawn. Any securities so deposited or withdrawn shall be valued at such time of

deposit or withdrawal at the lower of par or market value, the latter as determined by the Bank. Any securities so deposited shall thereupon become a part of the escrowed fund.

Upon receipt of a direction signed by the BRWA Finance Department, the Bank shall pay the principal of the fund, or any specified amount thereof, to the BRWA for deposit to the appropriate fund and account within the BRWA's approved accounting structure. Such payment shall be made in cash as soon as is practicable after receipt of the direction.

Upon receipt of a direction signed by the BRWA Finance Department, the Bank shall pay and deliver the principal of the fund, or any specified amount thereof, to the Contractor, in cash or in kind, as may be specified by the Contractor. Such payment and delivery shall be made as soon as is practicable after receipt of the direction.

## VII.

For its services hereunder, the Bank shall be entitled to a reasonable fee in accordance with its published schedule of fees or as may be agreed upon by the Bank and the Contractor. Such fee and any other costs of administration of this Agreement shall be paid from the income earned upon the escrowed fund and, if such income is not sufficient to pay the same, by the Contractor.

## VIII.

The net income earned and received upon the principal of the escrowed fund shall be paid over to the Contractor in quarterly or more frequent installments. Until so paid or applied to pay the Bank's fee or any other costs of administration, such income shall be deemed a part of the principal of the fund.

## IX.

The Surety undertakes no obligation hereby but joins in this Agreement for the sole purpose of acknowledging that its obligations as surety for the Contractor's performance of the Contract are not affected hereby.



WITNESS the following signatures, all as of the day and year first above written.

**BEDFORD REGIONAL  
WATER AUTHORITY**

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Name

\_\_\_\_\_  
Title

**[BANK]**

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Name

\_\_\_\_\_  
Title

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_  
Address

**[CONTRACTOR]**

\_\_\_\_\_  
Signature of Officer, Partner or Owner

\_\_\_\_\_  
Name

\_\_\_\_\_  
Title

**[SURETY]**

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Name

\_\_\_\_\_  
Title

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_  
Address

|                                                                         |
|-------------------------------------------------------------------------|
| <p><b>ATTACHMENT 2</b></p> <p><b>Purchased Equipment Submittals</b></p> |
|-------------------------------------------------------------------------|



Powering Business Worldwide

**TRANSFER SWITCH PRODUCT SUBMITTAL**  
**Contactor Design**

**Customer Order No:**  
425082RB1-2

**General Order No:**  
KJAA05749

**Item No:**  
001

**Job Name:**  
BRWA – Central WTP  
Improvements

**Customer Name:**  
Carter CAT

**Submittal Date:**  
February 11, 2025

**PRODUCT SPECIFICATIONS**

**Catalog No:** ATC9C5X30600XSU

**Quantity:** 1

**General Description:**

Automatic Transfer Switch with ATC-900  
277/480 Volts, 60 HZ, 3 Poles, 4W, 600 Amperes, NEMA 1 Enclosure,  
UL-1008 Listed

**With Options:**

|        |     |     |      |     |     |     |     |      |     |       |
|--------|-----|-----|------|-----|-----|-----|-----|------|-----|-------|
| 1B     | 1C  | 1D  | 2    | 3B  | 3C  | 3D  | 4   | 5H   | 5J  | 5K    |
| 5L     | 5M  | 6B  | 7    | 8E  | 10B | 10D | 11A | 11B  | 12C | 12D   |
| 12G    | 12H | 14E | 14F  | 15G | 15H | 22  | 23M | 26H  | 26J | 26K   |
| 26L    | 26M | 29G | 29J  | 32A | 35A | 42  | 48F | 48M1 | 48P | 48RAC |
| 48racB | 48U | 49C | 61F1 | 80B |     |     |     |      |     |       |

|                                     |                          |                          |                                                    |
|-------------------------------------|--------------------------|--------------------------|----------------------------------------------------|
| <input type="checkbox"/>            | APPROVED                 | <input type="checkbox"/> | REJECTED/RESUBMIT AS SPECIFIED                     |
| <input checked="" type="checkbox"/> | APPROVED AS NOTED        | <input type="checkbox"/> | NO ACTION REQUIRED                                 |
| <input type="checkbox"/>            | REVISE AS NOTED/RESUBMIT | <input type="checkbox"/> | SUBMITTAL NOT REQUIRED/<br>RETURNED WITHOUT REVIEW |

Approval is only for general conformance with the Project's design concept and the information given in the Contract Documents. Contractor is responsible for dimensions to be confirmed and correlated at the job site; information that pertains solely to the fabrication process or to the means and methods of construction; coordination of the work of all trades; and performing work in a safe and satisfactory manner. This approval does not modify Contractor's duty to comply with the Contract Documents.

By: *Rachel C. Cornwell*

Date: 03/03/25



**Comments:**

- Page 4 of 26: Make hardwired connections to provide the preferred and alternate source inputs to the SCADA system per sheet EP640.
- Page 7 of 26: Clarify that ATS will be provided with the ability to communicate - this appears to conflict with option selections on page 13-14 of 26.



*Powering Business Worldwide*

**Automatic Transfer Switch  
Catalog String Explanation**

**CATALOG STRING EXPLANATION**

AT = Automatic Transfer Switch

C9 = ATC-900 Microprocessor Based Logic

5X = Contactor, 3 position

3 = 3 poles

0600 = 800A

X = 480 Volts 60 Hz

S = NEMA 1 Enclosure.

U = UL-1008 Listed



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## **Automatic Transfer Switch Logic Description**

### **ATC-900 Transfer Logic – Open Transition**

The ATC-900 Transfer is a programmable, microprocessor-based monitoring device designed for use in Open Transition transfer switch applications. It provides superior precision and versatility in both programming and data access, which are performed using the touch-sensitive function keys in conjunction with an easy-to-read illuminated, alphanumeric LED display window. In addition, the ATC-900 Transfer is 100% communications-ready. Some of the ATC-900 Transfer features include:

- Applicable for use on any 120VAC – 38KV, three phase or single-phase system operating at 50 / 60 HZ.
- True RMS three phase voltage sensing on Normal, Emergency and Load. (+/- 1% of nominal voltage)
- Frequency sensing on Normal and Emergency. (40 – 60 Hz, +/- 0.1 Hz digital readout)
- Historical data on most recent events (up to 450 events) are exportable to Windows based software applications such as spread sheets and data bases.
- Factory programming will load all customer-specified functions and presets.
- Programmable setpoints stored in non-volatile memory.
- **Commit/No Commit during Time Delay Normal to Emergency.**
- Load monitoring and delayed transition features.
- Status indicator lights: Source 1 Available, Source 2 Available, Source 1 Connected, Source 2 Connected, Source 1 Preferred, Source 2 Preferred, Load Energized
- Instrumentation: Voltmeter, Line-to-line voltage reading on sources 1 and 2 and load, Frequency meter, Source available time, Source connected time, Source run time



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### **Automatic Transfer Switch Power Switching Panel**

The power switching panel consists of the main power contacts which connect and disconnect the load from the sources of power and an electrical transfer mechanism. The power switching panel includes the following features:

- Main contacts are rugged for maximum arc suppression and isolation during power transfer.
- Main contacts employ De-ion Arc Quenchers and contact arcing horns for long life and reduced contact surface pitting and burning.
- Conservatively rated main contacts ensure long life at 100% of nameplate rating.
- Meets or exceeds the standard set forth in UL 1008.
- Interlocking main contacts ensures that both power sources cannot be paralleled.
- Operating mechanism utilized linear actuator designed for years of reliable performance. The design allows for easy verification of switch positions.
- Manual operating handle provided.
- Two normally open, two normally closed auxiliary contacts, rated 120VAC at 10 amps, for both normal and emergency sources supplied as standard. *Make hardwired connections to provide the preferred and alternate source inputs to the SCADA system per sheet EP640.*
- Power panel control wiring terminated to insulated, quick-disconnect plugs for interconnection with logic panel. Provides positive, safe disconnecting for electrical isolation of electrical operator as well as corresponding logic panel.



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**Automatic Transfer Switch  
Features**

***Feature    Description***

- |     |                                                                                                                                                                                          |
|-----|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1B  | Provides a time delay when transferring from the Normal Power Source to the Emergency Power Source. Adjustable 0 second – 999 seconds.                                                   |
| 1C  | Provides a time delay to disconnect the normal source once source is determined to be no good. Adjustable 0-10 seconds.                                                                  |
| 1D  | Provides a time delay to reconnect the normal source once source is determined to be good. Adjustable 0-60 seconds.                                                                      |
| 2   | Delays initiation of the engine start circuit in order to override momentary power outages or voltage fluctuations of the normal power source. Adjustable 0 - 120 seconds.               |
| 3B  | Delays transfer from Emergency Power Source to the Normal Power Source to permit stabilization of the normal power source before retransfer is made. Adjustable 0 second – 9999 seconds. |
| 3C  | Provides a time delay to disconnect the emergency source once source is determined to be no good. Adjustable 0-10 seconds.                                                               |
| 3D  | Provides a time delay to reconnect the emergency source once source is determined to be good. Adjustable 0-60 seconds.                                                                   |
| 4   | Permits the generator to continue to run unloaded after retransfer to normal has occurred. Adjustable 0 second – 9999 seconds.                                                           |
| 5H  | Source 2, three phase rotation protection.                                                                                                                                               |
| 5J  | Source 2, all phase under voltage / under frequency protection.                                                                                                                          |
| 5K  | Source 2, all phase over voltage / over frequency protection.                                                                                                                            |
| 5L  | Source 2, three phase voltage unbalance / phase loss.                                                                                                                                    |
| 5M. | Provides Single Phase Loss Sensing on the Emergency Source                                                                                                                               |
| 6B  | Test push button for testing of transfer switch operation.                                                                                                                               |



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- 7 Time delay emergency fail, adjustable 0 – 6 seconds.
- 8E Bypass Feature for all active timers
- 10B Source Selector - Utility to Utility or Utility to Generator
- 10D Source Selector - Generator to Generator
- 11A ATS Health
- 11B Maintenance Watch
- 12C Pilot light connected to normal source.
- 12D Pilot light connected to emergency source.
- 12G Pilot light normal source available.
- 12H Pilot light emergency source available.
- 14E Normal Source 1 present 1NO/1NC
- 14F Emergency Source 2 present 1NO/1NC
- 15G Auxiliary contact, switch position normal, 3NO/3NC.
- 15H Auxiliary contact, switch position emergency, 3NO/3NC.
- 22 Ground Bar
- 23M Plant exerciser, selectable load/no load with fail safe. Up to 12 user specified dates.
- 26H Normal source sensing phase reversal.
- 26J Source 1, all phase under voltage / under frequency protection.
- 26K Source 1, all phase over voltage / over frequency protection.
- 26L Source 1, three phase voltage unbalance / phase loss.
- 26M Source 1, three phase voltage unbalance / phase loss.





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- 29G Auto/Manual Operation, field selectable
- 29J Auto/Manual selectable return to Normal source, Always Auto Normal to Emergency
- 32A Time delay in the Neutral (off) position when the load is transferred in either direction to prevent excessive inrush currents due to out-of-phase switching of large inductive loads.
- 35A Pre-transfer Signal Device – 1 NO/NC contacts open/close on a timed basis (adjustable 0 – 120 seconds) to allow the load to be de-energized prior to transfer in either direction.
- 42 IBC/CBC Seismic Qualified
- 48F MODBUS RTU Communication capability
- 48M1 I/O Module, 4 Inputs – 4 Outputs
- 48P Power supply for remote annunciator.
- 48RAC Remote annunciator with control - shipped loose.
- 48RACB Enclosure for remote annunciator
- 48U USB port for memory stick
- 49C Multi-tap transformer – for internal ATS use only
- 61F Power Loss Buffer for ATC Comm – includes DCT Module
- 80B Input Terminal Blocks

Clarify that ATS will be provided with the ability to communicate - this appears to conflict with option selections on page 13-14 of 26.



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### Automatic Transfer Switch

#### *Normal Incoming Line Lugs*

Cable Terminals:

| Cables / Phase | Conductor Range | Conductor Type |
|----------------|-----------------|----------------|
| 2              | 1/0 - 750 mcm   | CU/AL          |

#### *Emergency Incoming Line Lugs*

Cable Terminals:

| Cables / Phase | Conductor Range | Conductor Type |
|----------------|-----------------|----------------|
| 2              | 1/0 - 750 mcm   | CU/AL          |

#### *Load Lugs*

Cable Terminals:

| Cables / Phase | Conductor Range | Conductor Type |
|----------------|-----------------|----------------|
| 2              | 1/0 - 750 mcm   | CU/AL          |

#### *Neutral Lugs*

Cable Terminals:

| Cables / Phase | Conductor Range | Conductor Type |
|----------------|-----------------|----------------|
| 12             | 1/0 - 750 mcm   | CU/AL          |

### Standard Withstand Ratings:

Rating with upstream circuit breaker

| SWITCH RATING | 480VAC | 600VAC |
|---------------|--------|--------|
| 600           | 50/65  |        |

\*All Ratings in kA, 3 cycle, specific breaker/any breaker



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## Automatic Transfer Switch Logic Set Points

### Features and Setpoints

| OPT<br>NUM                 | DESCRIPTION                    | RANGE                                                                                                                                                                 | FACTORY<br>DEFAULT |
|----------------------------|--------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|
| <b>GENERAL SETTINGS</b>    |                                |                                                                                                                                                                       |                    |
|                            | Set New Password               | 0000 to 9999                                                                                                                                                          | 900                |
|                            | Selected Language              | English, French, or Spanish                                                                                                                                           | English            |
|                            | Nominal Frequency              | 50 or 60 Hz                                                                                                                                                           | As<br>ordered      |
|                            | Nominal Voltage                | 110 to 600 volts                                                                                                                                                      | As<br>ordered      |
|                            | Number of Phases               | 1 or 3                                                                                                                                                                | As<br>ordered      |
|                            | Number of Gens                 | 0, 1, or 2                                                                                                                                                            | 1                  |
|                            | Preferred Source               | Source 1 or Source 2                                                                                                                                                  | Source 1           |
|                            | PT Ratio                       | 2:1 - 500:1                                                                                                                                                           | As<br>ordered      |
|                            | CT Ratio                       | 200-5000                                                                                                                                                              | -                  |
|                            | Day Light Savings              | On or Off                                                                                                                                                             | 1                  |
|                            | Operating Mode                 | Stand Alone/Master or Slave                                                                                                                                           | Master             |
|                            | Phase Sequence Check           | ABC, CBA or Off                                                                                                                                                       | Off                |
|                            | Commitment to Transfer in TDNE | Yes or No                                                                                                                                                             | No                 |
|                            | Manual Retransfer              | Auto, Manual, or External                                                                                                                                             | As<br>ordered      |
|                            | Modbus Address                 | 1 to 247                                                                                                                                                              | 1                  |
|                            | Modbus Baud Rate               | 0 = 9600, 1, Even<br>1 = 9600, 1 Odd<br>2 = 9600, 2, None<br>3 = 9600, 1, None<br>4 = 19200, 1, Even<br>5 = 19200, 1, Odd<br>6 = 19200, 2, None<br>7 = 19200, 1, None | 9600               |
| <b>TRANSITION SETTINGS</b> |                                |                                                                                                                                                                       |                    |
| <b>47</b>                  | Closed Transition              |                                                                                                                                                                       |                    |
|                            | Closed Transition On/Off       | On or Off                                                                                                                                                             | As                 |



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|                        |                                 |                                                                         |               |
|------------------------|---------------------------------|-------------------------------------------------------------------------|---------------|
|                        | Closed Voltage Difference       | 1 - 5%                                                                  | ordered<br>2% |
|                        | Closed Frequency Difference     | 0.0 Hz to 0.3 Hz                                                        | 0.3           |
| 32                     | Open - In-phase Transition      |                                                                         |               |
|                        | In-phase On/Off                 | Disable, in-phase default to alarm, in-phase default to open transition | As<br>ordered |
|                        | In-phase Frequency Difference   | 0.0 Hz to 3.0 Hz                                                        | 1.0           |
|                        | Synchronization Timer           | 1 min to 60 min                                                         | 5             |
| 32                     | Open - Delayed Transition       |                                                                         |               |
|                        | Time Delay Neutral              | 0-120 seconds                                                           | 0             |
|                        | Load Voltage Decay              | 2 to 30% of Nominal Voltage                                             | 6%            |
| <b>Time Delays</b>     |                                 |                                                                         |               |
| 1a                     | Time Delay Normal to Emergency  | 0 -9999 seconds                                                         | 0:00          |
| 3a                     | Time Delay Emergency to Normal  | 0 -9999 seconds                                                         | 5:00          |
| 35A                    | Time Delay Pre-Transfer         | 0-120 seconds                                                           | 0:01          |
| 35C                    | Time Delay Post-Transfer        | 0-120 seconds                                                           | 0:10          |
| 2A                     | Time Delay Engine 1 Start       | 0-120 seconds                                                           | 0:03          |
|                        | Time Delay Engine 2 Start       | 0-120 seconds                                                           | 0:03          |
| 4A                     | Time Delay Engine Cool-off      | 0-9999 seconds                                                          | 5:00          |
| 7A                     | Time Delay Emergency Fail Timer | 0-6 seconds                                                             | 0:06          |
|                        | Voltage Unbalance Time Delay    | 10 sec to 30 sec                                                        | 0:30          |
| <b>SOURCE SETTINGS</b> |                                 |                                                                         |               |
| 26P                    | Source 1 Undervoltage Dropout   | 70% to 97% of nominal                                                   | 80%           |
|                        | Source 1 Undervoltage Pickup    | (dropout + 2%) to 99% of nominal                                        | 90%           |
| 5P                     | Source 2 Undervoltage Dropout   | 70% to 97% of nominal                                                   | 80%           |
|                        | Source 2 Undervoltage Pickup    | (dropout + 2%) to 99% of nominal                                        | 90%           |
| 26K                    | Source 1 Overvoltage Dropout    | 105% to 120% of nominal (0=disabled)                                    | 115%          |
|                        | Source 1 Overvoltage Pickup     | 103% of nominal to (dropout - 2%) (0=disabled)                          | 105%          |
| 5k                     | Source 2 Overvoltage Dropout    | 105% to 120% of nominal (0=disabled)                                    | 115%          |
|                        | Source 2 Overvoltage Pickup     | 103% of nominal to (dropout - 2%) (0=disabled)                          | 105%          |
| 26J                    | Source 1 Underfrequency Dropout | 90% to 97% of nominal (0=disabled)                                      | 94%           |
|                        | Source 1 Underfrequency Pickup  | (dropout + 1 Hz) to 99% of nominal (0=disabled)                         | 96%           |
| 5J                     | Source 2 Underfrequency Dropout | 90% to 97% of nominal (0=disabled)                                      | 94%           |
|                        | Source 2 Underfrequency Pickup  | (dropout + 1 Hz) to 99% of nominal (0=disabled)                         | 96%           |
| 26N                    | Source 1 Overfrequency Dropout  | 103% to 110% (0=disabled)                                               | 106%          |
|                        | Source 1 Overfrequency Pickup   | 101% to (dropout – 1 Hz) (0=disabled)                                   | 104%          |
| 5N                     | Source 2 Overfrequency Dropout  | 103% to 110% (0=disabled)                                               | 106%          |



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|                                                                                 |                                                 |                                                                                     |               |
|---------------------------------------------------------------------------------|-------------------------------------------------|-------------------------------------------------------------------------------------|---------------|
|                                                                                 | Source 2 Overfrequency Pickup                   | 101% to (dropout – 1 Hz) (0=disabled)                                               | 104%          |
| 26L                                                                             | Source 1 Voltage Unbalanced                     |                                                                                     |               |
|                                                                                 | Source 1 Percent for Unbalanced Voltage Dropout | 5 to 20% of Phase to Phase Voltage Unbalance (0=disabled)                           | 20%           |
|                                                                                 | Source 1 Percent for Unbalanced Voltage Pickup  | 3% to (Dropout - 2%) (0=disabled)                                                   | 10%           |
| 5L                                                                              | Source 2 Voltage Unbalanced                     |                                                                                     |               |
|                                                                                 | Source 2 Percent for Unbalanced Voltage Dropout | 5 to 20% of Phase to Phase Voltage Unbalance (0=disabled)                           | 20%           |
|                                                                                 | Source 2 Percent for Unbalanced Voltage Pickup  | 3% to (Dropout - 2%) (0=disabled)                                                   | 10%           |
| <b>ENGIEN TEST/PLANT EXERCISER (PE1 and PE2 are independently programmable)</b> |                                                 |                                                                                     |               |
| 6B                                                                              | Engine Test Pushbutton on Panel                 |                                                                                     |               |
|                                                                                 | Test Mode                                       | No Load, Load Transfer, Disabled                                                    | Load Transfer |
|                                                                                 | Engine Run Test Time                            | 0 min to 600 min                                                                    |               |
| 23M                                                                             | PE Time Delay Normal to Emergency               | 0-9999 seconds                                                                      | 1 minute      |
|                                                                                 | PE Time Delay Emergency to Normal:              | 0-9999 seconds                                                                      | 1 minute      |
|                                                                                 | PE Time Delay Engine Cooldown                   | 0-9999 seconds                                                                      | 5 minutes     |
|                                                                                 | PE1/PE2 Test Mode                               | No Load, Load Transfer, Disabled                                                    | Disabled      |
|                                                                                 | PE1 /PE2 Run Time                               | 0 min to 600 min                                                                    | 30 minutes    |
|                                                                                 | PE1 /PE2 Schedule                               | Off, Daily, 7-Day, 14-Day, 28 Day, or Calendar Date (up to 12 user specified dates) |               |
|                                                                                 | PE1 /PE2 Calendar Date                          | Month: 1 - 12; Day: 1 - 31                                                          |               |
|                                                                                 | PE1/PE2 Day of Week                             | 1 SUN, 2 MON, 3 TUE, 4 WED, 5 THU, 6 FRI or 7 SAT                                   |               |
|                                                                                 | PE1 /PE2 Plant Start Time                       | HH:MM AM/PM                                                                         |               |
| <b>ACCESSORY I/O</b>                                                            |                                                 |                                                                                     |               |
|                                                                                 | Accessory I/O Modules                           | 0 - 4                                                                               |               |
| <b>USER ASSIGNAABLE CONTROL OUTPUTS</b>                                         |                                                 |                                                                                     |               |
| 35A                                                                             | Pre-transfer delay timer                        | 0 sec to 120 sec                                                                    | 0:00          |
| 35C                                                                             | Pre and Post Transfer Delay                     | 0 sec to 120 sec                                                                    | 0:00          |
| 36                                                                              | Source 2 Inhibit                                |                                                                                     |               |
| 45A-I                                                                           | Load Sequence                                   | 0 sec to 120 sec                                                                    | 0:00          |
| 45L                                                                             | Selective Load Shed                             |                                                                                     |               |
|                                                                                 | Load Shed Limit (kW)                            |                                                                                     |               |
|                                                                                 | Load Restire Limit (kW)                         |                                                                                     |               |
| 81M                                                                             | Load Bank Control                               |                                                                                     |               |



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#### USER ASSIGNABLE ALARM OUTPUTS

|     |                             |
|-----|-----------------------------|
| 15  | Source 1 Connected          |
| 15  | Source 2 Connected          |
| 81A | General Alarm Contact       |
| 81B | ATS Not in Automatic        |
| 81C | ATS in Test                 |
| 81D | Engine Test Aborted         |
| 81E | Cooldown in Progress        |
| 81F | Engine Start Contact Status |
| 81G | Source 2 Inhibit On         |
| 81H | ATS on Bypass               |

#### USER ASSIGNABLE INPUTS

|     |                          |                                                   |   |
|-----|--------------------------|---------------------------------------------------|---|
| 10  | Preferred Source         | 0 - 2 (0=None, 1=Source 1, 2=Source2, 3=External) | 1 |
| 29L | Manual Retransfer On/Off |                                                   |   |
| 29K | Manual Retransfer        |                                                   |   |
| 26D | Go to Emergency          |                                                   |   |
| 81K | Monitor Mode             |                                                   |   |
| 8E  | Bypass Timers            |                                                   |   |
| 81J | Lockout                  |                                                   |   |
| 37  | Go to Neutral            |                                                   |   |
| 6C  | Remote Engine Test       |                                                   |   |
| 81L | Remote Load Test         |                                                   |   |
| 36  | Emergency Inhibit        |                                                   |   |
| 90B | Slave In                 |                                                   |   |

# Reliability, versatility and performance



3000 A rating shown

Eaton offers a comprehensive portfolio of UL® 1008 Listed automatic transfer switch (ATS) solutions to meet a wide variety of backup power applications.

The contactor type ATS line is not only reliable and simple to operate, but also available in a broad selection of product configurations. When coupled with Eaton's extensive custom engineering capabilities, finding the right transfer switch for your project has never been easier.

Whether your needs are standard commercial, harsh industrial or mission critical, the robust construction and performance of an Eaton ATS sets the standard for maintaining power to critical loads and optimizing system uptime.



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## Product configurations

- Closed and open transition (in-phase, time delayed, load voltage decay)
- 40 A to 3000 A
- Two-, three- and four-pole
- Up to 600 Vac, 50/60 Hz
- Single- or three-phase
- ~~Cam-Lok™ quick-connect terminals~~
- ~~Service entrance—UL 1008 Listed and 100% rated~~
  - ~~Integral circuit breaker with electronic trip (LSI, LSIG, ALSI, ALSIG)~~
  - ~~Arcflash Reduction Maintenance System™ (ARMS) complies with NEC® 240.87~~
- NEMA® 1, 12, 3R, 4X enclosure or open frame design
- Automatic transfer controller—ATC-900, ATC-300+, ATC-100

## Codes and standards

- UL 1008 Listed
- CSA® C22.2 No. 178 Certified
- Seismic qualified—OSHPD, CBC, IBC, UBC Zone 4
- NFPA® 110 and National Electrical Code® (NEC®) Articles 700, 701, 702, 708

## Features and benefits

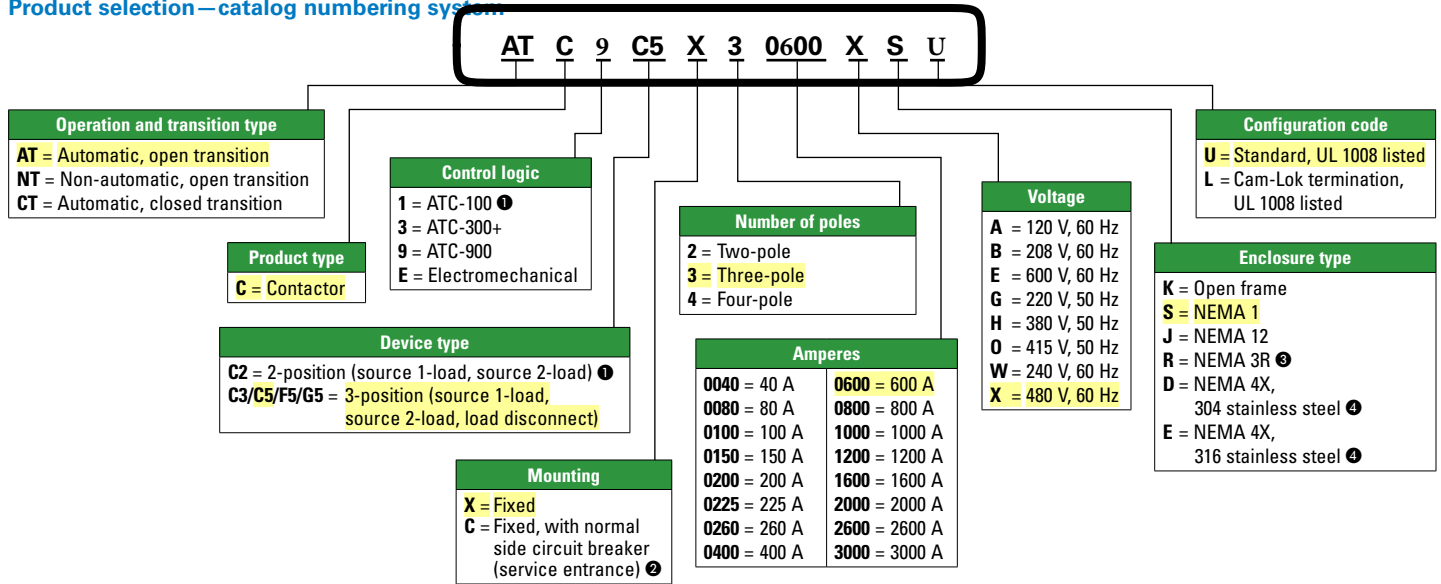
- Automatic and non-automatic modes of operation
- Solenoid-operated double-throw power switch
- Mechanically interlocked to prevent simultaneous connection of both sources
- Quick-connect, multi-tap transformer panel derives control power from either source and permits field selection of system voltage
- Top/bottom cable entry

- Industry standard serial communication (Modbus® RTU)
- Auxiliary contacts indicate position of main contacts
- Dual automatic plant exercisers for scheduling unloaded and loaded engine-generator testing
- Programmable control inputs and relay outputs for load management
- Programmable transition fallback settings
- Advanced source sensing incorporates negative sequence voltage detection for identifying phase loss condition
- USB port for downloading power quality data, managing set point profiles and updating firmware

## Options and accessories

- ATC-900 controller accessory modules:
  - ~~DCT—integral power metering (load) and 24 Vdc external supply power~~
  - I/O—expand programmable control inputs (up to 20) and Form C relay outputs (up to 20)
  - ~~Advanced power quality metering (PXM series) of source or load~~
  - ~~Surge protective device (UL 1449 3rd edition)~~
  - 7-inch color touch HMI remote annunciator to monitor and control a single or multiple (up to eight) transfer switches
  - Ethernet communication (Modbus TCP/IP, BACnet, EtherNet/IP)
  - Thermostat-controlled heater element for outdoor applications
  - Compression lug terminals
  - Non-automatic operator controls and indication lights

Ensure product meets surge withstand requirements of section 263600 2.1.H



❶ Limited to 400 A and below.

❷ Emergency side circuit breaker available upon request. Check with factory.

❸ Stainless steel option available for 1600–3000 A. Check with factory.

❹ 304 or 316 grade stainless steel available for ratings up to 1200 A.

## Standard and optional ATC controller features

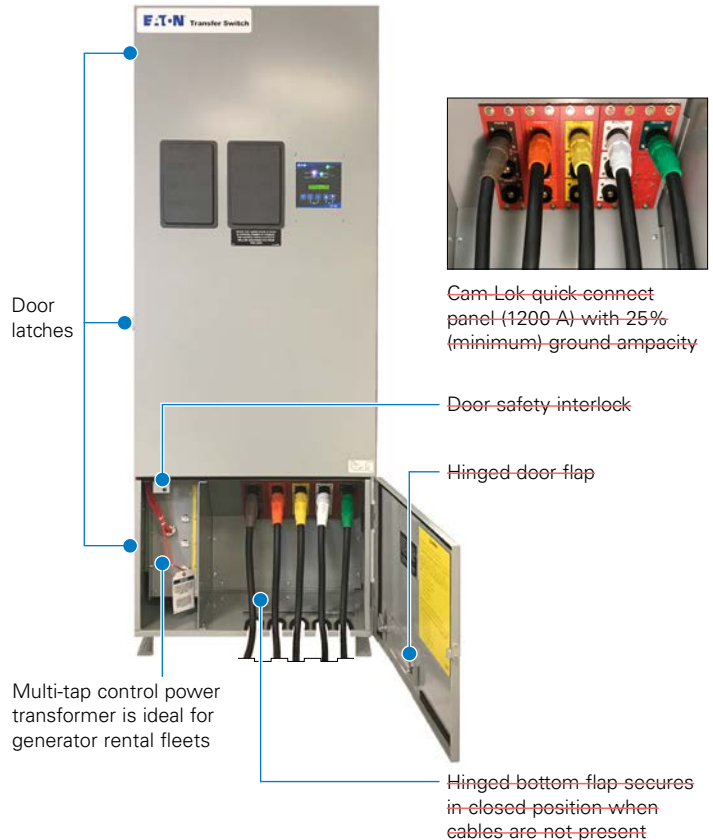
| Description                                                                                | Automatic controller |          |         |
|--------------------------------------------------------------------------------------------|----------------------|----------|---------|
|                                                                                            | ATC-100              | ATC-300+ | ATC-900 |
| Basic transfer control, plant exerciser, time delays, self diagnostics and system settings | Std                  | Std      | Std     |
| Source mimic diagram with LED indication                                                   | Std                  | Std      | Std     |
| Engine test and start contact                                                              | Std                  | Std      | Std     |
| Dual source control power input                                                            | Std                  | Std      | Std     |
| Liquid crystal display (LCD)                                                               | —                    | Std      | Std     |
| Programmable set points and plant exerciser                                                | —                    | Std      | Std     |
| Password protection                                                                        | —                    | Std      | Std     |
| Time-stamped history and event log                                                         | —                    | Std      | Std     |
| Time delay bypass                                                                          | —                    | Std      | Std     |
| Go to Source 2 control input                                                               | —                    | Std      | Std     |
| Pre-transfer and general alarm control outputs                                             | —                    | Std      | Std     |
| Lockout and monitor modes                                                                  | —                    | Std      | Std     |
| Source status output relay contacts                                                        | —                    | Std      | Std     |
| Modbus RTU communication                                                                   | —                    | Std      | Std     |
| Manual retransfer control input                                                            | —                    | Opt      | Std     |
| Source 2 inhibit / load shed input                                                         | —                    | Opt      | Std     |
| USB port—profile and data management                                                       | —                    | —        | Std     |
| Preferred source selection                                                                 | —                    | —        | Std     |
| Dual generator capability                                                                  | —                    | —        | Std     |
| User-configurable inputs/outputs                                                           | —                    | —        | Std     |
| Advanced diagnostics and troubleshooting with pre-/post-event data capture                 | —                    | —        | Std     |
| ATS Health and Maintenance Watch™                                                          | —                    | —        | Std     |
| Integrated load metering                                                                   | —                    | —        | Opt     |
| Load management with selective load shed                                                   | —                    | —        | Opt     |
| External DC supply voltage input                                                           | —                    | —        | Opt     |
| Three source-ATS—master/slave control                                                      | —                    | —        | Opt     |
| Modbus TCP/IP communication ❶                                                              | —                    | Opt      | Opt     |

❶ Modbus TCP/IP option requires use of Modbus RTU port.

## Quick-connect Cam-Lok termination

Transfer switches can be configured with a Cam-Lok power panel for quick connection to a temporary emergency power source (engine generator).

The color-coded power panel resides in an isolated compartment and is constructed of industry standard 16-series Cam-Lok receptacles (male) mounted on a high-strength fiberglass reinforced polyester material. Each Cam-Lok receptacle is rated for 400 A and can be equipped with an optional hinged cover. Ground ampacity can be specified as 25%, 50% or 100% of the transfer switch ampere rating.





## Open transition—standard dimensions and weights ❶

| Transfer switch rating (amperes) | Device type | Enclosure    | Dimensions in inches (mm) |                                    |                | Normal, emergency, load connection      | Neutral connection ❷ | Weight in lb (kg)            |
|----------------------------------|-------------|--------------|---------------------------|------------------------------------|----------------|-----------------------------------------|----------------------|------------------------------|
|                                  |             |              | Height                    | Width                              | Depth          |                                         |                      |                              |
| 40–100                           | C2          | N1, N12, N3R | 38.68 (982.5)             | 18.31 (465.1)                      | 13.34 (338.8)  | (1) #14–2/0                             | (3) #14–1/0          | 156 (71)                     |
|                                  |             | N4X          | 37.50 (952.5)             | 17.50 (444.5)                      | 14.34 (364.2)  | (1) #14–2/0                             | (3) #14–1/0          | 156 (71)                     |
| 150–200                          | C2          | N1, N12, N3R | 38.68 (982.5)             | 18.31 (465.1)                      | 13.34 (338.8)  | (1) #6–250 kcmil                        | (3) 1/0–250 kcmil    | 160 (73) ❸<br>164 (74) ❹     |
|                                  |             | N4X          | 37.50 (952.5)             | 17.50 (444.5)                      | 14.34 (364.2)  | (1) #6–250 kcmil                        | (3) 1/0–250 kcmil    | 160 (73) ❸<br>164 (74) ❹     |
| 225–400                          | C2          | N1, N12, N3R | 52.00 (1321.0)            | 19.81 (503.2)                      | 16.75 (425.5)  | (2) 1/0–250 kcmil/<br>(1) 1/0–750 kcmil | (6) 250–500 kcmil    | 250 (113) ❸<br>260 (118) ❹   |
|                                  |             | N4X          | 52.00 (1321.0)            | 21.00 (533.4)                      | 16.75 (425.5)  | (2) 1/0–250 kcmil/<br>(1) 1/0–750 kcmil | (6) 250–500 kcmil    | 250 (113) ❸<br>260 (118) ❹   |
| 40–100                           | C3, C5      | N1, N12, N3R | 52.00 (1321.0)            | 19.81 (503.2)                      | 16.75 (425.5)  | (1) #14–1/0                             | (3) #14–2/0          | 250 (113) ❸<br>260 (118) ❹   |
|                                  |             | N4X          | 52.00 (1321.0)            | 21.00 (533.4)                      | 16.75 (425.5)  | (1) #14–1/0                             | (3) #14–2/0          | 250 (113) ❸<br>260 (118) ❹   |
| 150–200                          | C3, C5      | N1, N12, N3R | 52.00 (1321.0)            | 19.81 (503.2)                      | 16.75 (425.5)  | (1) #6–250 kcmil                        | (3) 1/0–250 kcmil    | 250 (113) ❸<br>260 (118) ❹   |
|                                  |             | N4X          | 52.00 (1321.0)            | 21.00 (533.4)                      | 16.75 (425.5)  | (1) #6–250 kcmil                        | (3) 1/0–250 kcmil    | 250 (113) ❸<br>260 (118) ❹   |
| 225–400                          | C3, C5      | N1, N12, N3R | 52.00 (1321.0)            | 19.81 (503.2)                      | 16.75 (425.5)  | (2) 1/0–250 kcmil/<br>(1) 1/0–750 kcmil | (6) 250–500 kcmil    | 250 (113) ❸<br>260 (118) ❹   |
|                                  |             | N4X          | 52.00 (1321.0)            | 21.00 (533.4)                      | 16.75 (425.5)  | (2) 1/0–250 kcmil/<br>(1) 1/0–750 kcmil | (6) 250–500 kcmil    | 250 (113) ❸<br>260 (118) ❹   |
| 600                              | C3, C5      | N1, N3R      | 79.41 (2017.0)            | 25.25 (641.4) ❸<br>29.19 (741.4) ❹ | 22.46 (570.5)  | (2) 1/0–750 kcmil                       | (12) 1/0–750 kcmil   | 600 (272) ❸<br>650 (295) ❹   |
|                                  |             | N12, N4X     | 84.75 (2152.7)            | 29.00 (737.0)                      | 24.26 (616.2)  | (2) 1/0–750 kcmil                       | (12) 1/0–750 kcmil   | 700 (318) ❸<br>750 (340) ❹   |
| 800–1200                         | C3, C5      | N1, N3R      | 79.41 (2017.0)            | 25.25 (641.4) ❸<br>29.19 (741.4) ❹ | 22.46 (570.5)  | (4) 1/0–750 kcmil                       | (12) 1/0–750 kcmil   | 600 (272) ❸<br>650 (295) ❹   |
|                                  |             | N12, N4X     | 84.75 (2152.7)            | 29.00 (737.0)                      | 24.26 (616.2)  | (4) 1/0–750 kcmil                       | (12) 1/0–750 kcmil   | 700 (318) ❸<br>750 (340) ❹   |
| 1600                             | C3, C5      | N1           | 90.00 (2286.0)            | 40.00 (1016.0)                     | 29.00 (737.0)  | (4) 1/0–750 kcmil                       | (12) 1/0–750 kcmil   | 1090 (494) ❸<br>1150 (522) ❹ |
|                                  |             | N3R          | 90.72 (2304.3)            | 40.35 (1024.9)                     | 47.59 (1209.0) | (4) 1/0–750 kcmil                       | (12) 1/0–750 kcmil   | 1200 (544) ❸<br>1260 (571) ❹ |
| 800–2000                         | F5, G5      | N1           | 90.00 (2286.0)            | 40.00 (1016.0)                     | 40.00 (1016.0) | (8) 1/0–750 kcmil                       | (24) 1/0–750 kcmil   | 1400 (635) ❸<br>1500 (680) ❹ |
|                                  |             | N3R          | 90.69 (2303.5)            | 40.00 (1016.0)                     | 58.59 (1488.2) | (8) 1/0–750 kcmil                       | (24) 1/0–750 kcmil   | 1850 (839) ❸<br>1900 (862) ❹ |
| 2600–3000                        | F5, G5      | N1           | 90.00 (2286.0)            | 40.00 (1016.0)                     | 40.00 (1016.0) | (12) 1/0–750 kcmil                      | (36) 1/0–750 kcmil   | 1400 (635) ❸<br>1500 (680) ❹ |
|                                  |             | N3R          | 90.69 (2303.5)            | 40.00 (1016.0)                     | 58.59 (1488.2) | (12) 1/0–750 kcmil                      | (36) 1/0–750 kcmil   | 1850 (839) ❸<br>1900 (862) ❹ |

## Closed transition—standard dimensions and weights ❶

| Transfer switch rating (amperes) | Device type | Enclosure    | Dimensions in inches (mm) |                |                | Normal, emergency, load connection      | Neutral connection ❷ | Weight in lb (kg)            |
|----------------------------------|-------------|--------------|---------------------------|----------------|----------------|-----------------------------------------|----------------------|------------------------------|
|                                  |             |              | Height                    | Width          | Depth          |                                         |                      |                              |
| 40–100                           | C3          | N1, N12, N3R | 52.74 (1339.6)            | 25.00 (635.0)  | 17.18 (436.4)  | (1) #14–2/0                             | (3) #14–1/0          | 190 (86) ❸<br>200 (91) ❹     |
| 150–200                          | C3          | N1, N12, N3R | 52.74 (1339.6)            | 25.00 (635.0)  | 17.18 (436.4)  | (1) #6–250 kcmil                        | (3) 1/0–250 kcmil    | 210 (95) ❸<br>220 (100) ❹    |
| 225–400                          | C3          | N1, N12, N3R | 71.02 (1803.9)            | 31.11 (790.2)  | 14.72 (373.9)  | (2) 1/0–250 kcmil/<br>(1) 1/0–750 kcmil | (6) 250–500 kcmil    | 420 (190) ❸<br>440 (200) ❹   |
|                                  |             | N4X          | 71.50 (1816.1)            | 30.42 (772.6)  | 20.32 (516.1)  | (2) 1/0–250 kcmil/<br>(1) 1/0–750 kcmil | (6) 250–500 kcmil    | 420 (190) ❸<br>440 (200) ❹   |
| 600–1200                         | C3          | N1           | 90.00 (2286.0)            | 46.00 (1168.4) | 32.00 (812.8)  | (2) 1/0–750 kcmil                       | (12) 1/0–750 kcmil   | 800 (363) ❸<br>900 (408) ❹   |
|                                  |             | N12, N3R, 4X | 90.72 (2304.2)            | 46.00 (1168.4) | 49.66 (1261.3) | (2) 1/0–750 kcmil                       | (12) 1/0–750 kcmil   | 850 (385) ❸<br>950 (431) ❹   |
| 1600–2000                        | F5/G5       | N1           | 90.00 (2286.0)            | 40.00 (1016.0) | 40.00 (1016.0) | (8) 1/0–750 kcmil                       | (24) 1/0–750 kcmil   | 1400 (635) ❸<br>1500 (680) ❹ |
|                                  |             | N3R          | 90.69 (2303.5)            | 40.00 (1016.0) | 58.59 (1488.2) | (8) 1/0–750 kcmil                       | (24) 1/0–750 kcmil   | 1850 (839) ❸<br>1900 (862) ❹ |
| 2600–3000                        | F5/G5       | N1           | 90.00 (2286.0)            | 40.00 (1016.0) | 40.00 (1016.0) | (12) 1/0–750 kcmil                      | (36) 1/0–750 kcmil   | 1400 (635) ❸<br>1500 (680) ❹ |
|                                  |             | N3R          | 90.69 (2303.5)            | 40.00 (1016.0) | 58.59 (1488.2) | (12) 1/0–750 kcmil                      | (36) 1/0–750 kcmil   | 1850 (839) ❸<br>1900 (862) ❹ |

❶ Dimensions and weights are applicable for a standard product configuration at 480 V and subject to change. Please reference product outline drawings for the latest detailed information.

❷ Neutral connection size listed is for product configuration with a solid neutral. For product configurations with a switched neutral (four-pole), reference the size listed in the Emergency/Load Connection column.

❸ Three-pole product configuration.

❹ Four-pole product configuration.

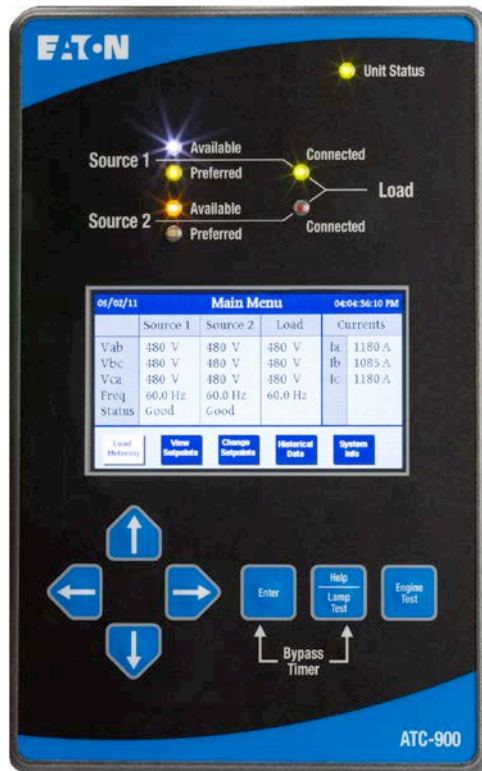
| Transfer switch rating (A) | Device type | Short-circuit withstand closing current rating (kA) |                   |                                              |                   |                                   |                        |                    |                   |                        |                    | Short-time withstand closing current rating (kA) |                   |
|----------------------------|-------------|-----------------------------------------------------|-------------------|----------------------------------------------|-------------------|-----------------------------------|------------------------|--------------------|-------------------|------------------------|--------------------|--------------------------------------------------|-------------------|
|                            |             | When protected by a circuit breaker                 |                   | When protected by a specific circuit breaker |                   | When protected by a specific fuse |                        |                    |                   |                        |                    | When protected by a circuit breaker              |                   |
|                            |             | Time duration (0.05 sec max.) ❶❷                    |                   | Manufacturer and type based                  |                   | Manufacturer and type based       |                        |                    |                   |                        |                    | Time duration (0.5 sec max.)                     |                   |
|                            |             | 480 Vac max. (kA)                                   | 600 Vac max. (kA) | 480 Vac max. (kA)                            | 600 Vac max. (kA) | 480 Vac max. (kA)                 | Fuse class             | Max. fuse size (A) | 600 Vac max. (kA) | Fuse class             | Max. fuse size (A) | 480 Vac max. (kA)                                | 600 Vac max. (kA) |
| 40                         | C2          | 10                                                  | 10                | 30                                           | 22                | 100                               | K5, RK5                | 200                | 100               | K5, RK5                | 200                | —                                                | —                 |
| 80                         |             |                                                     |                   |                                              |                   |                                   | K1, RK1                | 400                |                   | K1, RK1                | 400                | —                                                | —                 |
| 100                        |             |                                                     |                   |                                              |                   |                                   | J, T                   | 450                |                   | J, T                   | 450                | —                                                | —                 |
| 150                        | C2          | 10                                                  | 22                | 30                                           | 35                | 100                               | K5, RK5                | 400                | 200               | RK1, RK5, J, C, K1, K5 | 600                | —                                                | —                 |
| 200                        |             |                                                     |                   |                                              |                   |                                   | J, K1, RK1             | 600                |                   | L                      | 800                | —                                                | —                 |
|                            |             |                                                     |                   |                                              |                   |                                   | T                      | 800                |                   | T                      | 1200               | —                                                | —                 |
| 225                        | C2          | 30                                                  | —                 | 50                                           | —                 | 200                               | RK1, RK5, J, C, K1, K5 | 600                | 200               | J, T, L, RK5           | 600                | —                                                | —                 |
| 260                        |             |                                                     |                   |                                              |                   |                                   | L                      | 800                |                   | L                      | 1600               | —                                                | —                 |
| 400                        |             |                                                     |                   |                                              |                   |                                   | T                      | 1200               |                   | L                      | 1600               | —                                                | —                 |
|                            |             |                                                     |                   |                                              |                   |                                   |                        |                    |                   |                        |                    |                                                  |                   |
| 40 ❸                       | C3 ❸, C5    | 30 ❸                                                | 22 ❸              | 50 ❸                                         | 35 ❸              | 200 ❸                             | RK1, RK5, J, C, K1, K5 | 600                | 200 ❸             | RK1, RK5, J, C, K1, K5 | 600                | —                                                | —                 |
| 80 ❸                       |             |                                                     |                   |                                              |                   |                                   | L                      | 800                |                   | L                      | 800                | —                                                | —                 |
| 100 ❸                      |             |                                                     |                   |                                              |                   |                                   | T                      | 1200               |                   | T                      | 1200               | —                                                | —                 |
| 150 ❸                      |             |                                                     |                   |                                              |                   |                                   |                        |                    |                   |                        |                    |                                                  |                   |
| 200 ❸                      | C3, C5      | 30                                                  | 50                | 50                                           | 65                | 200                               | RK1, RK5, J, C, K1, K5 | 600                | 200               | J, T, L, RK5           | 600                | —                                                | —                 |
| 225                        |             |                                                     |                   |                                              |                   |                                   | L                      | 800                |                   | L                      | 1600               | —                                                | —                 |
| 260                        |             |                                                     |                   |                                              |                   |                                   | T                      | 1200               |                   | L                      | 1600               | —                                                | —                 |
| 400                        |             |                                                     |                   |                                              |                   |                                   |                        |                    |                   |                        |                    |                                                  |                   |
| 600                        | C3, C5      | 50                                                  | 50                | 65                                           | 65                | 200                               | J, T, L, RK5           | 600                | 200               | J, T, L, RK5           | 600                | 30 ❹                                             | —                 |
| 800                        |             |                                                     |                   |                                              |                   |                                   | L                      | 1600               |                   | L                      | 1600               | 30 ❹                                             | —                 |
| 1000                       | C3, C5      | 50                                                  | 50                | 65                                           | 65                | 200                               | J, T, L, RK5           | 600                | 200               | J, T, L, RK5           | 600                | —                                                | —                 |
| 1200                       |             |                                                     |                   |                                              |                   |                                   | L                      | 1600               |                   | L                      | 1600               | —                                                | —                 |
| 1600                       | C3, C5      | 50                                                  | —                 | 65                                           | —                 | 200                               | J, T, L, RK5           | 600                | —                 | —                      | —                  | —                                                | —                 |
|                            |             |                                                     |                   |                                              |                   |                                   | L                      | 2000               |                   |                        |                    |                                                  |                   |
| 800                        | F5, G5      | 100                                                 | 100               | 100                                          | 100               | 200                               | J, T, L, RK5           | 600                | —                 | —                      | —                  | 85 ❺                                             | 85 ❺              |
| 1000                       |             |                                                     |                   |                                              |                   |                                   | L                      | 2000               |                   |                        |                    | 85 ❺                                             | 85 ❺              |
| 1200                       |             |                                                     |                   |                                              |                   |                                   |                        |                    |                   |                        |                    |                                                  |                   |
| 1600                       |             |                                                     |                   |                                              |                   |                                   |                        |                    |                   |                        |                    |                                                  |                   |
| 2000                       |             |                                                     |                   |                                              |                   |                                   |                        |                    |                   |                        |                    |                                                  |                   |
| 2600                       |             |                                                     |                   |                                              |                   |                                   |                        |                    |                   |                        |                    |                                                  |                   |
| 3000                       |             |                                                     |                   |                                              |                   |                                   |                        |                    |                   |                        |                    |                                                  |                   |

- ❶ For open transition transfer switches rated 40–200 A (C2 device type), time duration is 0.025 sec maximum.
- ❷ For closed transition transfer switches rated 40–200 A (C3 device type), time duration is 0.025 sec maximum.
- ❸ For closed transition transfer switches rated 40–100 A (C3 device type) or 150–200 A (C3 device type), the short-circuit withstand closing current ratings associated with a C2 device type apply.
- ❹ Time duration is 0.13 sec maximum.
- ❺ G5 device type only.

## Custom ordering

In many cases, standard products can be custom-order engineered to meet your application needs. For additional information, please contact your local Eaton sales representative.

# Easy-to-operate ATS controller with advanced diagnostic capabilities



The Eaton ATC-900 controller brings ease of use, adaptability, supervisory and programming capabilities to automatic transfer switch (ATS) equipment. Extreme reliability makes this controller ideal for mission-critical applications in healthcare, wastewater, data center and other industrial and commercial applications. The ATC-900 controller is compatible with Eaton's complete transfer switch product offering including contactor, molded case and power frame type transfer switches.

## Ease of use

- Color display for system status, metering data, programming, diagnostics, help and troubleshooting
- Simple arrow keys are used for quick screen navigation
- LED mimic bus with source available and source connected indication
- Easy-to-interpret function descriptions without use codes
- Data screens are grouped for ease of viewing and secure edits
- Engine test, help, lamp test, enter and bypass timer pushbuttons
- PC-based setpoint editor tool (EASE)—create, edit and save setpoint configuration files
- USB port for upload/download of metering data, event details, setpoint configuration files and firmware updates

## Advanced diagnostics

- Time/date stamped event summaries and details including historical metering values
- High-speed event waveform capture of voltage, frequency and current
- Export event log (csv file) with metering data to USB drive for post-event analysis
- Integral load-side metering module (optional) provides real-time display of power, electrical current and power factor

## Monitoring and control

- Selective kilowatt load shed (optional module)
- Remote load testing
- Primary and secondary control functionality for three-source applications such as utility-generator-generator
- Industry standard communication—serial (RS-485/Modbus® RTU) and Ethernet (optional module)
- Remote management of a single or multiple ATC-900 with HMi Remote Annunciator Controller

## Flexibility

- Open (time delay, in-phase monitor) or closed transition control
- For use in low-voltage (up to 600 Vac) and medium-voltage systems (up to 46 kVac)
- Up to 20 field-programmable control inputs and relay outputs

## Smart functionality

- ATS Health reports equipment endurance, electrical excursions, performance and component health, allowing service personnel to make informed maintenance decisions and manage risk
- Maintenance Watch™ issues automated notifications and task guidance to perform scheduled inspection and maintenance based on NFPA® 110—standard for emergency and standby power systems

| Features                      | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|-------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| System application            | Three-phase or single-phase<br>Low-voltage: up to 600 Vac<br>Medium-voltage: up to 46 kVac (external PT required)<br>Frequency: 50 or 60 Hz                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Supply power                  | 120 Vac (65–160 Vac, 50/60 Hz) or 24 Vdc (±20%)<br>Power consumption (maximum): 20 VA                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| System arrangement            | Utility-generator, dual-utility, dual-generator, three-source                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| Transition                    | Closed and open (time delay, in-phase monitor, load voltage decay)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| User interface                | 4.3-inch color display (TFT LCD, 480 x 272), LED mimic bus (source available, source connected, preferred source), pushbutton control (navigation, enter, help, engine test, bypass timer, lamp test), UV-resistant faceplate                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| Metering                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Voltage                       | Sensing: Source 1, Source 2, Load<br>Measurement: Vab, Vbc, Vca (line-line), Vag, Vbg, Vcg (phase)<br>Range: up to 720 Vac rms<br>Accuracy: ±1%                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Frequency                     | Sensing: Source 1, Source 2, Load<br>Range: 40–80 Hz<br>Accuracy: ±0.2 Hz                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Current (optional)            | <del>Sensing: Load<br/>Measurement: Ia, Ib, Ic<br/>Range: 100–5000 A (CT ratio setpoint 100:5 to 5000:5)<br/>Accuracy: ±1%; burden: 0.0115 VA (per phase at 5 A)<br/>Current input: 0–5 A (CTs not included), wire range 6–22 AWG</del>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Power (optional)              | <del>Sensing: Load<br/>Measurement: kW, kvar, kVA, power factor (PF)<br/>Accuracy: ±2%</del>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| Sampling                      | 64 samples per cycle (frequency measured every cycle; voltage, current and power measured every third cycle)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| Voltage and current unbalance | Symmetrical component (positive and negative sequence) calculation detects abnormal conditions including phase loss                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| Phase rotation                | Three-phase sequence check                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Serial port                   | USB 2.0 (download: setpoints, events, statistics, metering data; upload: setpoints, firmware)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| Network communication         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Serial                        | Modbus RTU                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Ethernet (optional)           | ATS-ECAM (Modbus TCP/IP, SNMP)<br>CAENET (ICMP, IP, TCP, UDP, DHCP, HTTP, Modbus TCP, EtherNet/IP)<br>PXG-900 (Modbus TCP/IP, BACnet/IP, SMTP, DHCP, HTTP)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Inputs (fixed)                | Source 1 auxiliary, Source 2 auxiliary (wetted, 24 Vdc at 6 mA)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Inputs (field programmable)   | Four inputs standard. Expandable up to 20 (wetted, 24 Vdc at 6 mA): <ul style="list-style-type: none"> <li>Disabled</li> <li>Monitor mode (NO/NC)</li> <li>Bypass timer</li> <li>Lockout</li> <li>Manual retransfer enable</li> <li>Manual retransfer request</li> <li>Secondary control (3-source system)</li> <li>Remote engine test</li> <li>Preferred source select</li> <li>Source 2 inhibit / load shed</li> <li>Go to Source 2</li> <li>Go to neutral (load disconnect)</li> <li>ATS bypassed</li> <li>Safety interlock</li> <li>Closed transfer disable</li> <li>Remote I/O</li> <li>Engine test mode select</li> <li>Source 1 breaker health</li> <li>Source 2 breaker health</li> <li>Source 1 surge protection</li> <li>Source 2 surge protection</li> <li>Load surge protection</li> </ul> |

| Features                             | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|--------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Outputs (fixed)                      | Source 1 available and Source 2 available<br>(Form C, rated 10 A at 250 Vac/30 Vdc)<br>Generator start 1 and Generator start 2<br>(Form C rated 5 A at 250 Vac/30 Vdc)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| Outputs (field programmable)         | <ul style="list-style-type: none"> <li>Disabled</li> <li>Alarm</li> <li>Source 1 Connected</li> <li>Source 2 Connected</li> <li>Pre-/Post-Transfer</li> <li>Pre-Transfer</li> <li>Post-Transfer</li> <li>Engine 1 Start Contact Status</li> <li>Engine 2 Start Contact Status</li> <li>Selective Load Shed</li> <li>Load Bank Control</li> <li>Load Sequence</li> <li>Emergency Inhibit On</li> <li>ATS Not in Automatic</li> <li>Cooldown in Progress</li> <li>ATS in Test</li> <li>Engine Test Aborted</li> <li>Remote I/O</li> <li>ATS in Bypass</li> <li>Source 1 Available</li> <li>Source 2 Available</li> <li>Source 2 Request</li> <li>ATC status</li> <li>Waiting for Synchronization</li> </ul> |
| Source availability                  | Indication and status determined by programmable input or programmable setpoints                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| Drop-outs and pick-ups               | Source 1 and Source 2: undervoltage, overvoltage, underfrequency, overfrequency, voltage unbalance, phase loss<br>Load: current unbalance                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| Time delays                          | Engine start, engine fail, engine cool-down, normal to emergency, emergency to normal, neutral, pre-transfer, post-transfer, voltage unbalance/phase loss, normal disconnect/reconnect, emergency disconnect/reconnect, source synchronization                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Engine/plant exerciser               | Two independent exercisers with engine run-time<br>Test modes: run only, load transfer, external select, disabled<br>Schedule: off, daily, 7-14-28 day, up to 12 specific calendar dates                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| Maintenance Watch                    | One major maintenance and four inspection dates, load test cadence, up to 21 date/time stamped task completions                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| ATS Health                           | <ul style="list-style-type: none"> <li>Main contact operations</li> <li>Load overcurrent</li> <li>Source overvoltage</li> <li>Transfer switch under load</li> <li>Switching device exercise</li> <li>Main contact actuation</li> <li>Surge protection device</li> <li>Circuit breaker health</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                   |
| Historical counters                  | <ul style="list-style-type: none"> <li>Source 1 available time</li> <li>Source 2 available time</li> <li>Source 1 connected time</li> <li>Source 2 connected time</li> <li>Tier 4 timer</li> <li>Load energized time</li> <li>Number of transfers</li> <li>Number of run-only tests</li> <li>Number of transfer tests</li> <li>Counter resets are time-stamped and logged as events</li> </ul>                                                                                                                                                                                                                                                                                                            |
| Event logging                        | Up to 100 time-stamped event summaries and 350 event details.<br>Time-stamping resolution of 0.01 seconds.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Event recording (high-speed capture) | 4 seconds of metered data (stored every 20 msec) for certain events.<br>Data is captured 2 seconds before and 2 seconds after an event (except for power failure that stores 4 seconds before event).<br>Oscillographic data for 10 events is stored and can be downloaded via USB or displayed graphically.                                                                                                                                                                                                                                                                                                                                                                                              |
| Time/date                            | Programmable; daylight savings and time zone offset                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| Setpoints                            | User programmable (local or remote)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| Access control                       | Password protection (system setpoints and engine test)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| Environmental                        | Storage temperature: –30 °C to +80 °C (–22 °F to 176 °F)<br>Operating temperature: –20 °C to +70 °C (–4 °F to 158 °F)<br>Relative humidity: up to 90% (noncondensing)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| Emissions                            | FCC Part 15 (Subpart B, Class B); CISPR 11 (Class B)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Electromagnetic compatibility (EMC)  | IEC 61000-4-2: electrostatic discharge immunity<br>IEC 61000-4-3: radiated immunity<br>IEC 61000-4-4: fast transient/burst immunity<br>IEC 61000-4-5: surge immunity<br>IEC 61000-4-6: conducted immunity<br>IEC 61000-4-11: voltage dips/interruptions/variatio                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| Standards                            | UL® 1008 recognized, UL 991                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |

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Printed in USA  
Publication No. PA140003EN / Z27509  
April 2023



## Optimize transfer switch reliability through intelligence and efficient maintenance

### What is ATS Health and Maintenance Watch™?

Eaton's ATC-900 automatic transfer switch (ATS) controller has gotten smarter with the addition of two new features. **ATS Health** reports equipment condition so facility service personnel can make informed decisions based on real-time data. **Maintenance Watch** schedules due dates, issues reminder notifications and provides task guidance to comply with maintenance program requirements.

### Introduction

An ATS is a vital element in the power distribution chain and is responsible for providing continuous power to critical loads in emergency, legally required, optional standby and critical operation power systems.

To maintain a high degree of reliability, an ATS must undergo regular inspection, maintenance and exercise as part of an established program implemented by the equipment owner.

To optimize equipment uptime, ATS Health reports equipment condition to facility service personnel who can assess operational risk and plan for maintenance.

Maintenance Watch issues automated notifications and task guidance to perform regular test, inspection and maintenance based on NFPA® 110—the standard for emergency and standby power systems.

### ATS Health

- Measures equipment use against UL® 1008 endurance test threshold
- Identifies voltage and current excursions above the norm
- Reports condition of surge protection device (internal to ATS)
- Reports condition of circuit breaker (internal to ATS)
- Measures switching performance for comparison to commission baseline
- Tracks amount of time the load has been energized
- Reports date and time ATS last exercised, and number of days elapsed since
- Allows user to enable/disable via programmable setpoint

### Maintenance Watch

- Schedules quarterly inspection, major maintenance and load test activities
- Generates quarterly inspection major maintenance and load test due notifications with multiple resolution options
- Provides transfer switch maintenance task guidance per NFPA 110
- Records and displays recently completed inspection, maintenance and load test activities with date and time stamp
- Allows user to enable/disable via programmable setpoint

### Remote monitoring

- Eaton's HMi Remote Annunciator Controller (RAC) device allows ATS Health and Maintenance Watch features to be managed remotely; up to eight transfer switches can be managed with a single HMi RAC
- Eaton's Brightlayer™ Remote Monitoring application consolidates all your ATS equipment for remote monitoring via computer or mobile device



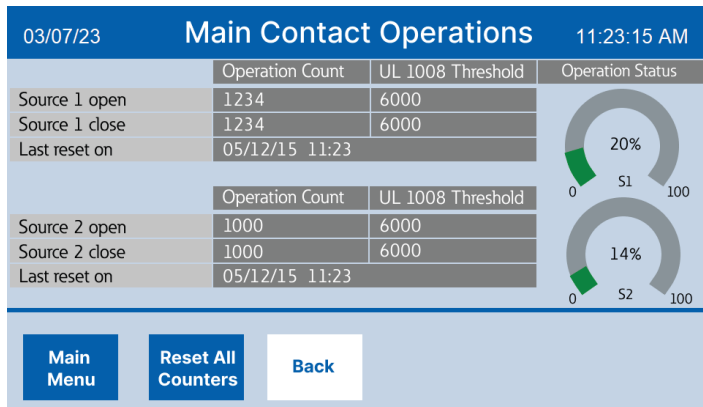
*Powering Business Worldwide*

## ATS Health

ATS Health reports equipment condition related to main contact operation and actuation, electrical excursions above the norm, last exercised date, load energized time and component status/health. Parametric data can be viewed locally on the ATC-900 display or monitored remotely via an Eaton HMI RAC device, Eaton Brightlayer application or a third-party power/building management system.

The parametric data reported is:

- Number of open/close operations for Source 1 and Source 2 main contacts; percentage of operations performed compared to UL 1008 (transfer switch standard) threshold; a notification is issued when operation threshold is reached
- Total number of load overcurrent events that have occurred with event date/time stamp and duration
- Total number of Source 1 and Source 2 overvoltage events that have occurred with event date/time stamp, phase and voltage
- Total duration (days/hours/minutes) transfer switch is under load (electric current flow)
- Total number of days that have elapsed since transfer switch was last exercised and date/time stamp of last exercise
- Open/close actuation time of Source 1 and Source 2 main contacts and load disconnect time for open in-phase transition
- Protection status of integral surge protection device (SPD) installed at Source 1, Source 2 and Load connection
- Health status of integral Source 1 and Source 2 circuit breaker

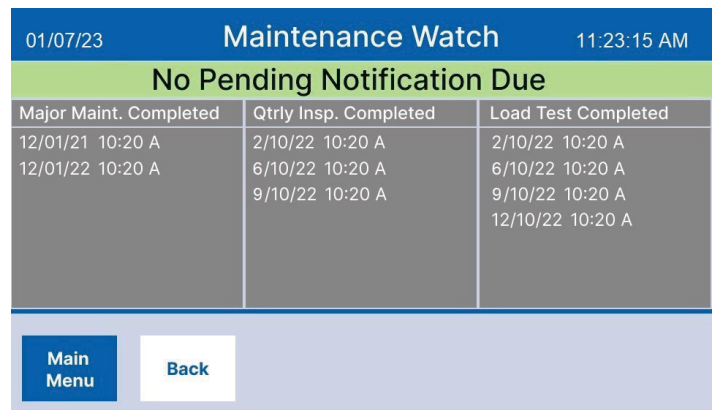
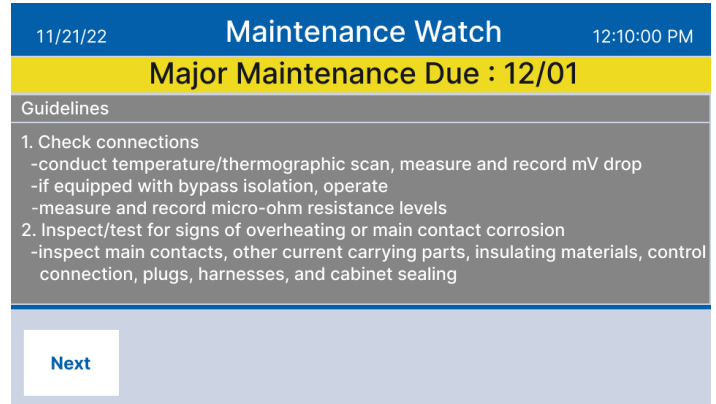


## Maintenance Watch

Maintenance Watch permits service personnel to schedule up to four quarterly inspections and one annual major maintenance to a specific calendar date that recurs each year. A load test can be programmed for a monthly or quarterly cadence.

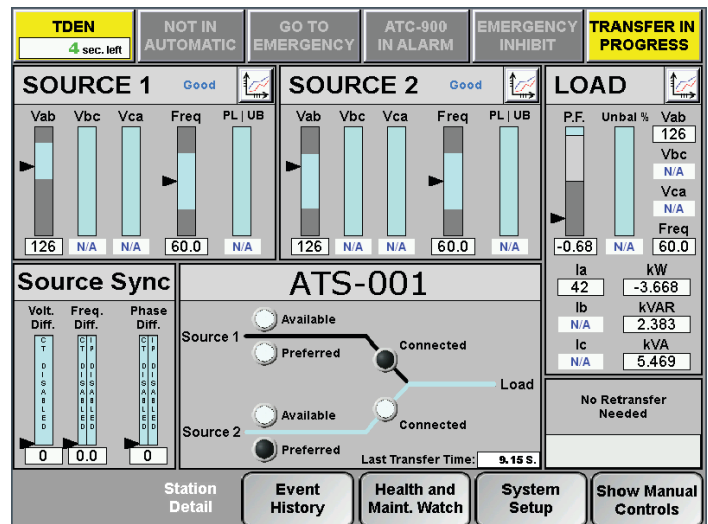
An automated notification is issued 10 days prior to each scheduled due date and includes task information to guide the service technician. Notifications can be viewed locally on the ATC-900 display or remotely via an Eaton HMI RAC device, Eaton Brightlayer application or a third-party power/building management system. A notification can be resolved by the user to postpone (up to 21 days), dismiss (decision not to perform) or complete (performed) the task.

When a task is marked as complete, a date and time stamp is recorded. A total of seven quarterly inspections, seven major maintenances and seven load tests can be viewed in a summary table on the ATC-900 screen. Maintenance Watch or any of its individual elements (quarterly inspection, major maintenance, load test) can be enabled or disabled by programmable setpoint.



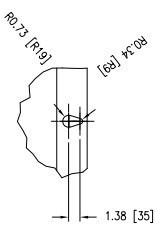
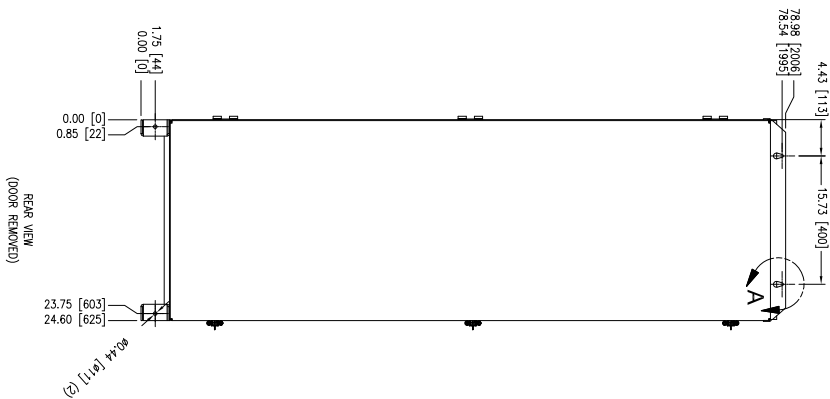
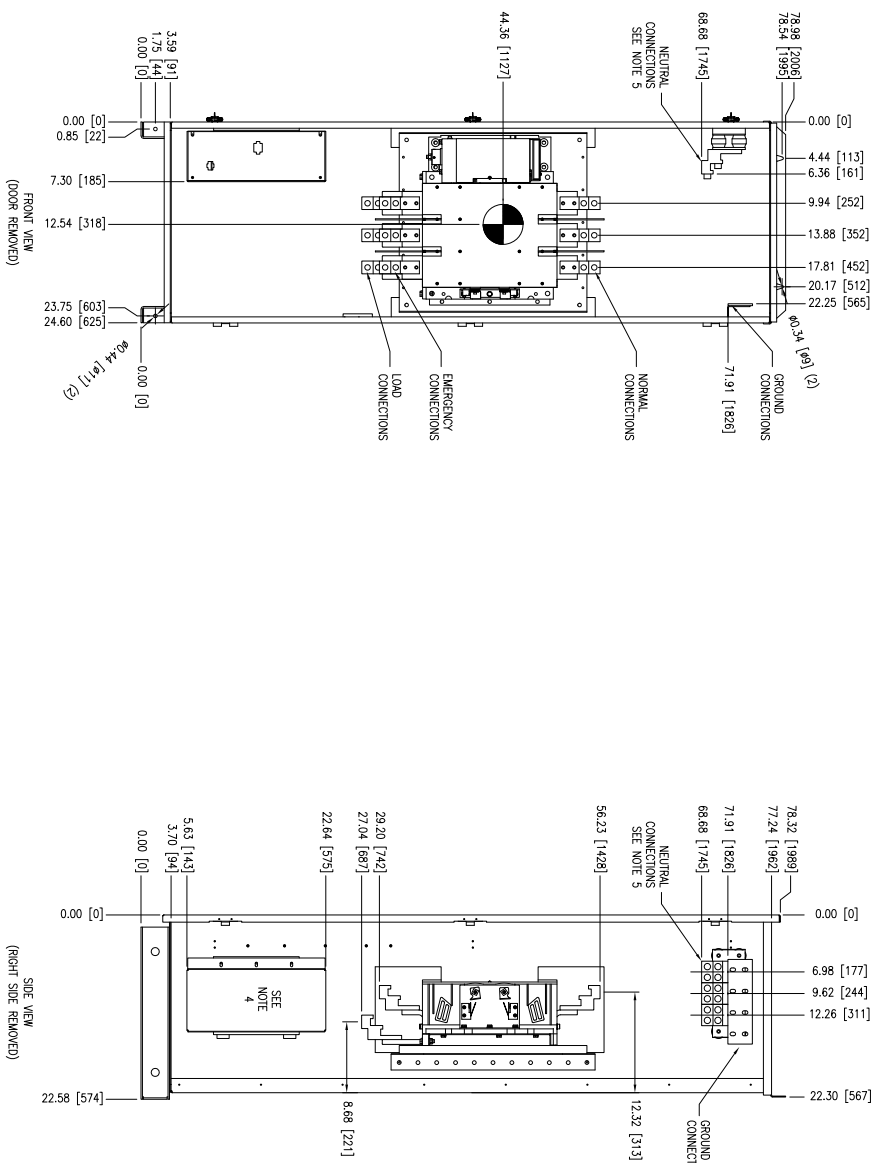
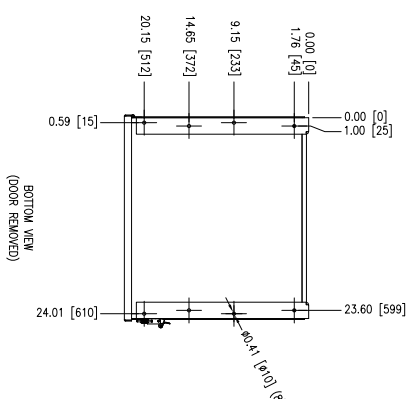
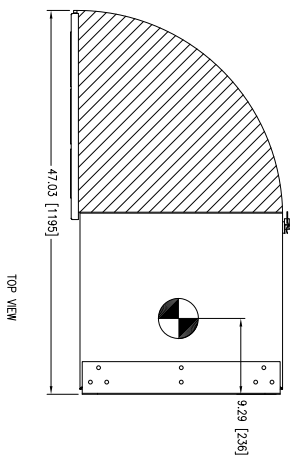
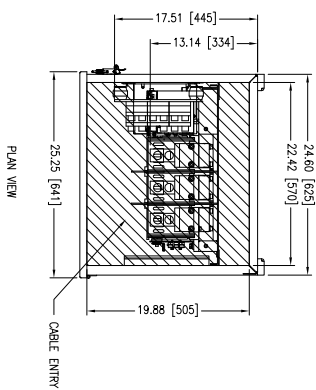
## HMI Remote Annunciator Controller (RAC)

Users can remotely manage multiple ATSS from one intuitive 7-inch touchscreen display that includes ATS Health and Maintenance Watch information.



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Printed in USA  
Publication No. PA140017EN / Z27584  
May 2023



DETAIL A  
SCALE 0.18:1

|              |              |                                                                                                                                                                    |                                                                                     |  |                                                                                     |
|--------------|--------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|--|-------------------------------------------------------------------------------------|
| DATE         | DATE         | THE INFORMATION ON THIS DOCUMENT WAS CREATED BY EATON CORPORATION. IT WAS DISCLOSED IN CONFERENCE AND IS ONLY TO BE USED FOR THE PURPOSE IN WHICH IT WAS SUPPLIED. |                                                                                     |  |  |
| JEFF TOLAN   | 2/10/2025    |                                                                                                                                                                    |                                                                                     |  |                                                                                     |
| APPD         | DATE         | TITLE<br>AUTOMATIC OPEN TRANSFER   CONTACTOR SWITCH<br>480V 3 POSITION   40-1200 AMP   ATC-900 CONTROLLER                                                          |                                                                                     |  |                                                                                     |
| PRODUCT CODE | S.O.         | TYPE                                                                                                                                                               | FIXED MOUNTED                                                                       |  | OUTLINE                                                                             |
| AT           | ALJ21118X4K7 | ATC9C5X30600XSU                                                                                                                                                    |                                                                                     |  |                                                                                     |
| REVISION     |              | G.O.                                                                                                                                                               | DWG                                                                                 |  | SHEET                                                                               |
| 1            |              | -001                                                                                                                                                               |  |  | 1 OF 6                                                                              |

ATC9C5X3060  
AUTOMATIC OPEN TRANSFER CONTACTOR SWITCH  
ATC-900 CONTROL, 3 POSITION CONTACTOR  
FIXED MOUNTED  
3 POLE, 600 AMPS  
480/277V 60HZ, 3 PHASE, 4 WIRE  
TYPE-1 ENCLOSURE, UL1008 LISTED

## FEATURES INCLUDED

- |        |                                                              |
|--------|--------------------------------------------------------------|
| 1B     | TIME DELAY NORMAL TO EMERGENCY ADU 0-9999 sec                |
| 1C     | TIME DELAY NORMAL DISCONNECT ADU 0-10 sec                    |
| 1D     | TIME DELAY NORMAL RECONNECT ADU 0-60 sec                     |
| 2A     | TIME DELAY ENGINE START ADU 0-120 sec                        |
| 3B     | TIME DELAY EMERGENCY TO NORMAL ADU 0-9999 sec                |
| 3C     | TIME DELAY EMERGENCY DISCONNECT ADU 0-10 sec                 |
| 3D     | TIME DELAY EMERGENCY RECONNECT ADU 0-10 sec                  |
| 4B     | TIME DELAY ENGINE COOL-OFF ADU 0-9999 sec                    |
| 5H     | EMERGENCY (S2) SENSING PHASE REVERSAL                        |
| 5J     | EMERGENCY (S2) SENSING ALL PHASE UNDERVOLTAGE/UNDER FREQ     |
| 5K     | EMERGENCY (S2) SENSING ALL PHASE OVERVOLTAGE/OVER FREQ       |
| 5L     | EMERGENCY (S2) SENSING ALL PHASE VOLTAGE UNBALANCE           |
| 5M     | EMERGENCY (S2) SENSING PHASE LOSS                            |
| 6B     | ENGINE TEST PUSHBUTTON                                       |
| 7A     | TIME DELAY ENGINE FAIL ADU 0-6 sec                           |
| 8E     | BYPASS ALL TIMERS                                            |
| 10B    | SOURCE SELECTOR-UTILITY TO UTILITY OR UTILITY TO GENERATOR   |
| 10D    | SOURCE SELECTOR-GENERATOR TO GENERATOR                       |
| 11A    | ATS HEALTH                                                   |
| 11B    | MAINTENANCE WATCH                                            |
| 12C    | NORMAL (S1) CONNECTED INDICATION                             |
| 12D    | EMERGENCY (S2) CONNECTED INDICATION                          |
| 12G    | NORMAL (S1) AVAILABLE INDICATION                             |
| 12H    | EMERGENCY (S2) AVAILABLE INDICATION                          |
| 14F    | SOURCE AVAILABLE CONTACT NORMAL (S1) 1 FORM C                |
| 14E    | SOURCE AVAILABLE CONTACT EMERGENCY (S2) 1 FORM C             |
| 15G    | POSITION INDICATION CONTACT NORMAL (S1) 3 FORM C             |
| 15H    | POSITION INDICATION CONTACT EMERGENCY (S2) 3 FORM C          |
| 22     | GROUND BAR                                                   |
| 23M    | PLANT EXERCISER DAILY/CALENDAR DATES, LOAD/NO LOAD 0-600 min |
| 26H    | NORMAL (S1) SENSING PHASE REVERSAL                           |
| 26J    | NORMAL (S1) SENSING ALL PHASE UNDERVOLTAGE/UNDER FREQ        |
| 26K    | NORMAL (S1) SENSING ALL PHASE OVERVOLTAGE/OVER FREQ          |
| 26L    | NORMAL (S1) SENSING ALL PHASE VOLTAGE UNBALANCE              |
| 26M    | NORMAL (S1) SENSING PHASE LOSS                               |
| 29G    | SELECTABLE AUTOMATIC OR NON-AUTOMATIC OPERATION              |
| 29J    | SELECTABLE AUTOMATIC OR NON-AUTOMATIC RETRANSEER w/FALSAFE   |
| 32D    | IN-PHASE (FALBACK TO TIME DELAYED)                           |
| 35A    | PRE-TRANSFER SIGNAL CONTACTS 1 FORM C                        |
| 42     | IBC/OBC SEISMIC QUALIFIED                                    |
| 48F    | COMMUNICATIONS MODBUS                                        |
| 48M1   | I/O MODULE 4IN-4OUT (1)                                      |
| 48P    | HMI, w/CONTROL                                               |
| 48RAC  | HMI, ENCLOSEURE                                              |
| 48RACB | HMPower SUPPLY                                               |
| 48U    | USB PORT FOR MEMORY STICK                                    |
| 49C    | MULTI-TAP VOLTAGE TRANSFORMER                                |
| 61F    | POWER LOSS BUFFER ATC COMM (INCLUDES DGT MODULE)             |
| 80B    | INPUT TERMINAL BLOCKS                                        |

REQUIRED FOR SEISMIC, RECOMMENDED FOR ALL APPLICATIONS:

USE 4, 5/16-13 UNC GRADE 5 OR BETTER HEX HEAD BOLTS AND WASHERS. THESE BOLTS ARE TO BE TORQUED TO 75 FT. LBS. (102 NM).

DETAIL A  
SCALE 0.18:1

TERMINA

NORMAL: (2) 1/0-750 CU/AL PER POLE

EMERGENCY: (2) 1/0-750 CU/AL PER POLE

LOAD: (2) 1/0-750 CU/AL PER  
NEUTRAL: (12) 1/0-750 CU/AL

## NOTES:

- 1 APPROXIMATE SHIPPING WEIGHT = 600 LBS [272 KG]
- 2 DIMENSIONS SHOWN IN INCHES [MILLIMETERS]
- 3 CONTROLS PROVIDED BASED ON CUSTOMER ORDER INFORMATION.
- 4 TRANSFORMER INCLUDED
- 5 FOR SWITCHED NEUTRAL APPLICATIONS CONNECT TO TERMINALS MARKED "N", "EN", AND "TN". NEUTRAL ASSEMBLY IS NOT PROVIDED. FOR PHASE 3 WIRE SYSTEMS NEUTRAL ASSEMBLY IS NOT PROVIDED.



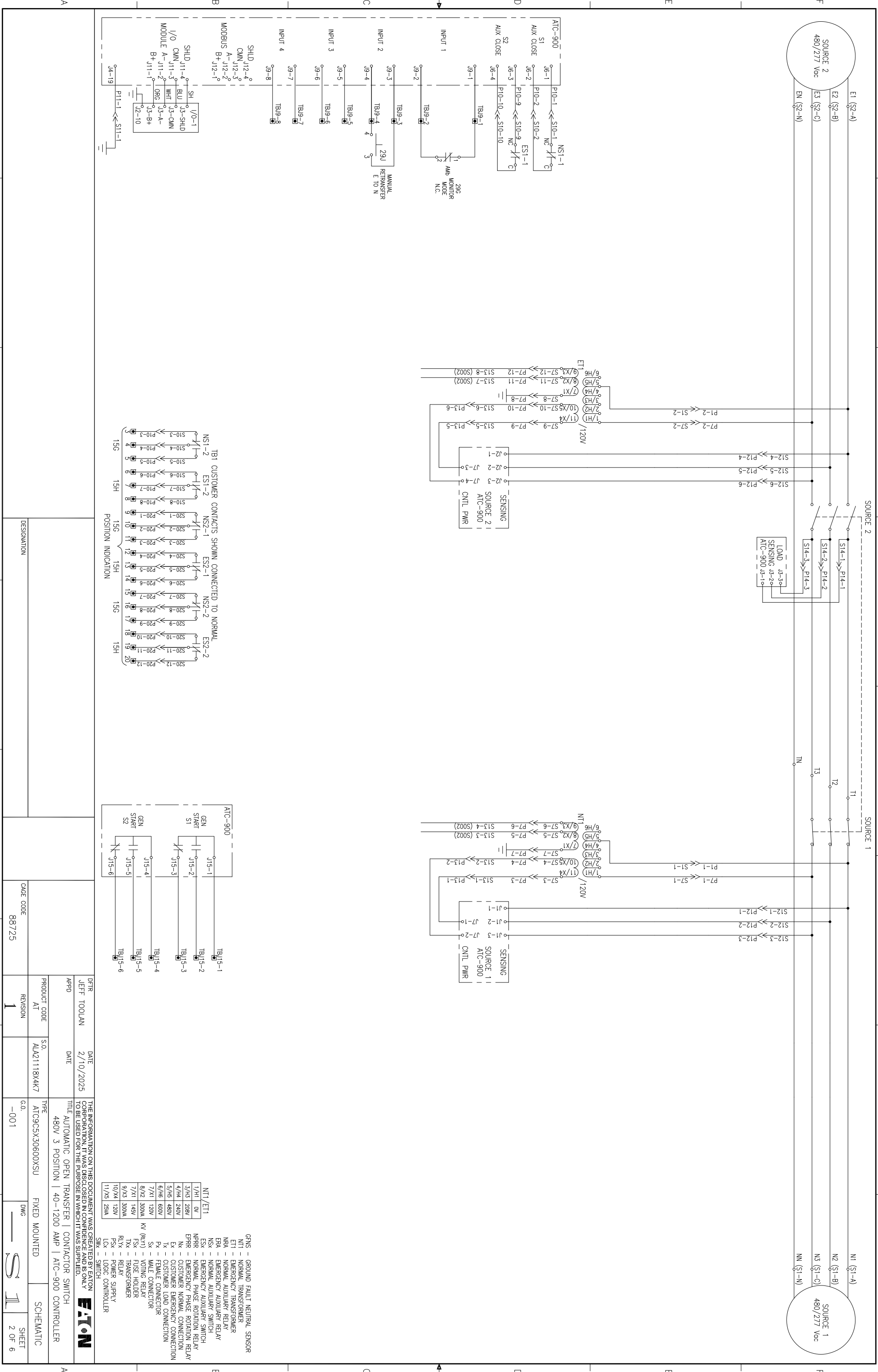
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# FATOM

TITLE AUTOMATIC OPEN TRANSFER | CONTACTOR SWITCH  
480V 3 POSITION | 40-1200 AMP | ATC-900 CONTROLLER

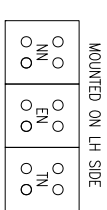
| TYPE            | OUTLINE       |
|-----------------|---------------|
| ATC9C5X30600XSU | FIXED MOUNTED |

|      |                                                                                   |              |
|------|-----------------------------------------------------------------------------------|--------------|
| G.O. | DWG                                                                               |              |
| -001 |  | SHEE<br>1 OF |

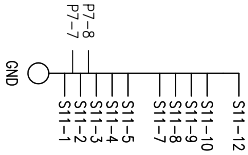
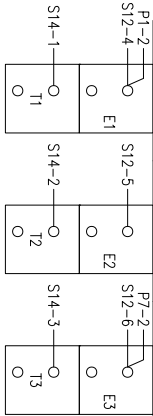
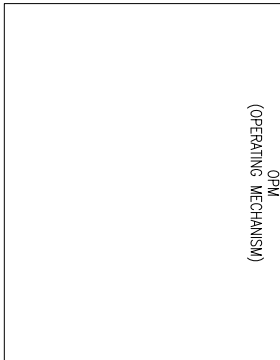
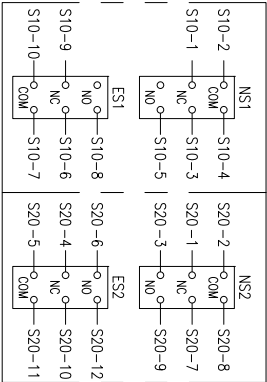
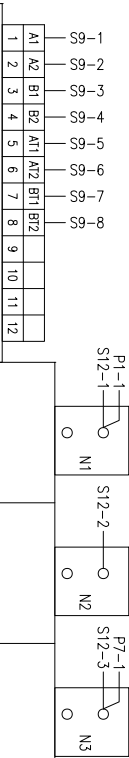




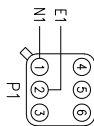
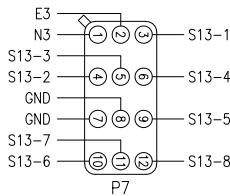
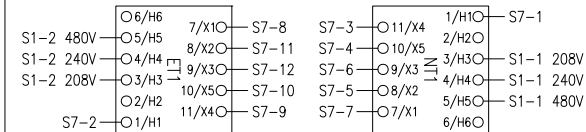




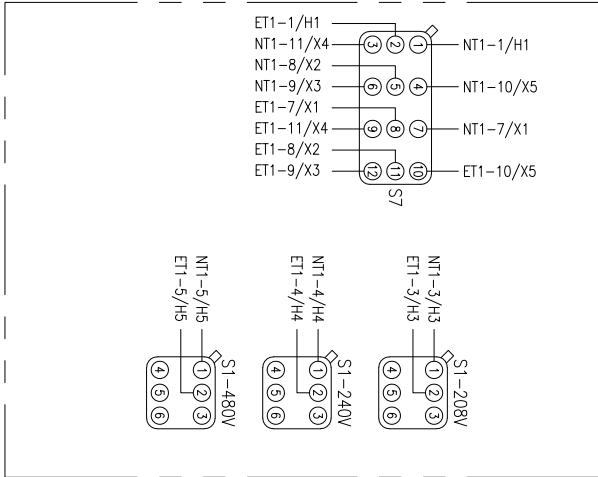
HINGE SIDE



XPMR PANEL W/COVER REMOVED  
MOUNTED ON LH SIDE



S<sup>7</sup> PLUGS ARE MOUNTED ON XPMR PANEL COVER



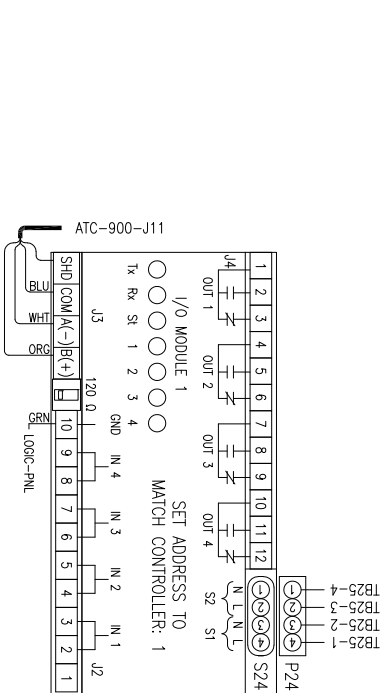
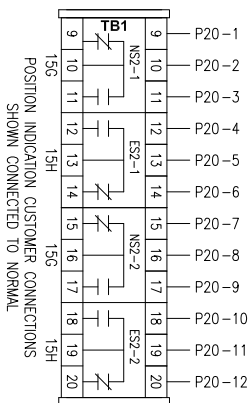
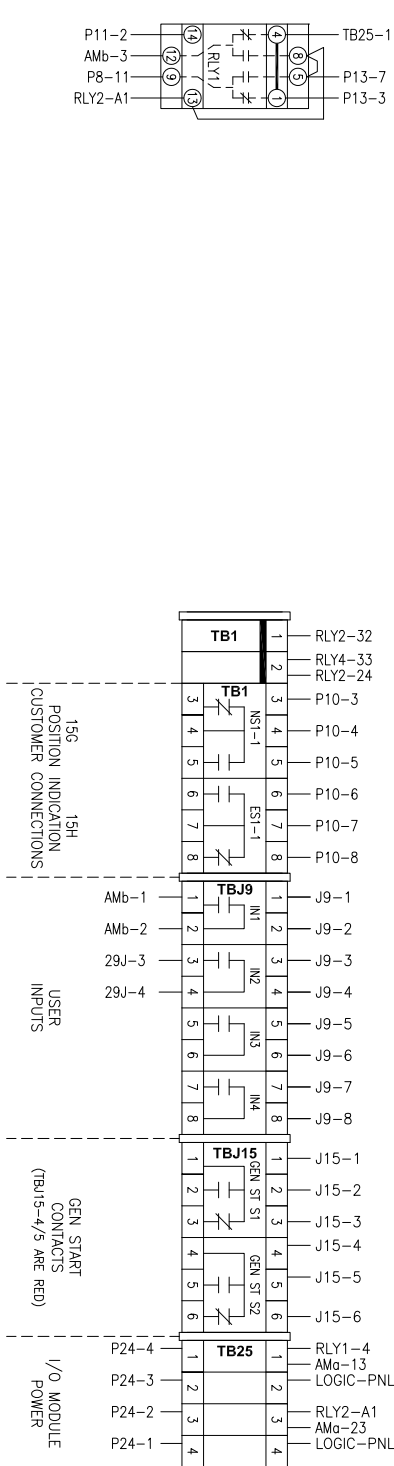
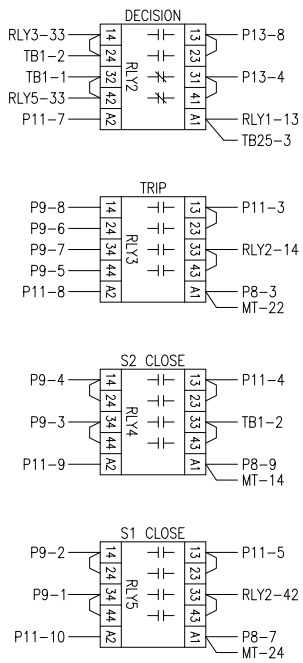
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|              |              |               |                                            |
|--------------|--------------|---------------|--------------------------------------------|
| DATE         | 2/10/2025    | TITLE         | AUTOMATIC OPEN TRANSFER   CONTACTOR SWITCH |
| APPD         | JEFF TOOLAN  | TYPE          | ATC9C5X30600XSU                            |
| PRODUCT CODE | ALA21118X4K7 | FIXED MOUNTED | DIAGRAM                                    |
| REVISION     | 1            | G.O.          | -001                                       |

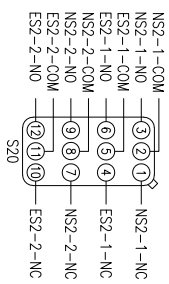
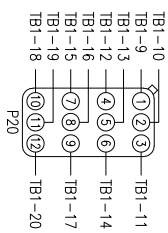
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| DESIGNATION |  |
|             |  |

|           |       |
|-----------|-------|
| CAGE CODE | 88725 |
|-----------|-------|



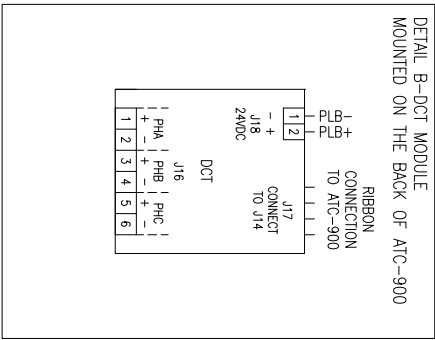
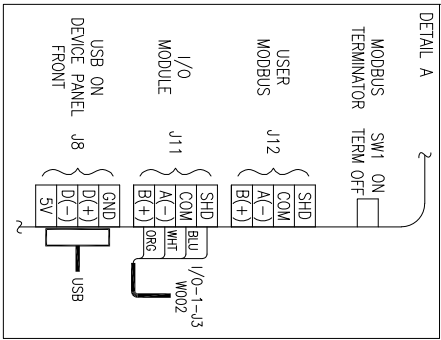
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|------------------------|-----------------------------------------|-----------|------|
| PROGRAMMABLE<br>INPUTS | CUSTOMER DESIGNATED<br>INPUT ASSIGNMENT |           | DATE |
|                        | SIGNAL                                  | NAME      |      |
| IN-1                   | <input type="checkbox"/> J2-2           |           |      |
|                        | <input type="checkbox"/> J2-3           |           |      |
| IN-2                   | <input type="checkbox"/> J2-4           |           |      |
|                        | <input type="checkbox"/> J2-5           |           |      |
| IN-3                   | <input type="checkbox"/> J2-6           |           |      |
|                        | <input type="checkbox"/> J2-7           |           |      |
| IN-4                   | <input type="checkbox"/> J2-8           |           |      |
|                        | <input type="checkbox"/> J2-9           |           |      |

| I/O MODULE 1            |                                | CUSTOMER DESIGNATED<br>OUTPUT ASSIGNMENT |      | DATE |
|-------------------------|--------------------------------|------------------------------------------|------|------|
| PROGRAMMABLE<br>OUTPUTS |                                | SIGNAL                                   | NAME |      |
| OUT-1                   | <input type="checkbox"/> J4-1  |                                          |      |      |
|                         | <input type="checkbox"/> J4-2  |                                          |      |      |
|                         | <input type="checkbox"/> J4-3  |                                          |      |      |
| OUT-2                   | <input type="checkbox"/> J4-4  |                                          |      |      |
|                         | <input type="checkbox"/> J4-5  |                                          |      |      |
|                         | <input type="checkbox"/> J4-6  |                                          |      |      |
| OUT-3                   | <input type="checkbox"/> J4-7  |                                          |      |      |
|                         | <input type="checkbox"/> J4-8  |                                          |      |      |
|                         | <input type="checkbox"/> J4-9  |                                          |      |      |
| OUT-4                   | <input type="checkbox"/> J4-10 |                                          |      |      |
|                         | <input type="checkbox"/> J4-11 |                                          |      |      |
|                         | <input type="checkbox"/> J4-12 |                                          |      |      |



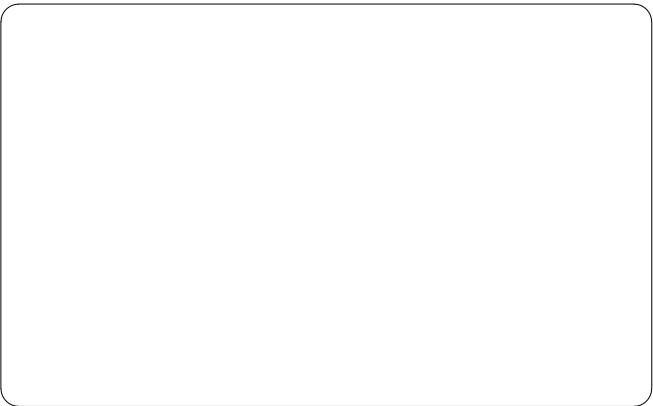
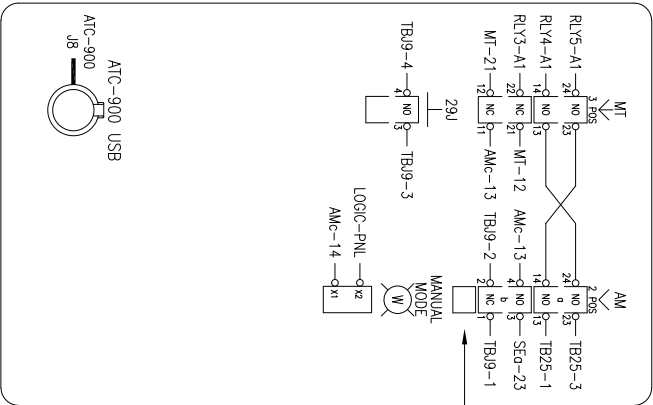
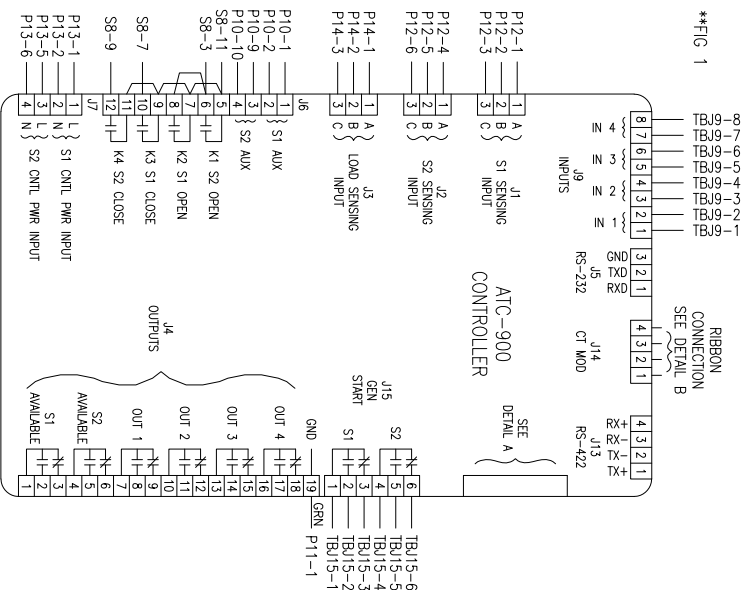
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| DESIGNATION |  | PAGE CODE<br>88725 | DIFFER       |      | DATE        | THE INFORMATION ON THIS DOCUMENT WAS CREATED BY EATON CORPORATION. IT WAS DISCLOSED IN CONFERENCE AND IS ONLY TO BE USED FOR THE PURPOSE IN WHICH IT WAS SUPPLIED. | EATON           |                 |         |
|             |  |                    | TOOLAN       |      | 2/10/2025   |                                                                                                                                                                    |                 |                 |         |
|             |  |                    | APPD         | DATE |             |                                                                                                                                                                    |                 |                 |         |
|             |  |                    | PRODUCT CODE | S.O. | TYPE        |                                                                                                                                                                    |                 | FIXED MOUNTED   | DIAGRAM |
|             |  |                    | REVISION     | AT   | ALA211184K7 |                                                                                                                                                                    |                 | ATC9C5X30600XSU |         |
|             |  | 1                  | G.O.         | —    | W           | 2                                                                                                                                                                  | SHEET<br>5 OF 6 |                 |         |

\*\*REFER TO ENCLOSURE DOOR REAR VIEW FOR DEVICE PLACEMENT



| ATC-900 CONTROLLER  |                                      |                   | 69D8391H01 |
|---------------------|--------------------------------------|-------------------|------------|
| PROGRAMMABLE INPUTS | CUSTOMER DESIGNATED INPUT ASSIGNMENT |                   | DATE       |
|                     | SIGNAL                               | NAME              |            |
| IN-1                | AMB-1                                | MONITOR MODE N.C. | 2/10/2025  |
| IN-2                | AMB-2                                | MANUAL RETRANSFER | 2/10/2025  |
| IN-3                |                                      |                   |            |
| IN-4                |                                      |                   |            |

| ATC-900 CONTROLLER   |                                       |      | 69D8391H02 |
|----------------------|---------------------------------------|------|------------|
| PROGRAMMABLE OUTPUTS | CUSTOMER DESIGNATED OUTPUT ASSIGNMENT |      | DATE       |
|                      | SIGNAL                                | NAME |            |
| OUT-1                | J4-7                                  |      |            |
| OUT-2                | J4-8                                  |      |            |
| OUT-3                | J4-9                                  |      |            |
| OUT-4                | J4-10                                 |      |            |
| OUT-5                | J4-11                                 |      |            |
| OUT-6                | J4-12                                 |      |            |
| OUT-7                | J4-13                                 |      |            |
| OUT-8                | J4-14                                 |      |            |
| OUT-9                | J4-15                                 |      |            |
| OUT-10               | J4-16                                 |      |            |
| OUT-11               | J4-17                                 |      |            |
| OUT-12               | J4-18                                 |      |            |



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### SUBMITTAL STATUS:

- ☒ Submitted ☐ Approved ☐ Rejected

### OTHER:

| Copies | Date      | No. | Description                      |
|--------|-----------|-----|----------------------------------|
| 1      | 2/11/2025 | 1   | GENERATOR SUBMITTAL FOR APPROVAL |

### THESE ARE TRANSMITTED as checked below:

- |                                                  |                                                   |                                   |
|--------------------------------------------------|---------------------------------------------------|-----------------------------------|
| <input type="checkbox"/> For approval            | <input type="checkbox"/> Approved as submitted    | <input type="checkbox"/> Resubmit |
| <input checked="" type="checkbox"/> For your use | <input type="checkbox"/> Approved as noted        | <input type="checkbox"/> Submit   |
| <input type="checkbox"/> As requested            | <input type="checkbox"/> Returned for corrections | <input type="checkbox"/> Return   |
| <input type="checkbox"/> For review & comment    | <input type="checkbox"/> Other                    |                                   |
| <input type="checkbox"/> Remarks:                |                                                   |                                   |

- GENERATOR: 20-24 WEEKS AFTER RELEASE OF ORDER.
- ATS: 25-27 WEEKS AFTER RELEASE OF ORDER.
- MTS DOCKING STATION: 9-13 WEEKS AFTER RELEASE OF ORDER

Note: Submittals or Drawing Approval must be received by Carter within 30 days of submittal date. Approvals received after 30 days of submission are subject price adjustment.

|                                     |                          |                                                    |  |
|-------------------------------------|--------------------------|----------------------------------------------------|--|
| <input type="checkbox"/>            | APPROVED                 | REJECTED/RESUBMIT AS SPECIFIED                     |  |
| <input checked="" type="checkbox"/> | APPROVED AS NOTED        | NO ACTION REQUIRED                                 |  |
| <input type="checkbox"/>            | REVISE AS NOTED/RESUBMIT | SUBMITTAL NOT REQUIRED/<br>RETURNED WITHOUT REVIEW |  |

Approval is only for general conformance with the Project's design concept and the information given in the Contract Documents. Contractor is responsible for dimensions to be confirmed and correlated at the job site; information that pertains solely to the fabrication process or to the means and methods of construction; coordination of the work of all trades; and performing work in a safe and satisfactory manner. This approval does not modify Contractor's duty to comply with the Contract Documents.

By: Rachel C. Cornwell Date: 03/03/25

#### Comments:

1. Verify communications connection to provide the required status, control and metrics to the SCADA system per sheet EP640.
2. Page 10 of 60: Two separate 20A/1P circuits are currently indicated for shore power connection to the generator. Update connection in Panel LA to match 30A/1P connection requirement.
3. Page 11 of 60: Basis of design assumed generator would have a 500A breaker so the scheduled feeder on EP610 requires (2) sets of 250kcmil. Update feeder to (1) set of #4/0 with #2AWG.



## **PROJECT SUBMITTAL** **For Approval:**

EQUIPMENT: **Caterpillar Generator Set Model D250GC 250kW**

PROJECT LOCATION: **Central WTP**

CUSTOMER: **Bedford Regional Water Authority**

PURCHASE ORDER: **Signed BOM**

CMCo PROJECT ID#: **25082RB1**

Date: **February 11, 2025**

Carter Machinery Company primary point of contact for any questions moving forward:

**Rigo Barba** | Project Manager

Office: **804-823-1119**

Email: **Rigo\_Barba@CarterMachinery.com**

**Power Systems Sales Representative:** Troy Kincer

**Power Systems Sales Engineer:** Gary Ouellette

**Carter**



**LET'S GET TO WORK.®**

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Carter

## Disclosure Statement

### Project #

I certify that all items listed on Carter Machinery's Installation Checklist have been performed, installation is complete, and the generator can be commissioned.

If a technician is dispatched for startup and unable to commission the machine due to unfinished installation issues, I recognize that I will automatically incur a charge that will be added to the company's invoice. Charges will vary based on the technician's labor hours on site, travel time, and mileage fee. Charges will be based on Carter Machinery's current labor rate for an EPG Field Technician including overtime when incurred. For the commissioning of a generator involving switchgear, charges will be based on Carter Machinery's current labor rate for an EPG Switchgear Technician including overtime when incurred.

#### Current Rates:

- |                              |                                                                 |
|------------------------------|-----------------------------------------------------------------|
| 1. EPG Field Technician      | \$200.00 per hour *                                             |
| 2. EPG Switchgear Technician | \$250.00 per hour **                                            |
| 3. Mileage Fee               | \$4.00/mile (600kw and below)<br>\$5.32/mile (+601kw and above) |
| 4. Travel Fee                | \$170.00/hr                                                     |

My signature indicates that we comply with the above statements and agree to pay the additional expense should Carter Machinery be unable to commission the machine due to unfinished installation issues.

---

Company

---

Name (print)

---

Title

---

Signature

\* \$196.00 per hour is regular time during the normal business hours of 7:30am-4:00pm Monday-Friday. Overtime is \$294.00 per hour outside of normal business hours Monday-Friday and all day Saturday. Double time is \$392.00 per hour all day Sunday and holidays.

\*\* \$250.00 per hour is regular time during the normal business hours of 7:30am-4:00pm Monday-Friday. Overtime is \$375.00 per hour outside of normal business hours Monday-Friday and all day Saturday. Double time is \$500.00 per hour all day Sunday and holidays.



# Generator Installation Checklist

ID#: Serial#: Project:

**Please complete this form and return to Carter Machinery to schedule start-up. Failure to properly complete these tasks prior to start-up will result in additional charges.**

## Mounting:

- ☐ Genset is level and properly secured to pad.
- ☐ There are no obstructions to cooling or combustion airflow to the unit. (4 foot minimum space between radiator)
- ☐ Easy access is provided to all doors and control panels.

## Fuel:

- ☐ Flexible fuel supply line connection installed between rigid piping and generator base frame.
- ☐ Fuel supply isolation valve installed at generator set.

## ~~LPG or Natural Gas Fuel Systems:~~ **Reference Fuel Systems Requirements Guide**

- ☐ ~~LPG supply tank 80% full~~
- ☐ ~~Flexible fuel supply line connection installed between rigid piping and generator base frame (shipped with genset).~~
- ☐ ~~Fuel supply lines are properly sized and installed to provide correct gas fuel flow rate~~
- ☐ ~~Inline gas regulator installed with inlet and outlet pressure test ports available; fuel supply line from regulator should run to generator set only~~
- ☐ ~~Gaseous fuel available at the required pressure.~~

## Electrical:

- ☐ Main AC power cables are pulled and properly landed at the generator set, switchgear and transfer switches.
- ☐ (Generator Control wires) Control wires pulled from Switchgear/Transfer Switch to the generator set control panel as required.
- ☐ (Battery Charger/Engine Heater) 120 VAC circuit **stranded** wires pulled to generator set control panel from one circuit breaker of appropriate rating. (20-60amp) (AC wires must be pulled in separate loom from control wires) these wires to remain de-energized until commissioning.
- ☐ Generator set frame is properly grounded.
- ☐ Flexible conduit connection to generator set.
- ☐ All electrical wiring performed by a licensed electrician.
- ☐ If applicable: Remote panel(s) mounted and (2) #14 awg stranded wires and RS-485 data cable (Belden 9366) in addition pulled to the generator control panel. Connections should be made at the remote panel and wiring properly labeled at the generator set control panel.

## Day of Start Up:

- ☐ Contractor Representative must be present at the time of Start Up. End user representative(s) may be present.
- ☐ Utility power must be available at the time of Start Up.
- ☐ A test of the transfer switches will be required at Start Up requiring a short interruption of facility power. Prior authorization should be obtained from the end user.
- ☐ The following information must be available at the time of Start Up.
  - Generator Set Exercise:  
Day: \_\_\_\_\_ Time: \_\_\_\_\_

\_\_\_\_\_  
Contractor Signature

**Please complete one form per generator set by checking the blocks and return to Carter Machinery to schedule start-up. Failure to properly complete these tasks prior to start-up will result in additional charges.**



## **Exemption Statement**

### **Project #**

Carter Machinery Co., Inc. is quoting this project as a material supplier only and therefore is exempt from provisions in the contract document, if any, pertaining to sub – contractor performance bonds and retainages .The equipment and services listed in this quotation are being offered as our interpretation of the specification requirements. We have included herein a complete listing of the equipment and services we propose to supply. If it is not listed in this Bill of Materials it is not being supplied by Carter Machinery.

**Carter**



# SECTION A

2/10/2025

Quote#: GBO110416-SPS

***BRWA-CENTRAL WTP***  
**USING SOURCEWELL CONTRACT PRICING - #092222- CAT**

## **SOURCEWELL CONTRACT ITEMS**

**BASE MODEL**

- **EPA STATIONARY EMERGENCY CERTIFIED- EPA TIER 3 & CARB EMISSIONS LEVELS (PER EPA NSPS RULE)**
  - C09DE60 [CAT D250GC, 277/480v, 60Hz ENGINE-GENERATOR SET – 3-PHASE]

**ATTACHMENTS**

- **EMISSION CERTIFICATION**
  - CERTESE [EPA STATIONARY EMERGENCY]
- **UL LISTING**
  - ULLIST – [UL2200 LISTED]
- **VOLTAGE INDICATOR**
  - 60H0480 [277/480V]
- **APPLICATION INDICATOR**
  - STANDBY [STANDBY RATING]
- **CONTROL PANEL**
  - GCCP12 [GCCP 1.2 AUTOSTART CONTROL PANEL]
  - EMCCAS3 [VOLT FREE ALARM CONTACTS AND GEN RUN RELAY]
- **GENERATOR ATTACHMENTS**
  - OGNSEDA [CAT M2754L4 SE DA GENERATOR, 105 DEGREE C TEMP RISE]
  - SHK0012 [ANTI-CONDENSATION HEATER FOR GENERATOR END]
  - PMEXC13 [PERMANENT MAGNET EXCITATION]
- **CIRCUIT BREAKER**
  - CBK0716 [400A/3P/100% RATED, LSI ELECTRONIC ADJUSTABLE TRIP]
    - AUX CONTACTS AND 24V SHUNT TRIP INSTALLED
  - SUSE [NEUTRAL BAR INSTALLED]
- **COOLING / HEATING SYSTEM**
  - STDRAD [RADIATOR INSTALLED]
  - WHHH01 [JACKET WATER HEATER PUMP STYLE]
- **ENCLOSURE**
  - ENCSAR1 [SA LEVEL 2 WHITE WITH MUFFLER]
    - 74dBA AT 23' FT
- **FUEL TANK**
  - FTDW035 [600 GALLON UL142 INTEGRAL FUEL TANK]
    - 28HRS AT 100% LOAD, 35HRS AT 75% LOAD, 47HRS AT 50% LOAD.
    - 156" L X 57" W X 98" H & APPROX. WEIGHT IS 7,800LBS (WITHOUT FUEL)
    - FAHL90 [AUTO ALARM (90%)]
    - FFLCK [FUEL TANK FILL PIPE & LOCK CAP]
- **AIR CLEANER**
  - STDAIR [AIR CLEANER INSTALLED]
- **STARTING/CHARGING SYSTEM**
  - BTC1028 [BATTERY CHARGER 10A, NFPA 110 COMPLIANT]
  - BAT2462 [1000CCA WET 90A/HR BATTERIES INSTALLED]
- **TESTS/REPORTS**
  - STDTEST [STANDARD 0.8 POWER FACTOR FACTORY TEST PRIOR TO SHIPPING]
- **MISC**
  - PL444 [PRODUCT LINK 4G LTE TELEMATICS]
  - EXPMD01 [OUTPUT MODULE]
  - GFCICS1 [20A GFCI (CONTROL SIDE)]
  - LDC100A [100AMP LOAD CENTER]
  - ANNRO1 [REMOTE ANNUNCIATOR]
  - EMGSTP1 [REMOTE E-STOP]

- **SOURCED GOODS & SUPPORT SERVICE PRICE ITEMS**

- ONE (1) EATON ATC900 SERIES ATS, 600A, 480V, NON-SERVICE RATED, 3-POLE, OPEN TRANSITION IN A NEMA1 INDOOR ENCLOSURE.
  - I/O MODULE FOR ADDITIONAL COMMUNICATIONS.
  - 50kAIC WITH ANY BREAKER
  - ATS REMOTE ANNUNCIATOR
- ONE (1) PSI, 600A, 480V, SERVICE RATED, SINGLE BREAKER, DUAL PURPOSE DOCKING STATION IN A NEMA-3R OUTDOOR ENCLOSURE.
  - CAM-LOK- MALE FOR TEMP GENERATOR CONNECTION- FEMALE FOR LOAD BANK CONNECTION
  - PHASE ROTATION
  - CAM-LOK LOCATION-BOTTOM OF ENCLOSURE
  - TWO YEAR WARRANTY STARTS WHEN THE ATS SHIPS FROM THE FACTORY.
- (12) MONTH PM AGREEMENT WITH QUARTERLY VISITS.
- FIVE (5) YEAR/2,500HR CAT (GENERATOR) ESC PLATINUM WARRANTY (NO DEDUCTABLES)
- STANDARD FIELD STARTUP DURING OUR NORMAL WORKING HOURS. (NO FUEL INCLUDED)
- NFPA110 RESISTIVE LOAD BANK TEST DURING OUR NORMAL WORKING HOURS. (NO FUEL INCLUDED)
- TRAVEL TO/FROM SITE
- FACTORY AND LOCAL FREIGHT
- DELIVERY TO JOBSITE
- OFF LOADING EQUIPMENT BY OTHERS AND NOT INCLUDED

**FACTORY LEAD TIME:**

- GENERATOR: 20-24 WEEKS AFTER RELEASE OF ORDER.
- ATS: 25-27 WEEKS AFTER RELEASE OF ORDER.
- MTS DOCKING STATION: 9-13 WEEKS AFTER RELEASE OF ORDER.



**IMPORTANT – Generator Control Wiring**

To be executed by Contractor and/or end user prior to on-site generator commissioning.  
Control Wiring Recommendations are provided as follows for:

**Bedford Regional Water Authority**

- |                                                |                                                                                                                              |
|------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------|
| Generator Model:                               | D250GC, 250kW                                                                                                                |
| Generator Control Panel:                       | GCCP 1.2                                                                                                                     |
| Generator Control Panel to ATS:                | (4) #14 stranded wires                                                                                                       |
| Generator control panel to Remote Annunciator: | #14 stranded wire and Belden 9366                                                                                            |
| Power Requirements (Minimum):                  | (1) 30 AMP, 120V circuit pulled to generator control panel for battery charger, anti-condensation heater and coolant heater. |

Two separate 20A/1P circuits are currently indicated for shore power connection to the generator. Update connection in Panel LA to match 30A/1P connection requirement.

THE ABOVE WIRING REQUIREMENTS HAVE BEEN MET FOR THIS PROJECT.

CONTRACTOR: \_\_\_\_\_

BY: \_\_\_\_\_ DATE: \_\_\_\_\_



**IMPORTANT – Lug Sizing**

To be executed by the Electrical Contractor and or the Engineer prior to release for production.

Cable Connection Lugs are provided as Follows for:

**Bedford Regional Water Authority**

***Circuit Breaker, 400 Ampere, 3 Pole:***      ***ABB XT5-Frame***

Line:                                      Qty/Phase: (1)                                      Wire Range: 4/0 AWG

Basis of design assumed generator would have a  
500A breaker so the scheduled feeder on EP610  
requires (2) sets of 250kcmil. Update feeder to (1) set  
of #4/0 with #2AWG.

The lugs listed above are standard for the equipment to be supplied, except where noted.

THE ABOVE LUGS ARE CORRECT FOR THIS PROJECT.

ELECTRICAL CONTRACTOR: \_\_\_\_\_

BY: \_\_\_\_\_ DATE: \_\_\_\_\_

**AND / OR**

ENGINEERING FIRM / OWNER: \_\_\_\_\_

BY: \_\_\_\_\_ DATE: \_\_\_\_\_



# SECTION B



# Cat® D250 GC

## Diesel Generator Sets



Standby : 60 Hz



Image shown may not reflect actual configuration.

|                       |                                     |
|-----------------------|-------------------------------------|
| Engine Model          | Cat® C9 In-line 6, 4-cycle diesel   |
| Bore x Stroke         | 112 mm x 149 mm (4.4 in x 5.9 in)   |
| Displacement          | 8.8 L (538 in³)                     |
| Compression Ratio     | 16.3:1                              |
| Aspiration            | Turbocharged Air-to-Air Aftercooled |
| Fuel Injection System | HEUI                                |
| Governor              | Electronic ADEM™ A4                 |

| Model   | Standby            | Emission Strategy                                  |
|---------|--------------------|----------------------------------------------------|
| D250 GC | 250 ekW, 312.5 kVA | EPA Certified for Stationary Emergency Application |

### PACKAGE PERFORMANCE

| Performance                                                     | Standby       |
|-----------------------------------------------------------------|---------------|
| Frequency                                                       | 60 Hz         |
| Genset Power Rating                                             | 312.5 kVA     |
| Genset power rating with fan @ 0.8 power factor                 | 250 ekW       |
| Emissions                                                       | EPA TIER 3    |
| Performance Number                                              | DM8501        |
| Fuel Consumption                                                |               |
| 100% load with fan, L/hr (gal/hr)                               | 73.3 (19.4)   |
| 75% load with fan, L/hr (gal/hr)                                | 58.8 (15.5)   |
| 50% load with fan, L/hr (gal/hr)                                | 43.8 (11.6)   |
| 25% load with fan, L/hr (gal/hr)                                | 27.4 (7.3)    |
| Cooling System¹                                                 |               |
| Radiator air flow restriction (system), kPa (in. water)         | 0.12 (0.48)   |
| Radiator air flow, m³/min (cfm)                                 | 497 (17551)   |
| Engine coolant capacity, L (gal)                                | 14 (3.69)     |
| Radiator coolant capacity, L (gal)                              | 25 (6.6)      |
| Total coolant capacity, L (gal)                                 | 45 (11.88)    |
| Inlet Air                                                       |               |
| Combustion air inlet flow rate m³/min (cfm)                     | 23.83 (841.5) |
| Max. Allowable Combustion Air Inlet Temp, °C (°F)               | 49 (120)      |
| Exhaust System                                                  |               |
| Exhaust stack gas temperature, °C (°F)                          | 460 (860)     |
| Exhaust gas flow rate, m³/min (cfm)                             | 63.6 (2246)   |
| Exhaust system backpressure (maximum allowable) kPa (in. water) | 10.0 (40.0)   |
| Heat Rejection                                                  |               |
| Heat rejection to jacket water, kW (Btu/min)                    | 104 (5928)    |
| Heat rejection to exhaust (total), kW (Btu/min)                 | 277 (15772)   |
| Heat rejection to aftercooler, kW (Btu/min)                     | 82 (4686)     |
| Heat rejection to atmosphere from engine, kW (Btu/min)          | 18 (1004)     |
| Heat rejection from alternator, kW (Btu/min)                    | 20 (1120)     |
| Emissions (Nominal)²                                            |               |
| NOx, mg/Nm³ (g/hp-hr)                                           | 1637.5 (3.14) |
| CO, mg/Nm³ (g/hp-hr)                                            | 323.2 (0.68)  |
| HC, mg/Nm³ (g/hp-hr)                                            | 71.2 (0.17)   |
| PM, mg/Nm³ (g/hp-hr)                                            | 63.7 (0.16)   |

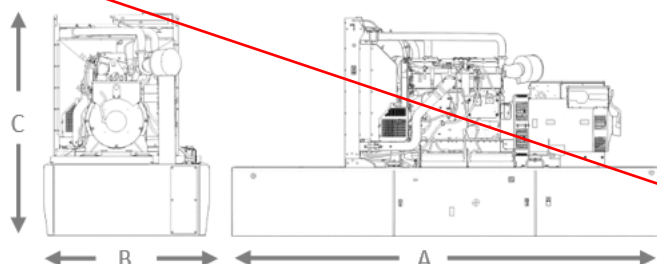
# D250 GC Diesel Generator Sets

## Electric Power



| Alternator <sup>3</sup>                           |         |         |         |
|---------------------------------------------------|---------|---------|---------|
| Voltages                                          | 480V    | 208     | 600V    |
| Motor starting capability @ 30% Voltage Dip, skVA | 809     | 544     | 1006    |
| Current Amps                                      | 375.9   | 867.4   | 300.7   |
| Frame Size                                        | M2754L4 | M2774L4 | M2754L4 |
| Excitation                                        | PMG     | S.E     | AREP    |
| Temperature Rise, °C                              | 105     | 105     | 105     |

### WEIGHTS & DIMENSIONS – OPEN SET



### FUEL TANK CAPACITY

| Tank Design | Total Capacity<br>L (gal) | Useable Capacity<br>L (gal) |
|-------------|---------------------------|-----------------------------|
| Integral    | 2270 (600)                | 2059 (554)                  |

| Base               | Length "A"<br>mm (in) | Width "B"<br>mm (in) | Height "C"<br>mm (in) | Generator Set Weight<br>kg (lb) |
|--------------------|-----------------------|----------------------|-----------------------|---------------------------------|
| Skid (Wide Base)   | 3950 (155.5)          | 1440 (56.7)          | 1706 (67.2)           | 2415 (5324.2)                   |
| Integral Tank Base | 3950 (155.5)          | 1430 (56.3)          | 2202 (86.7)           | 3055 (6735.1)                   |

**Note:** General configuration not to be used for installation. See general dimension drawings for detail.

### APPLICABLE CODES AND STANDARDS:

AS1359, CSA C22.2 No100-04, UL142, UL489, UL869, UL2200, NFPA37, NFPA70, NFPA99, NFPA110, IBC, IEC60034-1, ISO3046, ISO8528, NEMA MG1-22, NEMA MG1-33, 2006/95/EC, 2006/42/EC, 2004/108/EC.

Note: Codes may not be available in all model configurations. Please consult your local Cat Dealer representative for availability.

**STANDBY:** Output available with varying load for the duration of the interruption of the normal source power. Average power output is 70% of the standby power rating. Typical operation is 200 hours per year, with maximum expected usage of 500 hours per year.

**RATINGS:** Ratings are based on SAE J1349 standard conditions. These ratings also apply at ISO3046 standard conditions.

**FUEL RATES:** Based on fuel oil of 35° API [16° C (60° F)] gravity having an LHV of 42 780 kJ/kg (18,390 Btu/lb) when used at 29° C (85° F) and weighing 838.9 g/litre (7.001 lbs/U.S. gal.). Additional ratings may be available for specific customer requirements, contact your Caterpillar representative for details. For information regarding Low Sulfur fuel and Biodiesel capability, please consult your Cat dealer.

### DEFINITIONS AND CONDITIONS

<sup>1</sup> For ambient and altitude capabilities consult your Cat dealer. Air flow restriction (system) is added to existing restriction from factory.

<sup>2</sup> Emissions data measurement procedures are consistent with those described in EPA CFR 40 Part 89, Subpart D & E and ISO8178-1 for measuring HC, CO, PM, NOx. Data shown is based on steady state operating conditions of 77° F, 28.42 in HG and number 2 diesel fuel with 35° API and LHV of 18,390 BTU/lb. The nominal emissions data shown is subject to instrumentation, measurement, facility and engine to engine variations. Emissions data is based on 100% load and thus cannot be used to compare to EPA regulations which use values based on a weighted cycle.

<sup>3</sup> UL 2200 Listed packages may have oversized generators with a different temperature rise and motor starting characteristics. Generator temperature rise is based on a 40° C ambient per NEMA MG1-32.

**LET'S DO THE WORK.™**

LEHE2023-03 (06/22)

Materials and specifications are subject to change without notice. The International System of Units (SI) is used in this publication.  
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Image shown might not reflect the actual configuration

## M Frame

### Standby Power

10 - 385 kVA, 50 Hz  
12.5 - 400 kVA, 60 Hz

### Prime Power

8 - 350 kVA, 50 Hz  
10 - 362.5 kVA, 60 Hz

#### DETAILS:

M Frame Generators are designed, manufactured and marketed in an ISO 9001 and ISO 14001 environments and designed to meet vibration levels per IEC 60034-14.

#### Main components

##### Housing

- Made of Steel frame, Aluminium or Cast iron
- Compact rigid assembly to better withstand genset vibrations

##### Insulation

- Class H

##### Shield

- Made of Aluminium or cast iron depending on frame

##### Shaft

- Made of carbon steel and obtained by lamination (EN 10083 – 2)
- Single bearing with coupling disc

##### Automatic Voltage Regulator

- Standard - R120 / R121 / R150 / R180 / D350
- Optional – Integrated Voltage regulator (Excitation module with Compatible EMCP Controller)

##### Fan

- Made of Plastic or cast Aluminium.

##### Construction

- Enclosure : ODP - Open Drip Proof
- Degree of protection : IP 23 as per IEC 60034 - 5
- Cooling System : IC 01 as per IEC 60529

##### CIP (Optional)

CIP gives an additional protection on windings in case of aggressive, corrosive environment or/and a relative humidity > 95%.

CIP is an optional offering with all M frame generators

##### Certificates and testing

- Generators are designed in compliance with:
  - IEC 60034 - 1
  - NEMA MG 1.32 – 33
  - ISO 1940
  - NFC 51-111
- Generators conform to EU rules (CE marking).
- UL/CSA certifications available on request
- Adheres to ISO 8528 Group G performance

##### Operating conditions

- **Radio Interference**  
Generators can be equipped with Class B Group 1 radio interference filters as defined by EN 61000 – 6
- **THD (Total Harmonic Distortion)**  
The no-load voltage wave form is sinusoidal with THD level below 2% and up to 4% depending on frame.
- **Vibration**  
Measurement, evaluation and limits of vibration severity are in accordance with IEC 60034-14

### TECHNICAL DATA

#### Stator/Rotor Core

- Laminated and enamel-insulated on both sides to minimise eddy-current losses

#### Bearing

- Single antifriction bearing grease lubricated (ball type)
- Permanently greased bearings (Optional Regreasable ball bearings with grease nipple)
- Theoretical lifetime of bearings is in excess of 20,000 (L10h as per ISO 281/1, standard horizontal construction generators, without external forces (radial and/or axial)). Floating bearing located on the ND end side

### OPERATIONAL CONSIDERATIONS

#### Parallel Operation

- M Frame generators are provided with an amply sized damper cage, 2/3 Winding pitch and are suitable for parallel operations with other generators, when equipped with the paralleling unit

#### RTDs (optional)

- 1+1 RTD on each phase of stator winding

**GENERATOR DATA****FEBRUARY 10, 2025**For Help Desk Phone Numbers [Click here](#)**Selected Model**

**Engine:** C9      **Generator Frame:** M2754L4      **Genset Rating (kW):** 250.0      **Line Voltage:** 480  
**Fuel:** Diesel      **Generator Arrangement:** 5652319      **Genset Rating (kVA):** 312.5      **Phase Voltage:** 277  
**Frequency:** 60      **Excitation Type:** Permanent Magnet      **Pwr. Factor:** 0.8      **Rated Current:** 375.9  
**Duty:** STANDBY      **Connection:** SERIES STAR      **Application:** EPG      **Status:** Current

Version: 42423 /44642 /43655 /8535

**Spec Information**

| Generator Specification           |                                |                           | Generator Efficiency |           |                     |
|-----------------------------------|--------------------------------|---------------------------|----------------------|-----------|---------------------|
| <b>Frame:</b> M2754L4             | <b>Type:</b> SR500             | <b>No. of Bearings:</b> 1 | <b>Per Unit Load</b> | <b>kW</b> | <b>Efficiency %</b> |
| <b>Winding Type:</b> RANDOM WOUND | <b>Flywheel:</b> 14.0          |                           | 0.25                 | 62.5      | 90.1                |
| <b>Connection:</b> SERIES STAR    | <b>Housing:</b> 1              |                           | 0.5                  | 125.0     | 93.0                |
| <b>Phases:</b> 3                  | <b>No. of Leads:</b> 12        |                           | 0.75                 | 187.5     | 93.7                |
| <b>Poles:</b> 4                   | <b>Wires per Lead:</b> 4       |                           | 1.0                  | 250.0     | 93.5                |
| <b>Sync Speed:</b> 1800           | <b>Generator Pitch:</b> 0.6667 |                           |                      |           |                     |

| Reactances                             | Per Unit | Ohms   |
|----------------------------------------|----------|--------|
| SUBTRANSIENT - DIRECT AXIS $X''_d$     | 0.1029   | 0.0759 |
| SUBTRANSIENT - QUADRATURE AXIS $X''_q$ | 0.1280   | 0.0944 |
| TRANSIENT - SATURATED $X'_d$           | 0.1287   | 0.0949 |
| SYNCHRONOUS - DIRECT AXIS $X_d$        | 2.6377   | 1.9447 |
| SYNCHRONOUS - QUADRATURE AXIS $X_q$    | 1.3452   | 0.9918 |
| NEGATIVE SEQUENCE $X_2$                | 0.1154   | 0.0851 |
| ZERO SEQUENCE $X_0$                    | 0.0053   | 0.0039 |

| Time Constants                                         | Seconds |
|--------------------------------------------------------|---------|
| OPEN CIRCUIT TRANSIENT - DIRECT AXIS $T'_{d0}$         | 2.0492  |
| SHORT CIRCUIT TRANSIENT - DIRECT AXIS $T'_d$           | 0.1000  |
| OPEN CIRCUIT SUBTRANSIENT - DIRECT AXIS $T''_{d0}$     | 0.0124  |
| SHORT CIRCUIT SUBTRANSIENT - DIRECT AXIS $T''_d$       | 0.0100  |
| OPEN CIRCUIT SUBTRANSIENT - QUADRATURE AXIS $T''_{q0}$ | 0.1050  |
| SHORT CIRCUIT SUBTRANSIENT - QUADRATURE AXIS $T''_q$   | 0.0100  |
| EXCITER TIME CONSTANT $T_e$                            | 0.0170  |
| ARMATURE SHORT CIRCUIT $T_a$                           | 0.0150  |

Short Circuit Ratio: 0.5

Stator Resistance = 0.0229 Ohms

Field Resistance = 0.6456 Ohms

| Voltage Regulation                                        |      | Generator Excitation       |                              |                        |
|-----------------------------------------------------------|------|----------------------------|------------------------------|------------------------|
| <b>Voltage level adjustment:</b> +/-                      | 5.0% | <b>No Load</b>             | <b>Full Load, (rated) pf</b> |                        |
| <b>Voltage regulation, steady state:</b> +/-              | 0.8% |                            | <b>Series</b>                | <b>Parallel</b>        |
| <b>Voltage regulation with 3% speed change:</b> +/-       | 0.8% | <b>Excitation voltage:</b> | 13.52 Volts                  | 47.33 Volts      Volts |
| <b>Waveform deviation line - line, no load:</b> less than | 2.0% | <b>Excitation current</b>  | 1.14 Amps                    | 3.28 Amps      Amps    |
| <b>Telephone influence factor:</b> less than              | 50   |                            |                              |                        |

Selected Model

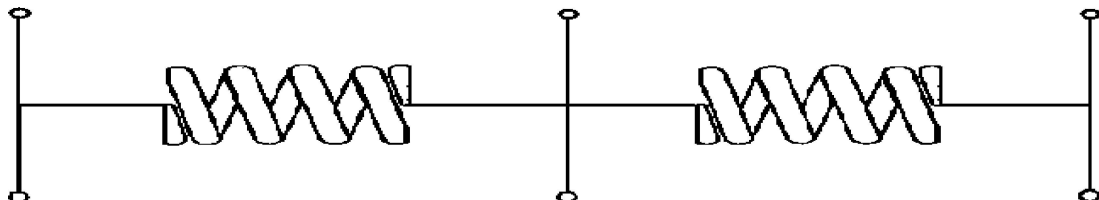
|               |                                   |                            |                      |
|---------------|-----------------------------------|----------------------------|----------------------|
| Engine: C9    | Generator Frame: M2754L4          | Genset Rating (kW): 250.0  | Line Voltage: 480    |
| Fuel: Diesel  | Generator Arrangement: 5652319    | Genset Rating (kVA): 312.5 | Phase Voltage: 277   |
| Frequency: 60 | Excitation Type: Permanent Magnet | Pwr. Factor: 0.8           | Rated Current: 375.9 |
| Duty: STANDBY | Connection: SERIES STAR           | Application: EPG           | Status: Current      |

Version: 42423 /44642 /43655 /8535

Generator Mechanical Information

| Center of Gravity                                                                                                                                                                                                                                                                                                                                            |           |           |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|-----------|
| Dimension X                                                                                                                                                                                                                                                                                                                                                  | -445.0 mm | -17.5 IN. |
| Dimension Y                                                                                                                                                                                                                                                                                                                                                  | 0.0 mm    | 0.0 IN.   |
| Dimension Z                                                                                                                                                                                                                                                                                                                                                  | 0.0 mm    | 0.0 IN.   |
| <ul style="list-style-type: none"><li>"X" is measured from driven end of generator and parallel to rotor. Towards engine fan is positive. See General Information for details</li><li>"Y" is measured vertically from rotor center line. Up is positive.</li><li>"Z" is measured to left and right of rotor center line. To the right is positive.</li></ul> |           |           |
| Generator WT = 754 kg    * Rotor WT = 302 kg    * Stator WT = 452 kg<br>1,662 LB                      666 LB                      996 LB                                                                                                                                                                                                                     |           |           |
| Rotor Balance = 0.0 mm deflection PTP<br>Overspeed Capacity = 125% of synchronous speed                                                                                                                                                                                                                                                                      |           |           |

Generator Torsional Data



The diagram illustrates a mechanical shaft assembly for a generator. It consists of three main components connected in series: J1 (Coupling and Fan) on the left, J2 (Rotor) in the center, and J3 (Exciter End) on the right. Each component is represented by a vertical line with a horizontal shaft segment. J1 and J2 are connected by a coupling (represented by a zigzag line), and J2 and J3 are also connected by a coupling. The shafts are labeled with their respective diameters and stiffnesses.

**J1 = Coupling and Fan**

**J2 = Rotor**

**J3 = Exciter End**

**TOTAL J = J1 + J2 + J3**

**K1 = Shaft Stiffness between J1 + J2 (Diameter 1)**

**K2 = Shaft Stiffness between J2 + J3 (Diameter 2)**

| J1                        | K1               | Min Shaft Dia 1 | J2                         | K2               | Min Shaft Dia 2 | J3                        |
|---------------------------|------------------|-----------------|----------------------------|------------------|-----------------|---------------------------|
| 5.5 LB IN. s <sup>2</sup> | 46.6 MLB IN./rad | 4.3 IN.         | 23.5 LB IN. s <sup>2</sup> | 50.2 MLB IN./rad | 4.5 IN.         | 1.5 LB IN. s <sup>2</sup> |
| 0.618 N m s <sup>2</sup>  | 5.27012 MN m/rad | 110.0 mm        | 2.655 N m s <sup>2</sup>   | 5.67 MN m/rad    | 115.0 mm        | 0.168 N m s <sup>2</sup>  |
| <b>Total J</b>            |                  |                 |                            |                  |                 |                           |
|                           |                  |                 | 30.5 LB IN. s <sup>2</sup> |                  |                 |                           |
|                           |                  |                 | 3.441 N m s <sup>2</sup>   |                  |                 |                           |

Selected Model

|               |                                   |                            |                      |
|---------------|-----------------------------------|----------------------------|----------------------|
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| Fuel: Diesel  | Generator Arrangement: 5652319    | Genset Rating (kVA): 312.5 | Phase Voltage: 277   |
| Frequency: 60 | Excitation Type: Permanent Magnet | Pwr. Factor: 0.8           | Rated Current: 375.9 |
| Duty: STANDBY | Connection: SERIES STAR           | Application: EPG           | Status: Current      |

Version: 42423 /44642 /43655 /8535

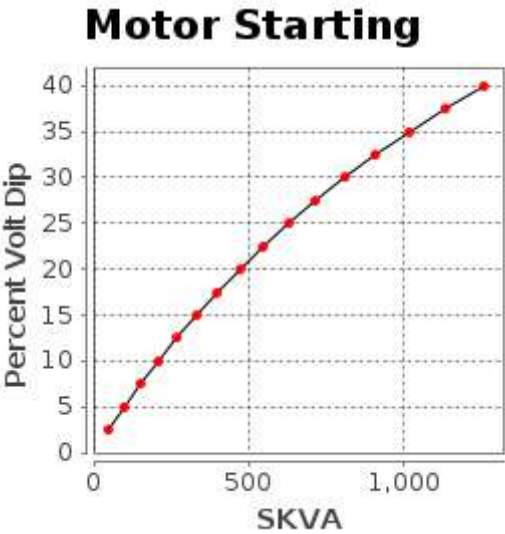
| Generator Cooling Requirements -<br>Temperature - Insulation Data |                          |                                   |
|-------------------------------------------------------------------|--------------------------|-----------------------------------|
| Cooling Requirements:                                             |                          | Temperature Data: (Ambient 40 °C) |
| Heat Dissipated:                                                  | 17.4 kW                  | Stator Rise: 105.0 °C             |
| Air Flow:                                                         | 30.0 m <sup>3</sup> /min | Rotor Rise: 105.0 °C              |
| Insulation Class: H                                               |                          |                                   |
| Insulation Reg. as shipped: 100.0 MΩ minimum at 40 °C             |                          |                                   |
| Thermal Limits of Generator                                       |                          |                                   |
| Frequency:                                                        | 60 Hz                    |                                   |
| Line to Line Voltage:                                             | 480 Volts                |                                   |
| B BR 80/40                                                        | 300.0 kVA                |                                   |
| F BR -105/40                                                      | 341.3 kVA                |                                   |
| H BR - 125/40                                                     | 375.0 kVA                |                                   |
| F PR - 130/40                                                     | 375.0 kVA                |                                   |
| H PR - 150/40                                                     | 397.5 kVA                |                                   |
| H PR27 - 163/27                                                   | 412.5 kVA                |                                   |

Selected Model

|                                    |                                   |                            |                      |
|------------------------------------|-----------------------------------|----------------------------|----------------------|
| Engine: C9                         | Generator Frame: M2754L4          | Genset Rating (kW): 250.0  | Line Voltage: 480    |
| Fuel: Diesel                       | Generator Arrangement: 5652319    | Genset Rating (kVA): 312.5 | Phase Voltage: 277   |
| Frequency: 60                      | Excitation Type: Permanent Magnet | Pwr. Factor: 0.8           | Rated Current: 375.9 |
| Duty: STANDBY                      | Connection: SERIES STAR           | Application: EPG           | Status: Current      |
| Version: 42423 /44642 /43655 /8535 |                                   |                            |                      |

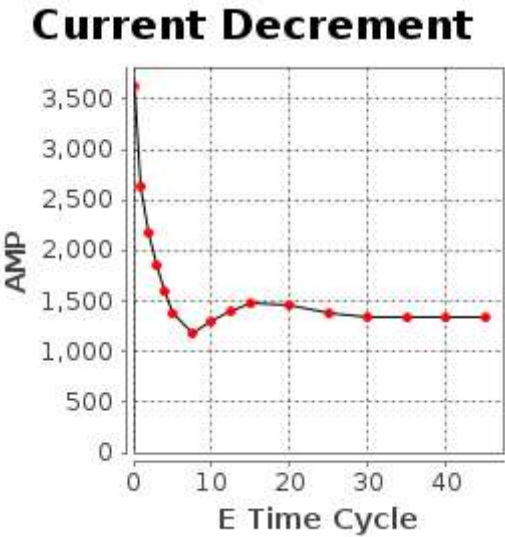
Starting Capability & Current Decrement  
Motor Starting Capability (0.6 pf)

| SKVA  | Percent<br>Volt Dip |
|-------|---------------------|
| 48    | 2.5                 |
| 99    | 5.0                 |
| 153   | 7.5                 |
| 210   | 10.0                |
| 270   | 12.5                |
| 333   | 15.0                |
| 400   | 17.5                |
| 472   | 20.0                |
| 548   | 22.5                |
| 629   | 25.0                |
| 716   | 27.5                |
| 809   | 30.0                |
| 908   | 32.5                |
| 1,016 | 35.0                |
| 1,132 | 37.5                |
| 1,258 | 40.0                |



Current Decrement Data

| E Time Cycle | AMP   |
|--------------|-------|
| 0.0          | 3,633 |
| 1.0          | 2,639 |
| 2.0          | 2,172 |
| 3.0          | 1,851 |
| 4.0          | 1,592 |
| 5.0          | 1,376 |
| 7.5          | 1,179 |
| 10.0         | 1,293 |
| 12.5         | 1,396 |
| 15.0         | 1,477 |
| 20.0         | 1,461 |
| 25.0         | 1,383 |
| 30.0         | 1,344 |
| 35.0         | 1,334 |
| 40.0         | 1,335 |
| 45.0         | 1,340 |



**Instantaneous 3 Phase Fault Current:** 3633 Amps      **Instantaneous Line - Line Fault Current:** 2966 Amps  
**Instantaneous Line - Neutral Fault Current:** 5016 Amps

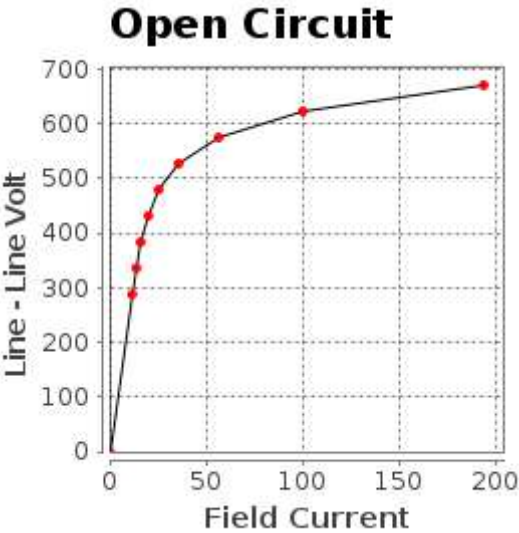
Selected Model

|                      |                                          |                                   |                             |
|----------------------|------------------------------------------|-----------------------------------|-----------------------------|
| <b>Engine:</b> C9    | <b>Generator Frame:</b> M2754L4          | <b>Genset Rating (kW):</b> 250.0  | <b>Line Voltage:</b> 480    |
| <b>Fuel:</b> Diesel  | <b>Generator Arrangement:</b> 5652319    | <b>Genset Rating (kVA):</b> 312.5 | <b>Phase Voltage:</b> 277   |
| <b>Frequency:</b> 60 | <b>Excitation Type:</b> Permanent Magnet | <b>Pwr. Factor:</b> 0.8           | <b>Rated Current:</b> 375.9 |
| <b>Duty:</b> STANDBY | <b>Connection:</b> SERIES STAR           | <b>Application:</b> EPG           | <b>Status:</b> Current      |

Version: 42423 /44642 /43655 /8535

Generator Output Characteristic Curves  
Open Circuit Curve

| Field Current | Line - Line Volt |
|---------------|------------------|
| 0.0           | 0                |
| 11.5          | 288              |
| 13.8          | 336              |
| 16.4          | 384              |
| 20.0          | 432              |
| 25.7          | 480              |
| 36.0          | 528              |
| 56.5          | 576              |
| 100.0         | 624              |
| 194.0         | 672              |

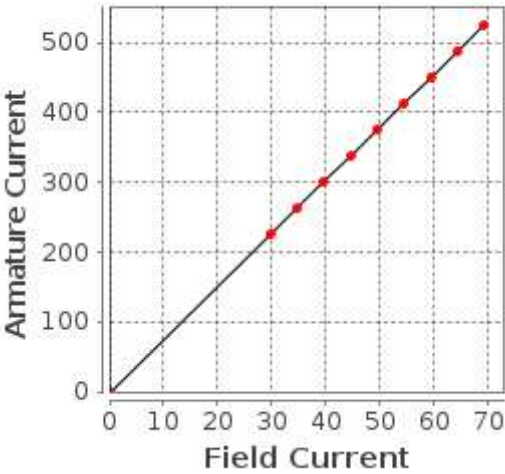




Short Circuit Curve

Short Circuit

| Field Current | Armature Current |
|---------------|------------------|
| 0.0           | 0                |
| 29.7          | 226              |
| 34.7          | 263              |
| 39.6          | 301              |
| 44.6          | 338              |
| 49.5          | 376              |
| 54.5          | 413              |
| 59.4          | 451              |
| 64.4          | 489              |
| 69.3          | 526              |



Selected Model

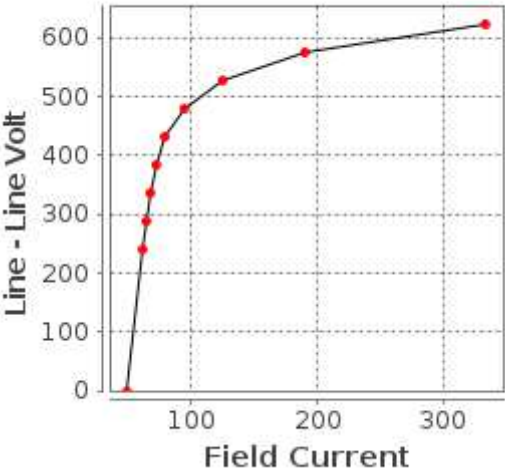
|               |                                   |                            |                      |
|---------------|-----------------------------------|----------------------------|----------------------|
| Engine: C9    | Generator Frame: M2754L4          | Genset Rating (kW): 250.0  | Line Voltage: 480    |
| Fuel: Diesel  | Generator Arrangement: 5652319    | Genset Rating (kVA): 312.5 | Phase Voltage: 277   |
| Frequency: 60 | Excitation Type: Permanent Magnet | Pwr. Factor: 0.8           | Rated Current: 375.9 |
| Duty: STANDBY | Connection: SERIES STAR           | Application: EPG           | Status: Current      |

Version: 42423 /44642 /43655 /8535

Generator Output Characteristic Curves  
Zero Power Factor Curve

Zero Power

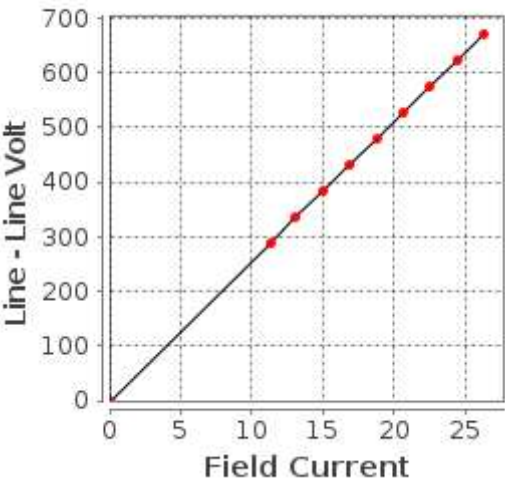
| Field Current | Line - Line Volt |
|---------------|------------------|
| 49.5          | 0                |
| 62.0          | 240              |
| 64.4          | 288              |
| 67.5          | 336              |
| 72.0          | 384              |
| 79.6          | 432              |
| 94.4          | 480              |
| 124.8         | 528              |
| 190.1         | 576              |
| 332.8         | 624              |



Air Gap Curve

Air Gap

| Field Current | Line - Line Volt |
|---------------|------------------|
| 0.0           | 0                |
| 11.3          | 288              |
| 13.1          | 336              |
| 15.0          | 384              |
| 16.9          | 432              |
| 18.8          | 480              |
| 20.6          | 528              |
| 22.5          | 576              |
| 24.4          | 624              |
| 26.3          | 672              |



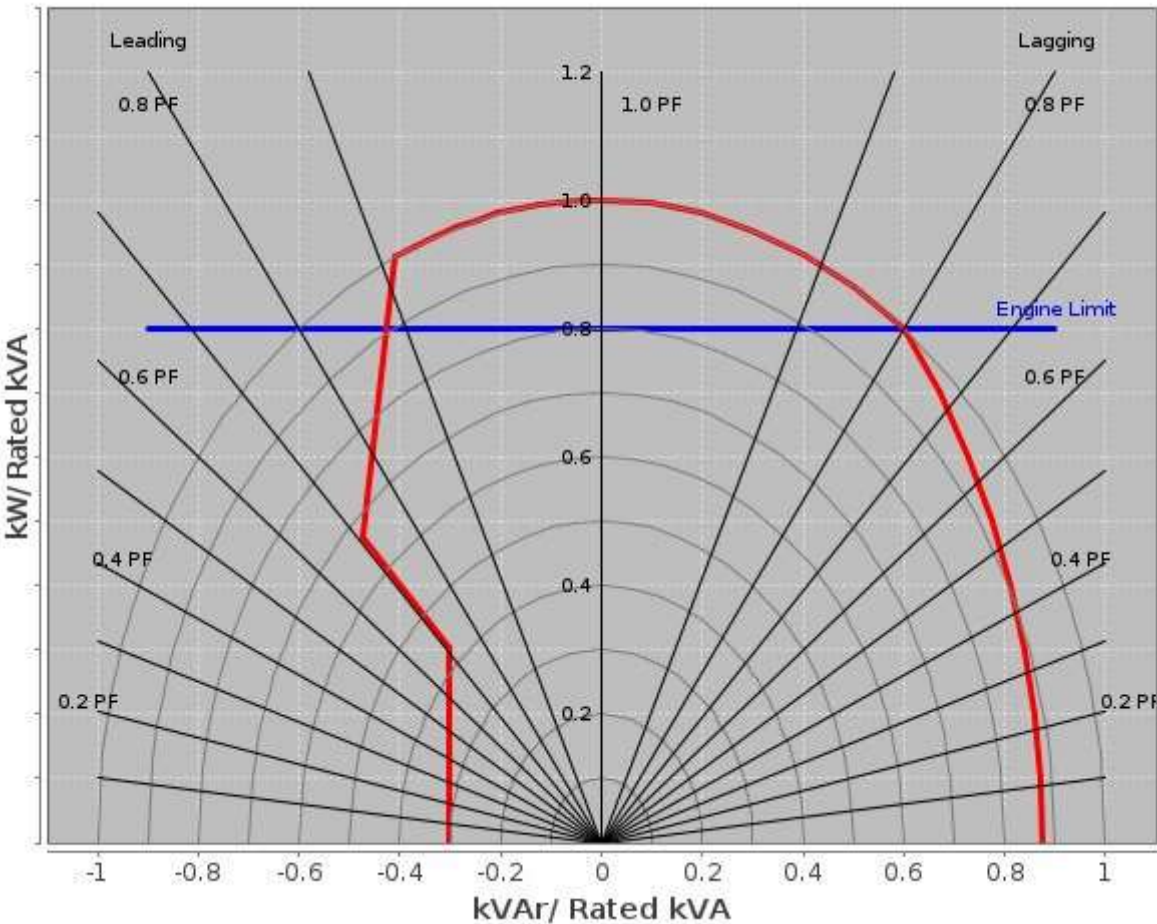
Selected Model

|               |                                   |                            |                      |
|---------------|-----------------------------------|----------------------------|----------------------|
| Engine: C9    | Generator Frame: M2754L4          | Genset Rating (kW): 250.0  | Line Voltage: 480    |
| Fuel: Diesel  | Generator Arrangement: 5652319    | Genset Rating (kVA): 312.5 | Phase Voltage: 277   |
| Frequency: 60 | Excitation Type: Permanent Magnet | Pwr. Factor: 0.8           | Rated Current: 375.9 |
| Duty: STANDBY | Connection: SERIES STAR           | Application: EPG           | Status: Current      |

Version: 42423 /44642 /43655 /8535

Reactive Capability Curve

Operating Chart





# SECTION C

# GCCP 1.2

## Control Panel



Image shown may not reflect actual configuration.

## GCCP 1.2 – Control Panel

GCCP 1.2 is an Auto Start Control Module suitable for a wide variety of diesel gen-set applications. Monitoring an extensive number of engine parameters, the modules will display warnings, shutdown and engine status information on the back-lit LCD screen, illuminated LEDs and remote PC.

### Description

The controller is compatible with electronic (CAN) and non-electronic (magnetic pick-up/alternator sensing) engines and offer an extensive number of flexible inputs, outputs and extensive engine protections so the system can be easily adapted to meet the most demanding industry requirements.

The extensive list of features includes enhanced event and performance monitoring, remote communications & PLC functionality. The modules can be easily configured using a configuration suite PC software.

### Full Range of Attachments

- Wide range of system expansion attachments, designed specifically to work with the GCCP controller
- Flexible packaging options for easy and cost effective installation

### Benefits

- Hours counter provides accurate information for monitoring and maintenance periods
- User-friendly set-up and button layout for ease of use
- Multiple parameters are monitored & displayed simultaneously for full visibility
- The module can be configured to suit a wide range of applications for user flexibility
- PLC editor allows user configurable functions to meet user specific application requirements
- RS485 Communication port can be used for the Remote Monitoring Communication (Compatible with Cat PLG)

### World Wide Product Support

- Cat dealers provide extensive pre and post sale support
- Cat dealers have over 1,600 dealer branch stores operating in 200 countries

### Features

- 4-line back-lit LCD text display
- Multiple display languages
- Five-key menu navigation
- LCD alarm indication
- Customisable power-up text and images
- Data logging facility
- Internal PLC editor
- Protections disable feature
- Fully configurable via PC using USB & RS485 communication
- Front panel configuration with PIN protection
- Power save mode
- 3-phase generator sensing and protection
- Generator current and power monitoring (kW, kvar, kVA, pf) kW and kvar overload and reverse power alarms
- Over current protection
- Unbalanced load protection
- Breaker control via fascia buttons
- Fuel and start outputs configurable when using CAN Support for 0V to 10V & 4 mA to 20 mA sensors
- 8 Configurable digital inputs (3 available for Customer use)
- 8 Configurable digital outputs (5 available for Customer use)
- 4 Configurable analogue inputs (3 available for Customer use)
- CAN, MPU and alternator frequency speed sensing in one variant
- Real time clock
- Engine pre-heat and post-heat functions
- Engine run-time scheduler
- Engine idle control for starting & stopping
- Fuel usage monitor and low fuel level alarms
- 3 Configurable maintenance alarms
- MODBUS RTU & TCP support
- User configurable MODBUS pages

### SPECIFICATIONS

#### DC SUPPLY

##### CONTINUOUS VOLTAGE RATING

8V to 35V continuous  
5V for upto 1 minute

##### CRANKING DROPOUTS

Able to survive 0V for 100 mS, providing supply was at least 10V before dropout and supply recovers to 5V. This is achieved without the need for internal batteries.

LEDs and backlight will not be maintained during cranking

##### MAXIMUM OPERATING CURRENT

260 mA at 12V, 150 mA at 24V

##### MAXIMUM STANDBY CURRENT

145 mA at 12V, 85 mA at 24V

##### CHARGE FAIL/EXCITATION RANGE

0V to 35V

##### GENERATOR & MAINS (UTILITY) VOLTAGE RANGE

15V to 415 V AC (Ph to N)  
26 V to 719 V AC (Ph to Ph)

##### MAGNETIC PICK-UP VOLTAGE RANGE

+/- 0.5 V to 70 V

##### FREQUENCY RANGE

10,000 Hz (max)

#### INPUTS

##### DIGITAL INPUTS A TO H

Negative switching

##### ANALOGUE INPUTS A TO D

Configurable as:

Negative switching digital input 0-10V sensor 4 mA to 20 mA  
Resistive Sensor

##### ANALOGUE INPUTS A TO C

Configurable as:

Negative switching digital input Resistive Sensor

#### OUTPUTS

##### OUTPUT A and B (FUEL & START)

15 A DC at supply voltage

##### AUXILIARY OUTPUTS C, D, E, F, G, H, I & J 2

A DC at supply voltage

#### DIMENSIONS

##### OVERALL

216 mm x 158 mm x 43 mm  
8.5" x 6.2" x 1.5"

##### PANEL CUTOUT

184 mm x 137 mm  
7.2" x 5.3"

##### MAXIMUM PANEL THICKNESS

8 mm  
0.3"

##### OPERATING TEMPERATURE

-30°C to +70°C  
-22°F to +158°F

##### STORAGE TEMPERATURE RANGE

-40°C to +85°C  
-40°F to +185°F

---

### STANDARDS

UL, cUL Listed

NFPA 70#

Electro-Magnetic Compatibility: BS EN 61000-6-2/6-4 Electrical Safety: BS EN 60950

Temperature: BS EN 60068-2-1, BS EN 60068-2-2

Vibration: BS EN 60068-2-6

Humidity: BS EN 60068-2-30, BS EN 60068-2-78 Shock: BS EN 60068-2-27

Degrees of protection provided by enclosures: BS EN 60529 Ingress Protection: IP65 –

Front of module when installed into the control panel with the optional sealing gasket

# Applicable codes and standards facilitate compliance to NFPA 70

### OPTIONAL MODULES

#### Remote annunciator



The Remote annunciator with an integral sounder is an output LED expansion module designed to display a maximum of eight individual LED indications up to a maximum distance of 1 km (0.6 miles). The annunciator will consist of two modules to provide a 16 Channel Fault annunciation. The Panels are fitted with removable label cards which can be used to identify the standard NFPA alarms.

#### Key Features:

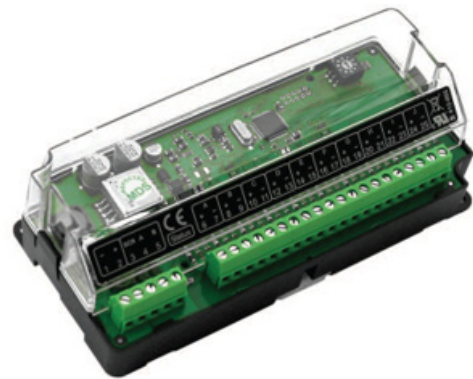
- Panel mount
- Vertical design
- In-built alarm
- Alarm mute button
- Max of 80 configurable LED's

#### Input Expansion Module

The Input Expansion module is used in conjunction with supported GCCP controllers to provide additional, flexible, input functionality. The module's ID switch is configurable from the module and the 10 inputs can be configured from within the 'host controller'. The inputs can be configured in a number of ways to connect to digital switches, resistive sensors, 0-10V DC signals or 4-20 mA signals.

#### Key Features:

- DIN rail & chassis mount
- Power on/link lost LED
- 1.2 km (0.75 Mile) working range
- Connect maximum of 4 x Input Modules to a single host controller
- Max of 40 configurable inputs



#### Output Expansion Module

The output relay expansion module for use with compatible GCCP control modules has been designed to extend a host module's output capabilities. A maximum of 10 relays can be connected to an individual module at any one time. All outputs are configurable via the host controller.

#### Key Features:

- Power On/Link Lost LED ID SWITCH
- 10 Expansion modules can be connected to 1 host controller at a time
- 8 Configurable relay contacts with LED indicators:
  - o 4 Normally Open (N/O)
  - o 4 Change Over (C/O)
- Terminal strip connection for quick and easy set-up



## LET'S DO THE WORK.™

LEHE2017-05 (11/24)

[www.cat.com/electricpower](http://www.cat.com/electricpower)

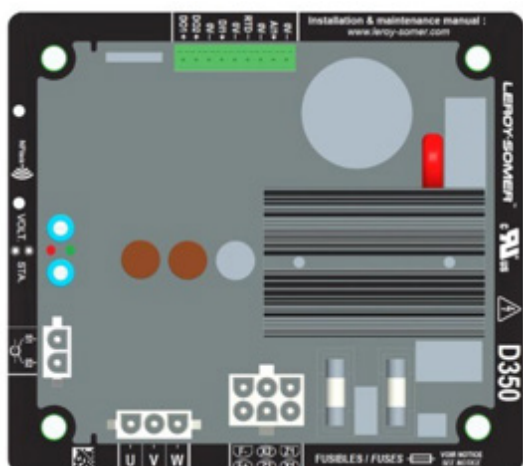
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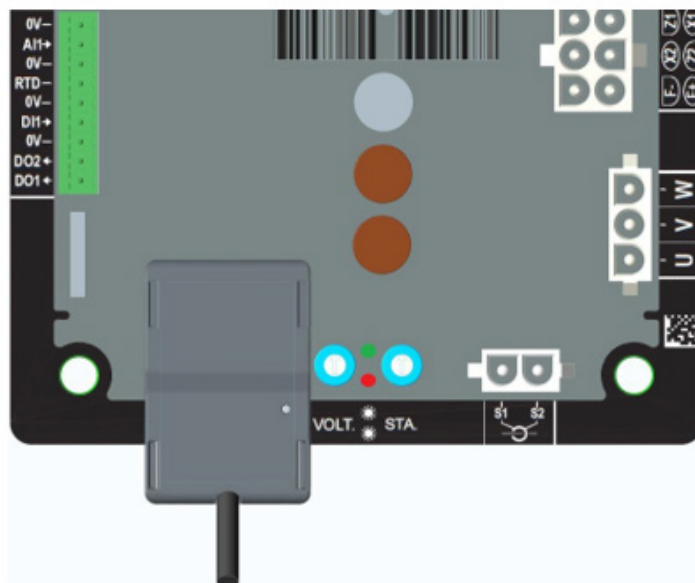
## D350AVR

The D350, Digital Voltage Regulator is used to regulate alternators with a field current of less than 5 A in continuous operations, and 10 A maximum in the event of short-circuit for 10 seconds maximum.

Its design is in accordance with mounting in a generator terminal box or a control cabinet. It is required, at a minimum, to follow the local protection and safety standards, especially those specific to electrical installations for voltages of 300 VAC phase-to-neutral maximum.

## NFLink™ configuration module

The D350 is equipped with NFC technology for communication and configuration purposes. The configuration module is placed over the two dedicated positioning holes on the plastic enclosure as shown below. Once the configuration is done, the NF Link must be removed as it is not supposed to be left on the D350 when it is in continuous operation.



## Technical Characteristics

D350 regulator can be used to perform the following functions:

### Voltage regulation

- With or without reactive droop compensation (Reactive droop to allow parallel operation)
- With or without line droop compensation

Regulation of the field current, or manual mode, which allows direct control of the field current.

### The D350 can also be used to:

- Adjust the reference for the regulation mode in progress, using an analogue input (0 – 10V and potentiometer)
- Monitoring of temperature sensor (Pt100 or CTP)
- Limit the minimum field current delivered to the exciter field
- Monitoring of the maximum stator current limit
- Loss of voltage sensing
- Withstand a sudden short-circuit for 10 seconds maximum in AREP, PMG
- Signals monitoring (events logger)
- 2 digital outputs for various trip, regulation mode and measurement data

### Alternator voltage sensing:

- 3 phases without neutral, 2 phases or 1 phase with neutral
- Three-phase range 0 – 530 VAC
- Consumption < 2 VA

### Stator current measurement with CT:

- Range 0 – 1A or 0 – 5A
- Consumption < 2 VA

### Power supply:

- 4 terminals for PMG, AREP, SHUNT
- Range 50 – 277 VAC
- Consumption max < 3000 VA

### Field excitation:

- Rated 0 – 5A
- Short-circuit 10A max



**Frequency:**

- Range 10-100 Hz
- Regulation accuracy:  $\pm 0.25\%$  of the average of the three phases on a linear load, with harmonic distortion less than 5%
- Voltage adjustment range: 0 to 150% of the rated voltage
- Quadrature droop adjustment range: -20% to 20%
- Under frequency protection: integrated, adjustable threshold, slope adjustable from 0.5 to 3V/Hz in steps of 0.1 V/Hz
- Excitation ceiling: adjustable by configuration at 3 points
- Environment: ambient temperature from -40°C to +65°C, relative humidity of less than 95% non-condensing, mounted in a cabinet or in a terminal box

**Easy Reg Advanced:**

- All the D350 settings are entered/configured using the "EasyReg Advanced" software
- This program is only compatible with computers running WINDOWS® versions Windows 7 and Windows 10 operating systems

**Dimensions:**

- Height: 52.9 mm
- Width: 125 mm
- Length: 140 mm

**Mounting:**

- Holes spacing on the Length: 115 mm
- Holes spacing on the width: 100 mm

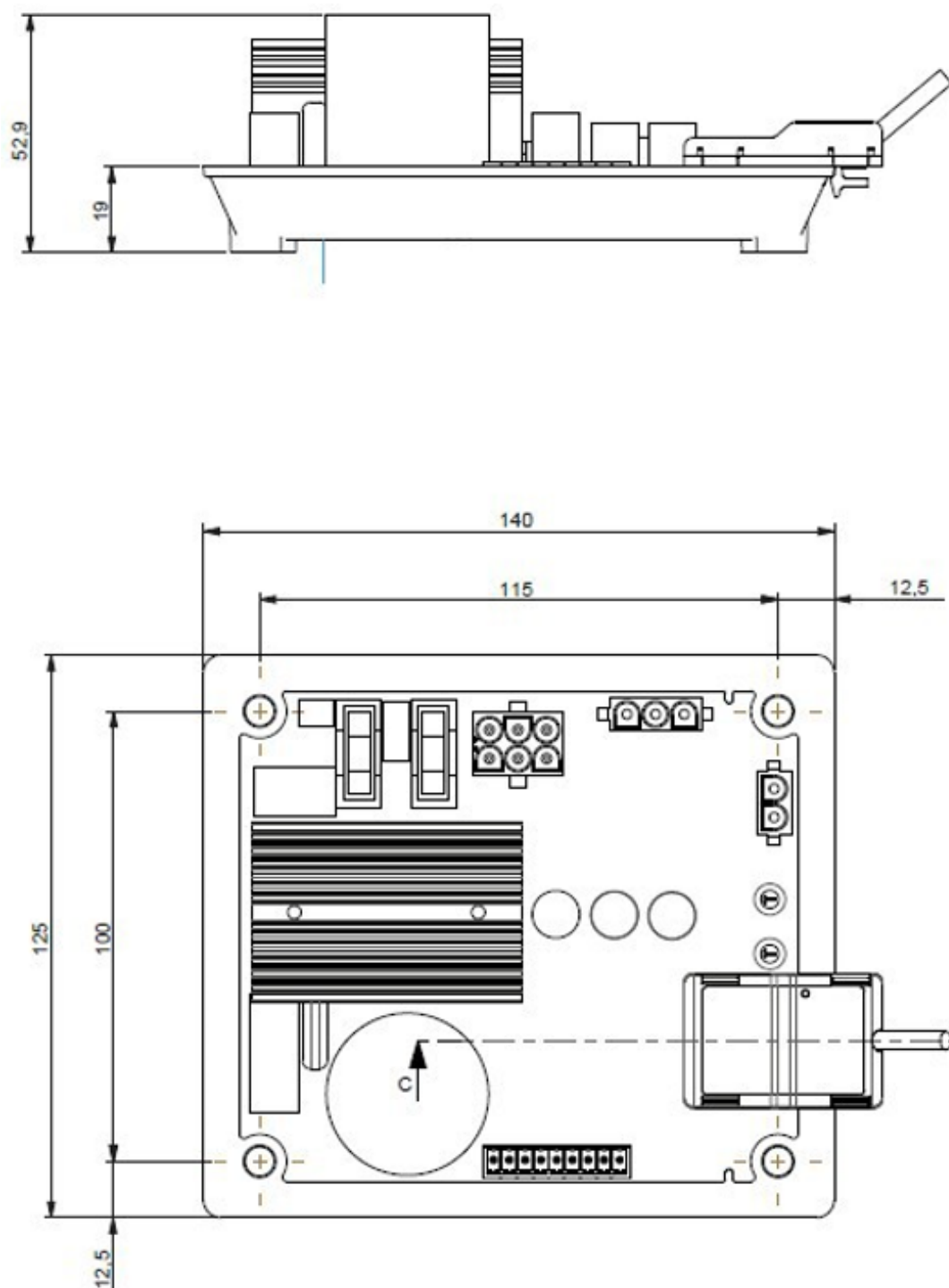
**Weight:**

- 0.45 kg

**Conformity to standards:**

- EMC: IEC 61000-6-2, IEC 61000-6-4
- Humidity: IEC 60068-1 and test in accordance with IEC 60068-2-14
- Dry heat: IEC 60068-2-2
- Damp heat: IEC 60028-2-30
- Cold: IEC 60068-2-1

## D350 AVR and NFLink™ Dimensions



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## ADEM™ A4 Engine Controller

The ADEM™ A4 is the main Electronic Control Module (ECM) used on select diesel engines. The ADEM A4 provides a higher degree of control over a large number of combustion variables. The ADEM A4 is designed to control/interface Electronic Unit Injector (EUI) equipped engines. The ADEM A4 engine system is composed of the ADEM A4 ECM, control software, sensors, actuators, fuel injectors, and interface to the generator system. The prime benefit of an ADEM A4 engine system is to better control and maintain the particulate emissions, both steady state and transient, while improving engine performance.

## Features

### Reliable, Durable

All ADEM A4 controllers are designed to survive the harshest environments.

- Environmentally sealed, die-cast aluminum housing isolates and protects electronic components from moisture and dirt contamination
- Rigorous vibration testing ensures product reliability and durability
- Accuracy maintained from  $-40^{\circ}\text{C}$  to  $85^{\circ}\text{C}$
- Electrical noise immunity to 100 volts / meter
- Internal circuits are designed to withstand shorts to + battery and – battery

### Simple Servicing

Each ADEM A4 system works in combination with the Cat® ET service tool software to keep the engine operating at peak performance.

- Displays measured parameters
- Retrieves active and logged event code documenting abnormal system operation
- Performs calibrations and diagnostic tests
- Supports flash programming of new software into the ADEM A4 ECM

### Self Diagnostics

Each ADEM A4 ECM has a full compliment of diagnostics. The ECM can detect faults in the electrical system and report those faults to the service technician for quick repair.

- Self-diagnostic capability pinpoints operational problems in need of attention.

### Advanced Features

- Enhanced performance from fuel injection timing and limiting
- Adjustable monitoring of vital engine parameters
- Programmable speed acceleration ramp rate
- Data link interfaces

## Description

The ECM is housed in an environmentally sealed cast-iron. All wiring connections to the ECM are made using two sealed connectors: a single seventy-pin connector and a single one hundred twenty-pin connector.

## Engine Speed Governing

Desired engine speed is calculated by the ECM and held within  $\pm 0.2$  Hz for isochronous and droop mode. The ECM accounts for droop that is requested. The proper amount of fuel is sent to the injectors due to these calculations. The ECM also employs cooldown/shutdown strategies, acceleration delays on startup, acceleration ramp times and speed reference.

## Fuel Limiting

Warm and cold fuel-air ratio control limits are controlled by the ECM. Electronic monitoring system derates, torque limit, and cranking limit, programmable torque scaling, and cold cylinder cutout mode are standard features.

## Fuel Injection Timing

Master timing for injection is controlled by the ECM control. Temperature dependencies are accounted for in the fuel injection calculations.

## Electronic Monitoring

Electronic monitoring of vital engine parameters can be programmed. Warning, derate, and shutdown event conditions may be customized by the user.

## Information Management

The ECM stores information to assist with electronic troubleshooting. Active and logged diagnostic codes, active events, logged events, fuel consumption, engine hours, and instantaneous totals aid service technicians when diagnosing electronic faults and scheduling preventive maintenance.

## Calibrations

Engine performance is optimized through injection timing. Auto/manual sensor calibrations are standard features.

## On-Board System Tests

System tests are available to assist in electronic troubleshooting. These tests include: injector activation, injector cutout, and override of control outputs.

## Data Link Interfaces

The ADEM A4 communicates with the EMCP via a dedicated communication network.

## Electronic Sensing

The following sensing is available on the ADEM A4: oil pressure, fuel pressure, fuel temperature, atmospheric pressure, air inlet temperature, turbo outlet pressure, engine coolant temperature, engine speed, throttle position, exhaust temperature, oil filter pressure differential, fuel filter pressure differential, air filter pressure differential and crankcase pressure.

## SPECIFICATIONS

### Impervious to:

Salt spray, fuel, oil and oil additives, coolant, spray cleaners, chlorinated solvents, hydrogen sulfide and methane gas, and dust.

### Input and output protection

All inputs and outputs are protected against short circuits to +battery and –battery

### Input voltage range (24 VDC nominal)

18 to 32 VDC

### Mounting

Engine mounted

### Reverse polarity protected

### Shock, withstands 20g

### Temperature range

Operating: –40°C to 85°C (–40°F to 185°F)

Storage: –50°C to 120°C (–58°F to 248°F)

### Vibration

Withstands 8.0g @ 24 to 2 kHz

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Picture shown may not reflect actual configuration.

## Remote Annunciator Module

It is an LED expansion module that can be used with compatible control modules. The module has been designed to display a maximum of eight individual LED indications up to a maximum distance of 1 KM (0.6 miles).

The Annunciator will consist of two modules to provide a 16 Channel Fault annunciation.

It is presented in a vertical enclosure. It includes an alarm sounder that is triggered when the host controller detects an alarm condition. The alarm can be muted using the front push button.

The Panels will be fitted with removable label cards which can be used to identify the standard NFPA alarms if desired.

It includes individual LEDs for each channel and a 'Power On' LED that flashes when the link with the host controller is lost.

## Features

- The Remote annunciator has an integral Sounder/Horn
- Eight configurable LEDs (per module)
- Works up to 1 KM (0.6 miles) from the host controller
- A single controller can support five Caterpillar configured remote annunciator control boxes

## ENVIRONMENTAL TESTING STANDARD

### ELECTRO-MAGNETIC COMPATIBILITY

BS EN 61000-6-2  
EMC Generic Immunity Standard for the Industrial Environment  
BS EN 61000-6-4  
EMC Generic Emission Standard for the Industrial Environment

### ELECTRICAL SAFETY

BS EN 60950  
Safety of Information Technology Equipment, including  
Electrical Business Equipment

### TEMPERATURE

BS EN 60068-2-1  
Ab/Ae Cold Test -30 °C BS EN 60068-2-2  
Bb/Be Dry Heat +70°C

### VIBRATION

BS EN 60068-2-6  
Ten sweeps in each of three major axes  
5 Hz to 8 Hz @ +/-7.5 mm, 8 Hz to 500 Hz @ 2 gn

### SHOCK

BS EN 60068-2-27  
Three shocks in each of three major axes 15 gn in 11 Ms

### HUMIDITY

BS EN 60068-2-30  
Db Damp Heat Cyclic 20/55 °C @ 95% RH 48 Hours  
BS EN 60068-2-78  
Cab Damp Heat Static 40 °C @ 93% RH 48 Hours

### DEGREES OF PROTECTION PROVIDED BY ENCLOSURES BS EN 60529

IP65 – Front of module when installed into the control panel with the supplied sealing gasket.

## SPECIFICATION

### CONTINUOUS VOLTAGE RATING

8 V to 35 V Continuous

### CRANKING DROPOUTS

Able to survive 0 V for 50 mS, providing supply was at least 10 V before dropout and supply recovers to 5 V. This is achieved without the need for internal batteries. LEDs and backlight will not be maintained during cranking.

### MAXIMUM OPERATING CURRENT

112 mA at 12 V, 53 mA at 24 V

### MAXIMUM STANDBY CURRENT

74 mA at 12 V, 35 mA at 24 V

### DIMENSIONS OVERALL

355 mm x 369 mm x 90 mm  
13.6" x 14.5" x 3.5"

### PANEL CUT-OUT

286 mm x 326 mm x 93 mm  
11.2" x 12.8" x 3.6"

### MAXIMUM PANEL THICKNESS

8 mm  
0.3"

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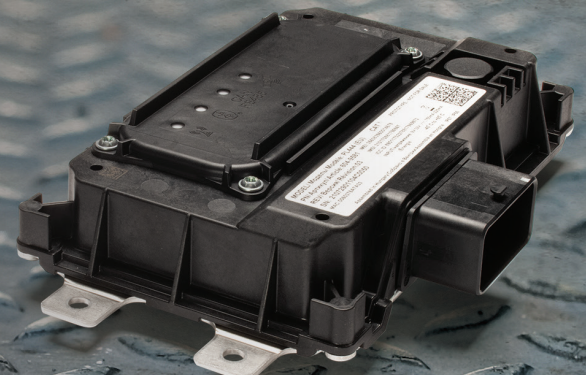
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# CAT<sup>®</sup> PRODUCT LINK<sup>™</sup> TECHNOLOGY



## PRODUCT LINK<sup>™</sup>

### Cat<sup>®</sup> Product Link<sup>™</sup> PL444

The PL444 is designed as a reliable, low-cost, engine agnostic telematics solution which is easy to install. The device comes pre-configured with a standard set of parameters including hours and location which report each day and enables immediate alerting of fault codes. Server side geofencing is also available so you can be confident your asset is in the right place. The PL444 will be used by multiple industries and functionality varies by industry.

#### Data Available Includes:

- [+] Status of Asset
- [+] Engine Parameters
- [+] Events and Alarms
- [+] Location
- [+] Electrical Parameters
- [+] Fuel Consumption & Fuel Level

## HIGH-LEVEL SECURITY OVERVIEW

Product Link's end-to-end system is designed with multi-layer security controls and safeguards to protect against unauthorized access and disclosure. High-level security safeguards include, but are not limited to:

- [+] Cryptographically secured to protect against unauthorized Product Link device software changes
- [+] Encrypted and authenticated remote connection
- [+] Caterpillar IT infrastructure secured utilizing generally accepted information security principles and practices
- [+] Only outbound remote connection, initiated by the Product Link device, is allowed. Device does not participate in or respond to general Internet traffic
- [+] Secure Caterpillar Equipment Management web application connection with user login authentication and role-based access controls

## END-TO-END ARCHITECTURE



## PL444 4G LTE RADIO TECHNICAL SPECIFICATIONS

### HOW IT WORKS

The PL444 integrates a positioning receiver with a 4G LTE cellular communication system that will fall back to 3G or 2G signal if necessary to establish a connection. The PL444 will transfer hours, location and other asset data to Caterpillar to be viewed and analyzed through Caterpillar equipment management software.

### INPUT VOLTAGE

|               |                      |
|---------------|----------------------|
| Voltage Range | [+] 9.0V to 32.0V DC |
| Protection    | [+] Reverse polarity |

### CURRENT CONSUMPTION (TYPICAL)

|                                 |             |
|---------------------------------|-------------|
| Sleep Current                   | [+] <3 mA   |
| Idle Current (non-transmitting) | [+] <300 mA |
| Peak Current                    | [+] <6A     |

### PHYSICAL SPECIFICATIONS

|                      |                                                                                |
|----------------------|--------------------------------------------------------------------------------|
| Enclosure Material   | [+] Plastic Cover (PBT+ASA GF30 FR)<br>Aluminum Backplate (AlMg2.5 / H22; H23) |
| Dimensions (mm)      | [+] 215.5 x 141.2 x 37.5                                                       |
| Weight               | [+] 0.45 kg                                                                    |
| Interface Connectors | [+] 48 pin Molex                                                               |
| LEDs                 | [+] Orange (GNSS), Yellow (Cellular),<br>Blue (Data link), White (Bluetooth*)  |

### ENVIRONMENT

|                       |                                                                   |
|-----------------------|-------------------------------------------------------------------|
| Operating Temperature | [+] -40°C to +85°C                                                |
| Storage Temperature   | [+] -40°C to +95°C                                                |
| Ingress Protection    | [+] IP66/67 (MATING CONNECTOR<br>MUST BE INSTALLED)               |
| Humidity              | [+] SAE J1455                                                     |
| Vibration             | [+] 9.8 Grms random (24-2000 Hz),<br>up to 0.5 g <sup>2</sup> /Hz |

### COMMUNICATIONS

|          |                                |
|----------|--------------------------------|
| Datalink | [+] J1939/CAN                  |
| Datalink | [+] Modbus (RS-485)            |
| Wireless | [+] 4G LTE with 2G/3G fallback |
| Wireless | [+] Bluetooth®/BLE 5.0         |

### INPUTS / OUTPUTS

|                               |       |
|-------------------------------|-------|
| Low Side Drivers (300 mA max) | [+] 2 |
| Switch to Ground              | [+] 1 |
| Keyswitch                     | [+] 1 |



**Note:** In the case of an extended outage, the capacity of the message queue can be exceeded and some data will be lost as older messages are overwritten.

### POSITIONING (GNSS)

|                 |                                |
|-----------------|--------------------------------|
| Signal Tracking | [+] GPS/Galileo/GLONASS/BeiDou |
| Accuracy        | [+] <6 m (95%)                 |
| Antenna         | [+] Internal                   |

### BLUETOOTH\* LOW ENERGY

|          |                             |
|----------|-----------------------------|
| Version: | [+] BLE 5.0                 |
| Band:    | [+] 2.4 GHz (2.42-2.48 GHz) |
| Antenna: | [+] Internal                |

### REGULATORY COMPLIANCE: PL444 (NA)

FCC, IC, UL/CSA 62368-1, RED, RoHS, WEEE, REACH

### REGULATORY COMPLIANCE: PL444 (EU)

RCM, EAC, EN 62368-1, CE RED, RoHS, WEEE, REACH

## CELLULAR COMMUNICATIONS

### CELLULAR COMMUNICATIONS PL444 (NA): 604-9580

|                       |                                                              |
|-----------------------|--------------------------------------------------------------|
| 4G LTE Cat 4          | [+] + 2, 4, 5, 7, 12/17, 13                                  |
| 3G                    | [+] +2, 4, 5                                                 |
| 2G                    | [+] +2, 5                                                    |
| Operating Temperature | [+] -30°C to +70°C                                           |
| Antenna               | [+] 2x Internal (Primary + Diversity)<br>to support 2x2 MIMO |
| SIM                   | [+] eUICC chip                                               |

### CELLULAR COMMUNICATIONS PL444 (EU): 604-9581

|                       |                                                              |
|-----------------------|--------------------------------------------------------------|
| 4G LTE Cat 4          | [+] + 1, 3, 7, 8, 20, 28A                                    |
| 3G                    | [+] +1, 3, 8                                                 |
| 2G                    | [+] +3, 8                                                    |
| Operating Temperature | [+] -30°C to +70°C                                           |
| Antenna               | [+] 2x Internal (Primary + Diversity)<br>to support 2x2 MIMO |
| SIM                   | [+] eUICC chip                                               |

\*Bluetooth is a future capability.

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# SECTION D

## Circuit Breakers [C9, C13, C15, C18]

D250 GC, D300 GC, D350 GC, D400 GC, D450 GC, D500 GC, D550 GC, D600 GC

### Manually Operated Circuit Breakers

| Current (A) | Frame | Number of Poles | Interrupting Ratings (kA ms) |      |      | Trip Unit              | (Lugs) Cable Size Range / Phase | Auxilliary Options                           |
|-------------|-------|-----------------|------------------------------|------|------|------------------------|---------------------------------|----------------------------------------------|
|             |       |                 | 240V                         | 480V | 600V |                        |                                 |                                              |
| 100         | XT2   | 3               | 65                           | 25   | 18   | Electronic LS/I or LSI | 14-1/0 AWG                      | 1 Form C + 1 Bell Alarm Shunt Trip 24VDC     |
| 250         | XT4   | 3               | 65                           | 25   | 18   | Electronic LS/I or LSI | 14-1/0 AWG                      | 1 Form C + 1 Bell Alarm Shunt Trip 24VDC     |
| 400         | XT5   | 3               | 65                           | 35   | 18   | Electronic LS/I or LSI | 4/0 AWG                         | 1 Form C + 1 Bell Alarm Shunt Trip 24VDC     |
| 600         | XT6   | 3               | 65                           | 35   | 20   |                        | (3) 2/0 – 400 kcmil             |                                              |
| 800         | XT6   | 3               | 65                           | 35   | 20   |                        | (3) 2/0 – 400 kcmil             |                                              |
| 1200        | XT7   | 3               | 65                           | 50   | 25   |                        | (4) 4/0 – 500 kcmil             | 1 Form C + 1 Bell Alarm Shunt Trip 24VAC/VDC |

### 1st Breaker Options (400 – 1200A)

| Model             | Current (A) | Operation         |
|-------------------|-------------|-------------------|
| C9, C13, C15      | 400         | Manually Operated |
| C9, C13, C15, C18 | 600         | Manually Operated |
| C9, C13, C15, C18 | 800         | Manually Operated |
| C9, C18           | 1200        | Manually Operated |

1st Breaker FLC Capacity or one frame less than FLC capacity except when 1st breaker is 400 A.

### 2nd Breaker Options

| Model             | Current (A) | Operation         |
|-------------------|-------------|-------------------|
| C9, C13, C15, C18 | 100 / 250   | Manually Operated |

2nd Breaker either 100A or 250A.

XT5 Ekip Dip LSI  
L-S-I Functions

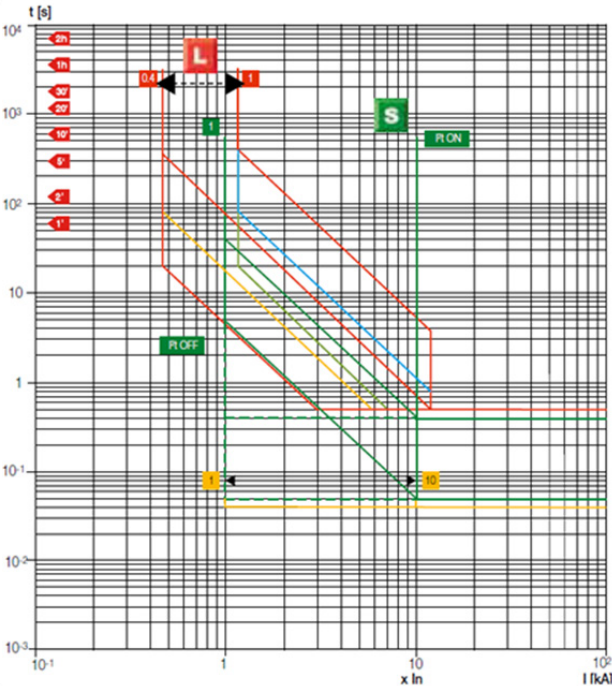


Figure 4

## XT5 – XT6 Ekip Dip LS/I L-S-I Functions

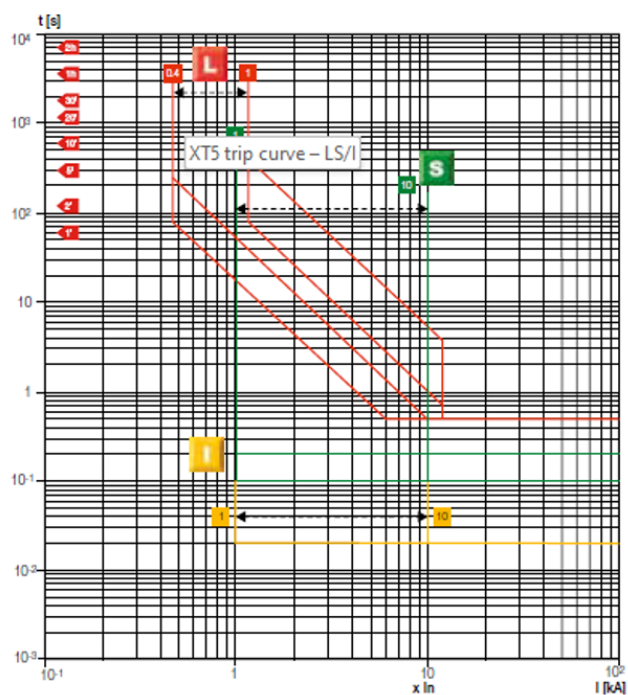


Figure 6



Image shown might not reflect actual configuration.

## BATTERY CHARGER

The intelligent battery charger has been developed with safety, usability, optimised battery performance and maximum battery lifetimes in mind.

A comprehensive range of input and output protections ensures a continued safe charging environment also enabling the use of the charger as a power supply.

## FEATURES

- Intelligent two, three and four stage charging profiles
- Configurable to suit most battery types (12V/24V)
- Adjustable current limit
- Can be used as a battery charger, power supply or both at the same time
- Automatic or Manual boost and storage charge functions to help maintain battery condition
- Digital Microprocessor Technology
- Temperature compensation for battery charging
- Low Output Ripple and superb line regulation
- Three LED Indicators
- AC input Under voltage
- AC input Over voltage
- Battery charger output Over voltage
- Battery charger output Over current
- Optional battery temperature compensation with over temperature protection
- Output short circuit and Inversion polarity with auto recovery
- Configurable charge termination
- UL1236 /UL1564 Compliant

### Automatic Boost Mode

- Boosts and equalises cell charge improving battery performance and life

### Power Save Mode

- Once the battery is fully charged the chargers switch to Eco-Power to save energy

### Communication

- Can be integrated into external systems through MODBUS RTU using RS485
- Fully configurable via PC Software

## BENEFITS

- Fully flexible to maximise the life of the battery
- Suitable for a wide range of battery types
- Switched mode design
- Minimum 86% efficiency throughout full operating range
- No external intervention for boost mode
- Multiple chargers can be linked together to provide larger current output
- Can be permanently connected to battery and mains (utility) supply. No need to disconnect through high load conditions.

## SPECIFICATION

### AC SUPPLY

VOLTAGE RANGE 90 V to 305 V (L-N)

### FREQUENCY RANGE

48 Hz to 64 Hz (L-N)

### DC OUTPUT RATING

10 A DC at 24 V DC

### RIPPLE AND NOISE

<1%

### EFFICIENCY

>86%

### REGULATION LINE

<0.5%

### LOAD

2%

### TEMPERATURE SENSOR INPUT

PT1000

### PROTECTIONS

Short Circuit  
DC Over Voltage  
DC Over Current  
Reverse Polarity  
Over Temperature  
AC Under & Over Voltage

### CHARGE FAILURE RELAY

3 A at 30 V DC volt free relay

### DIMENSIONS OVERALL

70 mm x200 mm x 130 mm  
2.7" x 7.9" x 5.1"

### WEIGHT

0.75 kg

### OPERATING TEMPERATURE RANGE

-30 °C to +80 °C  
-22 °F to +176 °F

### STORAGE TEMPERATURE RANGE

-30 °C to +80 °C  
-22 °F to +176 °F

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## Jacket Water Heater (WHHH01/WHHH03)

Appropriate when the generator set is to be sited in a low ambient environment, the heater maintains the engine coolant at a temperature [typically 38°C (100°F)] which facilitates rapid starting and load acceptance. The heater assembly uses UL compliant components (to UL1030) and has CSA certification which is to both CSA and UL Standards.

The heater itself is powered by a 240V for 60 Hz AC auxiliary supply. A thermostatic controller is included to regulate the output temperature to within safe limits. When the generator set is not running the heater is automatically connected to the AC supply through a power relay mounted in the control panel.

Upon receiving a start signal the AC supply is automatically disconnected by the power relay and automatically reconnected when the start signal is removed, and the engine has stopped.

## Features

- Uniform heat distribution
- Reduces wear from cold spots
- Improves startability
- Thermostatically controlled and protected
- 6' (1.8m) cord length (577-1758)
- 16.4' (5.0m) cord length (578-9355).
- Ensures generator is at optimal starting temperature and ready to accept load
- Durable pump with non-magnetic impeller that does not attract metal debris
- Robust die cast aluminum housing improves sealing of the hoses, eliminates leaking and breakage
- Corrosion resistant steel brackets for superior strength and durability
- Reduces thermal stress on coolant hoses
- Element designed for long life with maximum heat transfer
- IP44 Ingress Protection Rating
- No evaporation of coolant from hoses
- Reduces low coolant level alarms because coolant does not boil

| Part No           | Outlet Location | Watts | Volts | Amps  | Regulating Thermostat              | Safety Thermostat |
|-------------------|-----------------|-------|-------|-------|------------------------------------|-------------------|
| 577-1758/578-9355 | Right           | 2700  | 240   | 11.25 | On 90°F (32°C)<br>Off 115°F (46°C) | 210°F (98°C)      |

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### Remote Emergency Stop Button

Image shown may not reflect actual configuration.

### Features and Benefits

- Enclosure degree of protection – IP 69K (NEMA 6)
- UL Listed (NKCR)
- Assembled enclosure with shroud
- 40 mm mushroom emergency stop
- Twist release
- 2NC – horizontally mounted

### Dimensions

- Net Width: 0.065 m
- Net Height: 0.078 m
- Net Depth: 0.065 m
- Net Weight: 0.124 kg

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# SECTION E





## D250 GC – D600 GC Sound Attenuated Enclosures

60 Hz

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### Features

#### Robust/Highly Corrosion Resistant Construction

- Safeguards genset against environmental and weather conditions
- Factory installed on skid base or tanks base
- Environmentally friendly, polyester powder baked paint
- Enclosure constructed with 18-gauge steel
- Interior zinc plated fasteners
- Internally mounted exhaust silencing system
- Comply with ASCE /SEI 7 for Wind loads up to 100 mph
- Designed and tested to comply with UL 2200 Listed generator set package

#### Excellent Access

- Large cable entry area for installation ease
- Accommodates side mounted single or multiple breakers
- Two doors on both sides
- Vertically hinged allow 180° opening rotation
- Radiator fill cover

#### Security and Safety

- Lockable access doors which give full access to control panel and breaker
- Cooling fan and battery charging alternator fully guarded
- Fuel fill, oil fill and battery can only be reached via lockable access
- Externally mounted emergency stop button (Optional)
- Designed for spreader bar lifting to ensure safety
- Stub-up area is rodent proof

#### Sound Attenuated Level 2

- Caterpillar white paint
- UL Listed integral fuel tank with 24 hours running time capacity (Optional)
- DC lighting package (Optional)

## Enclosure Package Operating Characteristics

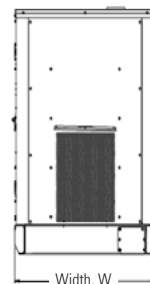
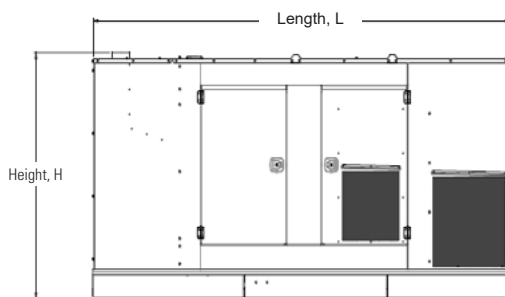
| Enclosure Type                             | Standby | Cooling Air Flow Rate |       | Ambient Capability* |     | Sound Pressure Levels (dBA) at 7m (23 ft) |
|--------------------------------------------|---------|-----------------------|-------|---------------------|-----|-------------------------------------------|
|                                            | ekW     | m <sup>3</sup> /s     | cfm   | °C                  | °F  | 100% Load                                 |
| Level 2 Sound Attenuated Enclosure (Steel) | 250     | 6.4                   | 13561 | 57                  | 135 | 74                                        |
|                                            | 300     | 6.4                   | 13561 | 51                  | 125 | 74                                        |
|                                            | 350     | 7.4                   | 15680 | 57                  | 134 | 71                                        |
|                                            | 400     | 7.4                   | 15680 | 53                  | 127 | 71                                        |
|                                            | 450     | 8.4                   | 17692 | 54                  | 130 | 73                                        |
|                                            | 500     | 8.4                   | 17692 | 50                  | 122 | 73                                        |
|                                            | 550     | 11.2                  | 23731 | 56                  | 133 | 73                                        |
|                                            | 600     | 11.2                  | 23731 | 53                  | 127 | 73                                        |

\*Cooling system performance at sea level. Consult your Cat<sup>®</sup> dealer for site specific ambient and altitude capabilities.

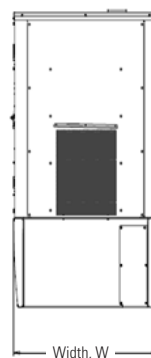
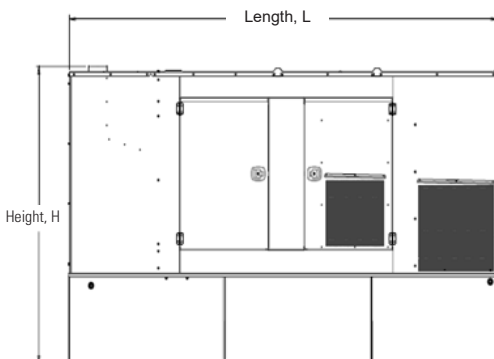
**Note:** Sound level measurements are subject to instrumentation, installation and manufacturing variability, as well as ambient site conditions

## Weights and Dimensions

| Enclosure Type                                                           | Standby Ratings | Length, L |       | Width, W |      | Height, H |       | Package Weights |         |
|--------------------------------------------------------------------------|-----------------|-----------|-------|----------|------|-----------|-------|-----------------|---------|
|                                                                          | ekW             | mm        | in    | mm       | in   | mm        | in    | kg              | lb      |
| Sound Attenuated Enclosure on Skid Base                                  | 250             | 3958      | 155.8 | 1440     | 56.7 | 1991      | 78.4  | 2857            | 6298.6  |
|                                                                          | 300             |           |       |          |      |           |       | 2945            | 6492.6  |
|                                                                          | 350             | 4633      | 182.4 | 1630     | 64.2 | 2227      | 87.7  | 3983            | 8781.0  |
|                                                                          | 400             |           |       |          |      |           |       | 4017            | 8856.0  |
|                                                                          | 450             | 4823      | 189.8 | 1630     | 64.2 | 2227      | 87.7  | 4408            | 9718.0  |
|                                                                          | 500             |           |       |          |      |           |       | 4457            | 9826.0  |
|                                                                          | 550             | 4980      | 196.1 | 1865     | 73.4 | 2172      | 85.5  | 4754            | 10480.8 |
|                                                                          | 600             |           |       |          |      |           |       | 4837            | 10663.8 |
| Sound Attenuated Enclosure on UL Listed Integral Fuel Tank Base          | 250             | 3958      | 155.8 | 1440     | 56.7 | 2487      | 97.9  | 3497            | 7709.6  |
|                                                                          | 300             |           |       |          |      |           |       | 3585            | 7903.6  |
|                                                                          | 350             | 4633      | 182.4 | 1630     | 64.2 | 2644      | 104.1 | 4765            | 10505.0 |
|                                                                          | 400             |           |       |          |      |           |       | 4799            | 10580.0 |
|                                                                          | 450             | 4823      | 189.8 | 1630     | 64.2 | 2777      | 109.3 | 5345            | 11783.7 |
|                                                                          | 500             |           |       |          |      |           |       | 5394            | 11891.7 |
|                                                                          | 550             | 4980      | 196.1 | 1865     | 73.4 | 2723      | 107.2 | 5973            | 13168.2 |
|                                                                          | 600             |           |       |          |      |           |       | 6056            | 13351.2 |
| Sound Attenuated Enclosure on UL Listed Extended Integral Fuel Tank Base | 250             | 4608      | 181.4 | 1430     | 56.3 | 2379      | 93.7  | 3590            | 7914.6  |
|                                                                          | 300             |           |       |          |      |           |       | 3678            | 8108.6  |
|                                                                          | 350             | 5251      | 203.7 | 1620     | 63.8 | 2561      | 100.8 | 4876            | 10749.7 |
|                                                                          | 400             |           |       |          |      |           |       | 4910            | 10824.7 |
|                                                                          | 450             | 5909      | 232.6 | 1620     | 63.8 | 2612      | 102.8 | 5497            | 12118.8 |
|                                                                          | 500             |           |       |          |      |           |       | 5546            | 12226.8 |
|                                                                          | 550             | 6759      | 266.1 | 1865     | 73.4 | 2487      | 97.9  | 6237            | 13750.2 |
|                                                                          | 600             |           |       |          |      |           |       | 6320            | 13933.2 |



**Sound Attenuated Enclosure on Skid Base**



**Sound Attenuated Enclosure on a UL Listed Integral Fuel Tank Base**

Image shown may not reflect actual configuration

## LET'S DO THE WORK.™

[www.cat.com/electricpower](http://www.cat.com/electricpower)

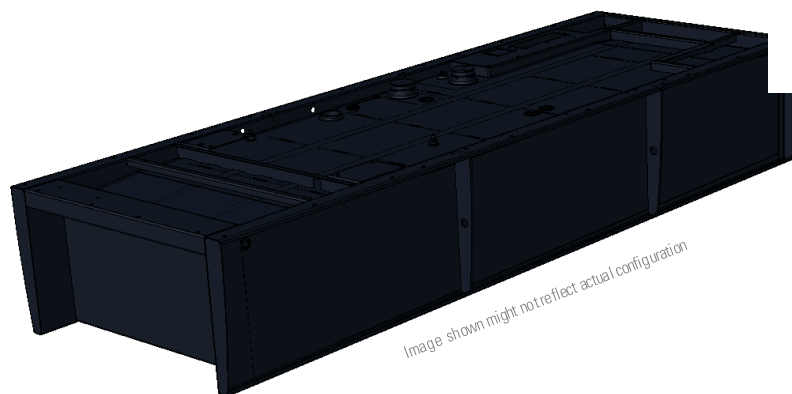
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Materials and specifications are subject to change without notice.

The International System of Units (SI) is used in this publication. CAT, CATERPILLAR, LET'S DO THE WORK, their respective logos, "Caterpillar Corporate Yellow", the "Power Edge" and Cat "Modern Hex" trade dress as well as corporate and product identity used herein, are trademarks of Caterpillar and may not be used without permission.



# SECTION F



## INTEGRAL FUEL TANKS

### D250 GC – D600 GC

#### FEATURES

---

- UL Listed for United States (UL 142) and Canada (CAN/ULC S601)
- Facilitates compliance with NFPA 30 code, NFPA 37 and 110 standards and CSA C282 code
- Dual wall
- Low fuel level warning standard, customer configurable warning or shutdown
- Primary tank leak detection switch in containment basin
- Tank design provides capacity for thermal expansion of fuel
- Fuel supply dip tube is positioned so as not to pick up fuel sediment
- Fuel return and supply dip tube is separated by an internal baffle to prevent immediate re-supply of heated return fuel
- Pressure washed with an iron phosphate solution
- Interior tank surfaces coated with a solvent-based thin-film rust preventative
- Heavy gauge steel gussets with internal lifting rings
- Primary and secondary tanks are leak tested at 20.7 kPa (3 psi) minimum
- Compatible with open packages and enclosures
- Gloss black polyester alkyd enamel exterior paint
- Welded steel containment basin (minimum of 110% of primary tank capacity)
- Direct reading fuel gauge with variable electrical output
- Emergency vents on primary and secondary tanks are sized in accordance with NFPA 30.

#### INTEGRAL

- Integral diesel fuel tank is incorporated into the generator set base frame
- Robust base design includes linear vibration isolators between tank base and engine generator.

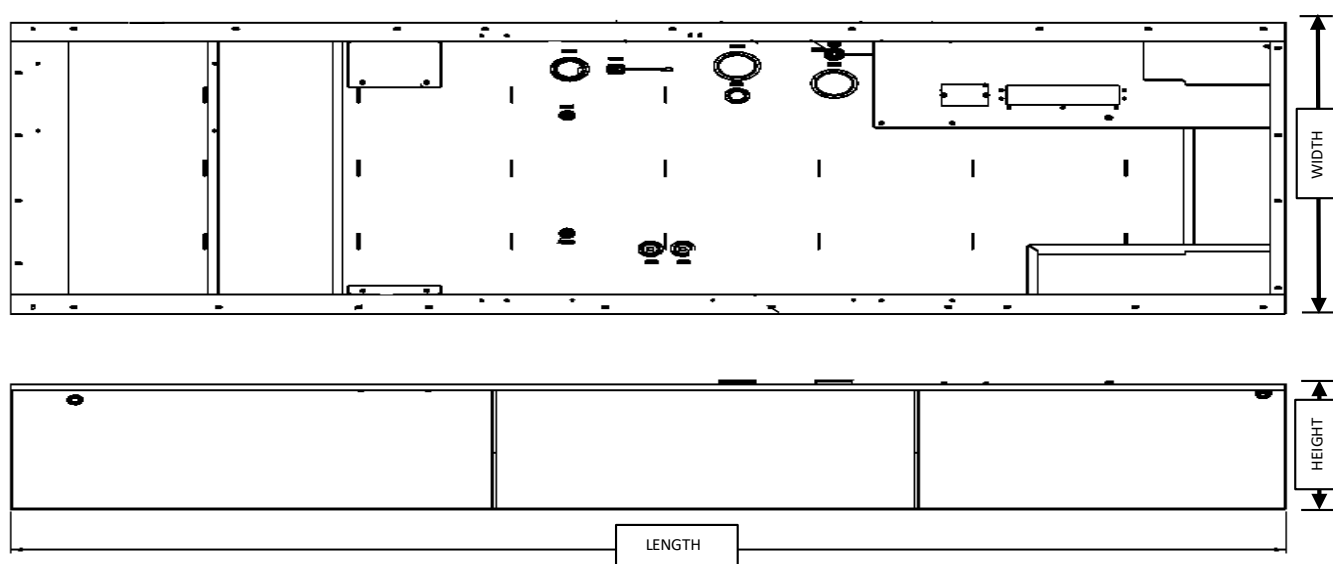
#### OPTIONS

- Audio/visual fuel level alarm panel
- 5gal (18.9 L) spill containment\*
- Locking Fuel Fill
- Overfill prevention Valve\*

\*Applicable for D350GC-D600GC Models only

## Integral Fuel Tank Base Useable Capacities with Fuel Tank Dimensions & Weights

| Standby<br>ekW | Width<br>mm | Width<br>in |
|----------------|-------------|-------------|
| 250-300        | 1430        | 56.3        |
| 350-400        | 1630        | 64.1        |
| 450-500        | 1630        | 64.1        |
| 550-600        | 1865        | 73.4        |



The heights listed above do not include lumber used during manufacturing and shipping

## A. Open Set & Sound Attenuated Enclosure

| Tank Design   | Feature Code | Total Capacity |        | Useable Capacity |        | Tank Only  |      |            |      |            |       | Overall Package Height with Tank |       |           |       |
|---------------|--------------|----------------|--------|------------------|--------|------------|------|------------|------|------------|-------|----------------------------------|-------|-----------|-------|
|               |              |                |        |                  |        | Dry Weight |      | Height 'H' |      | Length 'L' |       | Open                             |       | Enclosure |       |
|               |              | Litre          | Gallon | Litre            | Gallon | kg         | lb   | mm         | in   | mm         | in    | mm                               | in    | mm        | in    |
| Integral Tank | FTDW035      | 2270.7         | 599.8  | 2059.9           | 543.9  | 970        | 2138 | 762.4      | 30.0 | 3958       | 155.8 | 2202                             | 86.7  | 2487      | 97.9  |
|               | FTDW036      | 2820           | 744.9  | 2553             | 674.4  | 1165       | 2568 | 818.8      | 32.2 | 4625       | 182.1 | 2584                             | 101.7 | 2644      | 104   |
|               | FTDW037      | 3671           | 969.7  | 3323             | 877.8  | 1331       | 2934 | 668.2      | 26.3 | 4622       | 181.9 | 2456                             | 96.7  | 2644      | 104   |
|               | FTDW038      | 4292           | 1133.8 | 3889             | 1027.3 | 1657       | 3653 | 816.4      | 32.1 | 4980       | 196   | 2560                             | 100.7 | 2721      | 107.1 |

## B. Estimated Run Time (Hours)

| Tank Design   | Feature Code | Standby Ratings (kVA) |      |       |      |       |      |      |
|---------------|--------------|-----------------------|------|-------|------|-------|------|------|
|               |              | ekW                   | 100% |       | 75%  |       | 50%  |      |
|               |              |                       | Hrs  | L/hr  | Hrs  | L/hr  | Hrs  | L/hr |
| Integral Tank | FTDW035      | 250                   | 28.1 | 73.3  | 35   | 58.8  | 47   | 43.8 |
|               |              | 300                   | 24   | 86.0  | 30.8 | 66.8  | 40   | 51.5 |
|               | FTDW036      | 350                   | 27.1 | 94.3  | 31.2 | 81.9  | 42.4 | 60.2 |
|               |              | 400                   | 24.1 | 105.9 | 28.1 | 90.7  | 38.6 | 66.2 |
|               | FTDW037      | 450                   | 25.2 | 131.7 | 31.3 | 106.1 | 42.0 | 79.1 |
|               |              | 500                   | 24.3 | 137   | 30.1 | 110.5 | 46.6 | 71.3 |
|               | FTDW038      | 550                   | 25.7 | 151.1 | 32.9 | 118.1 | 45.2 | 86.1 |
|               |              | 600                   | 24.1 | 161.6 | 30.0 | 129.6 | 42.4 | 91.7 |

Tanks with full electrical stub-up area include removable end channel. Tanks with RH stub-up include stubup area directly below the circuit breaker or power terminal strips.

Fuel tanks and applicable options facilitate compliance with the following United States NFPA Code and Standards:

NFPA 30: Flammable and Combustible Liquids Code

NFPA 37: Standard for the Installation and Use of Stationary Combustion Engines and Gas Turbines

NFPA 110: Standard for Emergency and Standby Power Systems

Fuel tanks and applicable options facilitate compliance with the following Canadian Standard and Code:

CSA C282 – Emergency Electrical Power Supply for Buildings

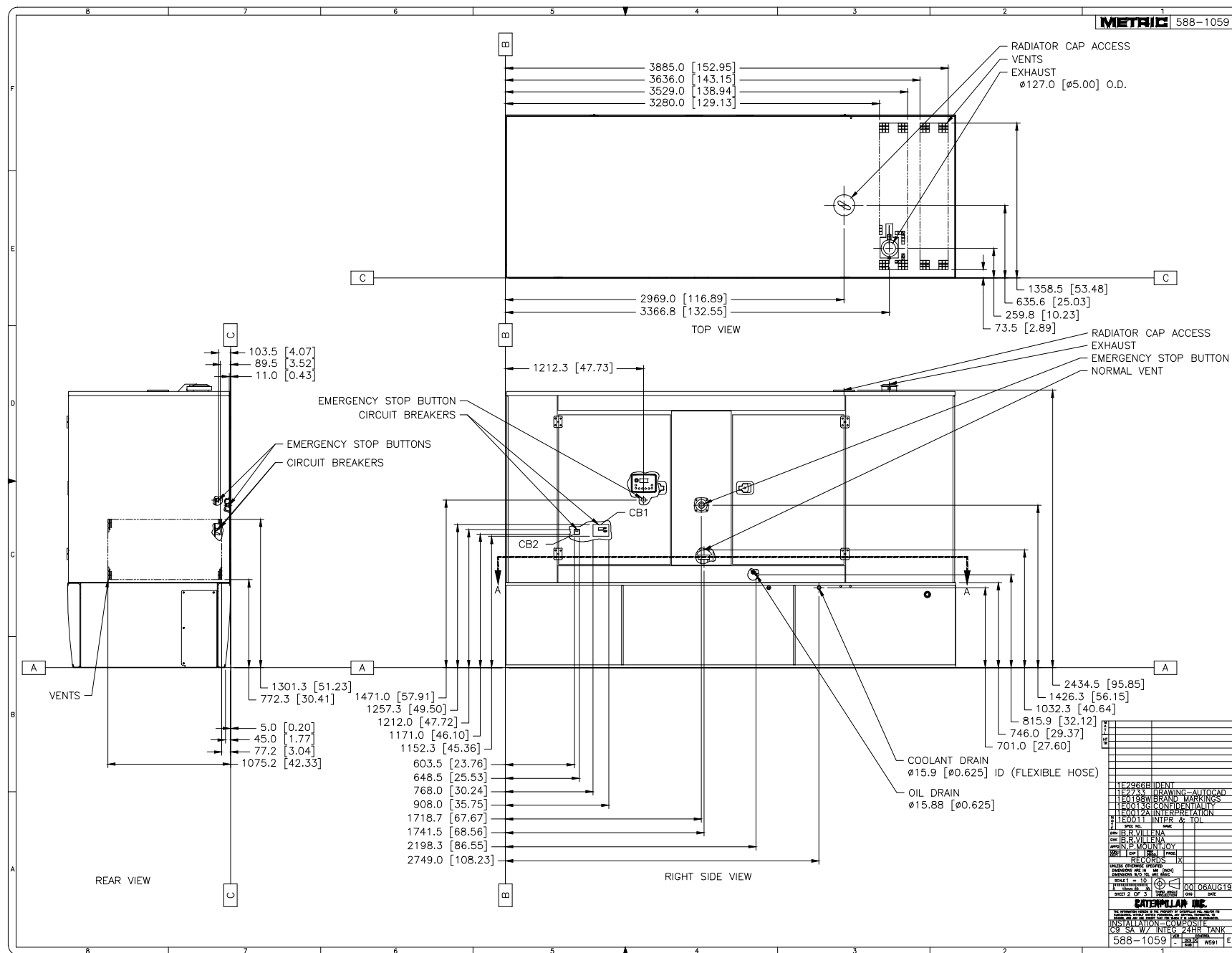
CSA B139-09 – Installation Code for Oil-Burning Equipment

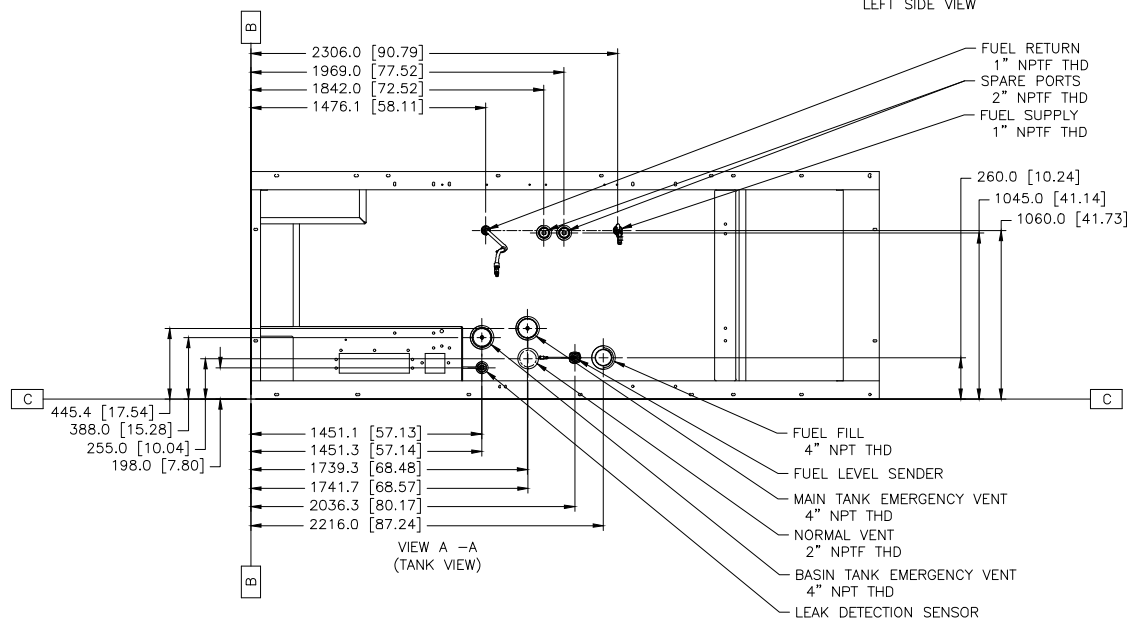
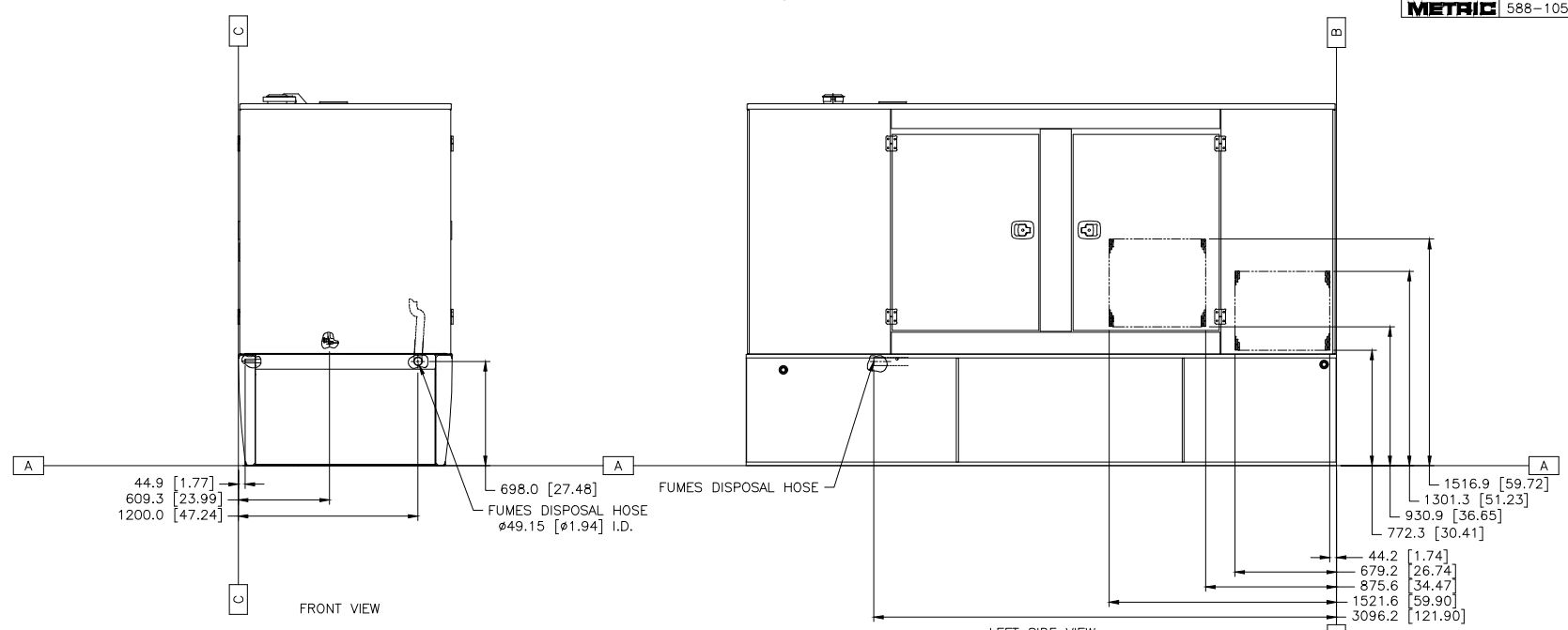


# SECTION G









|     |                          |  |
|-----|--------------------------|--|
| 1   | 1C2968BIDENTY            |  |
| 2   | 1E2731 DRAWING - AUTOCAD |  |
| 3   | 1E0188WIRING DIAGRAMS    |  |
| 4   | 1E0013GCONFIDENTIALITY   |  |
| 5   | 1E0012AINTEOPERATION     |  |
| 6   | 1E0011 INTER RELATION    |  |
| 7   | 1E0010                   |  |
| 8   | 1E0009                   |  |
| 9   | 1E0008                   |  |
| 10  | 1E0007                   |  |
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# SECTION H

# CAT® PROTECTS YOUR INVESTMENT AT NO ADDITIONAL COST

## 5 YEAR PLATINUM EXTENDED SERVICE COVERAGE (ESC) NOW INCLUDED WITH YOUR CAT STANDBY GENERATOR SET PURCHASE\*

\*Applicable to diesel C4.4 - C32 gensets only

Your operation depends on reliable power. That's why you trust Cat® generator sets. With the most robust ESC in the industry, you receive coverage that's just as durable and long lasting. ESC protects your investment and your peace of mind.

Platinum level ESC is a reliable top choice coverage from Caterpillar. It covers the as-shipped consist of the generator set from the factory and offers Additional Allowances. Some exclusions apply.

| COOLING SYSTEM                                 | PLATINUM |
|------------------------------------------------|----------|
| Thermostat Housing                             | ✓        |
| Water Manifold Housing                         | ✓        |
| Jacket Water Precooler                         | ✓        |
| Jacket Water Pump                              | ✓        |
| Thermostat                                     | ✓        |
| Radiator & Fan                                 | ✓        |
| FUEL SYSTEM                                    |          |
| Steel Fuel Lines                               | ✓        |
| Fuel Shutoff Solenoid                          | ✓        |
| Fuel Injectors                                 | ✓        |
| Fuel Transfer Pump & Housing                   | ✓        |
| Fuel Priming Pump                              | ✓        |
| Fuel Transfer Pump                             | ✓        |
| LUBRICATION SYSTEM                             |          |
| Pan, Pump Cooler                               | ✓        |
| Crankcase Breather                             | ✓        |
| Engine Oil Pump Drive                          | ✓        |
| Prelubrication Pump                            | ✓        |
| ELECTRIC SYSTEM                                |          |
| Control Module (ECM)                           | ✓        |
| Sensors: All Engine Sensors                    | ✓        |
| Wiring Harness & Connectors                    | ✓        |
| Starter                                        | ✓        |
| Engine Alternator                              | ✓        |
| ALTERNATOR END                                 |          |
| Alternator, including Rotor Stator and Exciter | ✓        |
| Generator Controls                             | ✓        |
| Power Center                                   | ✓        |

| AIR INDUCTION AND EXHAUST                       | PLATINUM |
|-------------------------------------------------|----------|
| Exhaust Manifolds, Studs & Gaskets              | ✓        |
| Inlet Air Heater Relay                          | ✓        |
| Intake Manifold                                 | ✓        |
| Turbocharger(s)                                 | ✓        |
| Air-to-Air Cores                                | ✓        |
| Muffler / Exhaust System                        | ✓        |
| Exhaust Guards                                  | ✓        |
| Diesel Oxidation Catalyst                       | ✓        |
| SHORT BLOCK                                     |          |
| Cylinder Block Casting                          | ✓        |
| Crankshaft                                      | ✓        |
| Connecting Rod Assembly                         | ✓        |
| Piston, Wrist Pin, Retainer Clip & Piston Rings | ✓        |
| Idle and Timing Gears                           | ✓        |
| Accessory Drive                                 | ✓        |
| CYLINDER HEAD                                   |          |
| Cylinder Head                                   | ✓        |
| Intake & Exhaust Valves                         | ✓        |
| Valve Mechanism                                 | ✓        |
| Camshaft, Camshaft Bearings, Key, Gear          | ✓        |
| FRONT & REAR COVERS                             |          |
| Front Cover / Plate / Housing / Gears & Gaskets | ✓        |
| Vibration Damper                                | ✓        |
| Flywheel Housing & Gasket                       | ✓        |
| AFTERTREATMENT (FACTORY INSTALLED)              |          |
| Diesel Particulate Filter                       | ✓        |
| Selective Catalytic Reduction                   | ✓        |

For visual purposes only. Not all covered components listed.

### PLATINUM ESC ADDITIONAL ALLOWANCES

| TRAVEL / MILEAGE LIMITATIONS    |               |
|---------------------------------|---------------|
| Up to 7.5 liters                | 4 hr / 200 mi |
| Over 7.5 liters up to 32 liters | 8 hr / 320 mi |
| EMERGENCY FREIGHT               |               |
| \$500 USD                       | ✓             |
| RENTAL                          |               |
| Up to 7.5 liters                | \$5,000 USD   |
| Over 7.5 liters up to 32 liters | \$10,000 USD  |

### PLATINUM PLUS ESC ADDITIONAL ALLOWANCES

| TRAVEL / MILEAGE LIMITATIONS    |              |
|---------------------------------|--------------|
| 10 hr / 500 mi                  | ✓            |
| RENTAL                          |              |
| Up to 7.5 liters                | \$10,000 USD |
| Over 7.5 liters up to 32 liters | \$20,000 USD |
| CRANE & RIGGING                 |              |
| Up to 7.5 liters                | \$1,000 USD  |
| Over 7.5 liters up to 32 liters | \$5,000 USD  |
| OVERTIME                        |              |
| Up to 32 liters                 | \$3,000 USD  |

Based on Engine Displacement in Liters.

### UPGRADING YOUR ESC

You may choose to upgrade to Platinum Plus coverage level or extend to a maximum 120 month term. Work with your local Cat dealer to price and register the ESC extension and get the protection and peace of mind you deserve.

This marketing tool does not represent a contract or obligation of any kind between Caterpillar Inc., its subsidiaries or affiliates, and the equipment owner. For details on any dealer agreement, including a complete description of the terms, conditions, and/or exclusions, contact your local Cat dealer. All graphics and lists in this marketing tool are provided solely for general information purposes and are not intended to be a solicitation or an offer to sell any product or service.

Effective with sales to the first user on or after August 1, 2018

# CATERPILLAR LIMITED WARRANTY

## Industrial, Petroleum, Locomotive, and Agriculture Engine Products and Electric Power Generation Products

### Worldwide

Caterpillar Inc. or any of its subsidiaries ("Caterpillar") warrants new and remanufactured engines and new and rebuild electric power generation products sold by it (including any products of other manufacturers packaged and sold by Caterpillar), to be free from defects in material and workmanship.

This warranty does not apply engines sold for use in on-highway vehicle or marine applications; engines in machines manufactured by or for Caterpillar; C175, 3500 and 3600 series engines used in locomotive applications; 3000 Family engines, C0.5 through C4.4 and ACERT™ (C6.6, C7, C7.1, C9, C9.3, C11, C13, C15, C18, C27, and C32) engines used in industrial, mobile agriculture and locomotive applications; or Cat<sup>®</sup> batteries; or Electric Power Generation Products manufactured or assembled in India. These products are covered by other Caterpillar warranties.

This warranty is subject to the following:

#### Warranty Period

- For industrial engines, engines in a petroleum applications or Petroleum Power Systems (excluding petroleum fire pump application), or engines in a Locomotive application, or Uninterruptible Power Supply (UPS) systems, the warranty period is 12 months after date of delivery to the first user.
- For engines used in petroleum fire pump and mobile agriculture applications the warranty period is 24 months after date of delivery to the first user.
- For controls only (EPIC), configurable and custom switchgear products, and automatic transfer switch products, the warranty period is 24 months after date of delivery to the first user.
- For new CG132, CG170 and CG260 series power generation products the warranty period is 24 months after date of delivery to first user, but not to exceed 36 months from shipment from the Caterpillar place of manufacture.
- For electric power generation products other than CG132, CG170 and CG260 series in prime or continuous applications the warranty period is 12 months. For standby applications the warranty period is 24 months/1000 hours. For emergency standby applications the warranty period is 24 months/400 hours. All terms begin after date of delivery to the first user.
- For Caterpillar rebuild electric power generation products the warranty period is 12 months, but not to exceed 24 months from shipment of rebuilt electric power generation product from Caterpillar.
- For all other applications the warranty period is 12 months after date of delivery to the first user.

#### Caterpillar Responsibilities

If a defect in material or workmanship is found during the warranty period, Caterpillar will, during normal working hours and at a place of business of a Cat dealer or other source approved by Caterpillar:

- Provide (at Caterpillar's choice) new, Remanufactured, or Caterpillar approved repaired parts or assembled components needed to correct the defect.
- Note:** New, remanufactured, or Caterpillar approved repaired parts or assembled components provided under the terms of this warranty are warranted for the remainder of the warranty period applicable to the product in which installed as if such parts were original components of that product. Items replaced under this warranty become the property of Caterpillar.
- Replace lubricating oil, filters, coolant, and other service items made unusable by the defect.
- Provide reasonable and customary labor needed to correct the defect, including labor to disconnect the product from and reconnect the product to its attached equipment, mounting, and support systems, if required.

For new 3114, 3116, and 3126 engines and, new and Caterpillar rebuild electric power generation products (which includes the following: any new products of other manufacturers packaged and sold by Caterpillar)

- Provide travel labor, up to four hours round trip, if in the opinion of Caterpillar, the product cannot reasonably be transported to a place of business of a Cat dealer or other source approved by Caterpillar (travel labor in excess of four hours round trip, and any meals, mileage, lodging, etc. is the user's responsibility).

For all other products:

- Provide reasonable travel expenses for authorized mechanics, including meals, mileage, and lodging, when Caterpillar chooses to make the repair on-site.

#### User Responsibilities

The user is responsible for:

- Providing proof of the delivery date to the first user.
- Labor costs, except as stated under "Caterpillar Responsibilities," including costs beyond those required to disconnect the product from and reconnect the product to its attached equipment, mounting, and support systems.
- Travel or transporting costs, except as stated under "Caterpillar Responsibilities."

- Premium or overtime labor costs.
- Parts shipping charges in excess of those that are usual and customary.
- Local taxes, if applicable.
- Costs to investigate complaints, unless the problem is caused by a defect in Caterpillar material or workmanship.
- Giving timely notice of a warrantable failure and promptly making the product available for repair.
- Performance of the required maintenance (including use of proper fuel, oil, lubricants, and coolant) and items replaced due to normal wear and tear.
- Allowing Caterpillar access to all electronically stored data.

#### Limitations

Caterpillar is not responsible for:

- Failures resulting from any use or installation that Caterpillar judges improper.
- Failures resulting from attachments, accessory items, and parts not sold or approved by Caterpillar.
- Failures resulting from abuse, neglect, and/or improper repair.
- Failures resulting from user's delay in making the product available after being notified of a potential product problem.
- Failures resulting from unauthorized repairs or adjustments, and unauthorized fuel setting changes.
- Damage to parts, fixtures, housings, attachments, and accessory items that are not part of the engine, Cat Selective Catalytic Reduction System or electric power generation product (including any products of other manufacturers packaged and sold by Caterpillar).
- Repair of components sold by Caterpillar that is warranted directly to the user by their respective manufacturer. Depending on type of application, certain exclusions may apply. Consult your Cat dealer for more information.

(Continued on reverse side...)

This warranty covers every major component of the products. Claims under this warranty should be submitted to a place of business of a Cat dealer or other source approved by Caterpillar. For further information concerning either the location to submit claims or Caterpillar as the issuer of this warranty, write Caterpillar Inc., 100 N. E. Adams St., Peoria, IL USA 61629.

Caterpillar's obligations under this Limited Warranty are subject to, and shall not apply in contravention of, the laws, rules, regulations, directives, ordinances, orders, or statutes of the United States, or of any other applicable jurisdiction, without recourse or liability with respect to Caterpillar.

*A) For products operating outside of Australia, Fiji, Nauru, New Caledonia, New Zealand, Papua New Guinea, the Solomon Islands and Tahiti, the following is applicable:*

NEITHER THE FOREGOING EXPRESS WARRANTY NOR ANY OTHER WARRANTY BY CATERPILLAR, EXPRESS OR IMPLIED, IS APPLICABLE TO ANY ITEM CATERPILLAR SELLS THAT IS WARRANTED DIRECTLY TO THE USER BY ITS MANUFACTURER.

THIS WARRANTY IS EXPRESSLY IN LIEU OF ANY OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE, EXCEPT CATERPILLAR EMISSION-RELATED COMPONENTS WARRANTIES FOR NEW ENGINES, WHERE APPLICABLE. REMEDIES UNDER THIS WARRANTY ARE LIMITED TO THE PROVISION OF MATERIAL AND SERVICES, AS SPECIFIED HEREIN.

CATERPILLAR IS NOT RESPONSIBLE FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES.

CATERPILLAR EXCLUDES ALL LIABILITY FOR OR ARISING FROM ANY NEGLIGENCE ON ITS PART OR ON THE PART OF ANY OF ITS EMPLOYEES, AGENTS OR REPRESENTATIVES IN RESPECT OF THE MANUFACTURE OR SUPPLY OF GOODS OR THE PROVISION OF SERVICES RELATING TO THE GOODS.

IF OTHERWISE APPLICABLE, THE VIENNA CONVENTION ON CONTRACTS FOR THE INTERNATIONAL SALE OF GOODS IS EXCLUDED IN ITS ENTIRETY.

For personal or family use engines or electric power generation products, operating in the USA, its territories and possessions, some states do not allow limitations on how long an implied warranty may last nor allow the exclusion or limitation of incidental or consequential damages. Therefore, the previously expressed exclusion may not apply to you. This warranty gives you specific legal rights and you may also have other rights, which vary by jurisdiction. To find the location of the nearest Cat dealer or other authorized repair facility, call (309) 675-1000. If you have questions concerning this warranty or its applications, call or write:

In USA and Canada: Caterpillar Inc, 100 N.E. Adams St., Peoria, IL USA 61629, Attention: Customer Service Manager, Telephone 1 (309) 675-1000, outside the USA and Canada: Contact your Cat dealer.

*B) For products operating in Australia, Fiji, Nauru, New Caledonia, New Zealand, Papua New Guinea, the Solomon Islands and Tahiti, the following is applicable:*

THIS WARRANTY IS IN ADDITION TO WARRANTIES AND CONDITIONS IMPLIED BY STATUTE AND OTHER STATUTORY RIGHTS AND OBLIGATIONS THAT BY ANY APPLICABLE LAW CANNOT BE EXCLUDED, RESTRICTED OR MODIFIED ("MANDATORY RIGHTS"). ALL OTHER WARRANTIES OR CONDITIONS, EXPRESS OR IMPLIED (BY STATUTE OR OTHERWISE), ARE EXCLUDED. WITHOUT LIMITING THE FOREGOING PROVISIONS OF THIS PARAGRAPH, WHERE A PRODUCT IS SUPPLIED FOR BUSINESS PURPOSES, THE CONSUMER GUARANTEES UNDER THE CONSUMER GUARANTEES ACT 1993 (NZ) WILL NOT APPLY.

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IF THE MANDATORY RIGHTS MAKE CATERPILLAR LIABLE IN CONNECTION WITH SERVICES OR GOODS, THEN TO THE EXTENT PERMITTED UNDER THE MANDATORY RIGHTS, THAT LIABILITY SHALL BE LIMITED AT CATERPILLAR'S OPTION TO (a) IN THE CASE OF SERVICES, THE SUPPLY OF THE SERVICES AGAIN OR THE PAYMENT OF THE COST OF HAVING THE SERVICES SUPPLIED AGAIN AND (b) IN THE CASE OF GOODS, THE REPAIR OR REPLACEMENT OF THE GOODS, THE SUPPLY OF EQUIVALENT GOODS, THE PAYMENT OF THE COST OF SUCH REPAIR OR REPLACEMENT OR THE ACQUISITION OF EQUIVALENT GOODS.

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CATERPILLAR IS NOT LIABLE FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES UNLESS IMPOSED UNDER MANDATORY RIGHTS.

IF OTHERWISE APPLICABLE, THE VIENNA CONVENTION ON CONTRACTS FOR THE INTERNATIONAL SALE OF GOODS IS EXCLUDED IN ITS ENTIRETY.

*C) For products supplied in Australia:*

IF THE PRODUCTS TO WHICH THIS WARRANTY APPLIES ARE:

I. PRODUCTS OF A KIND ORDINARILY ACQUIRED FOR PERSONAL, DOMESTIC OR HOUSEHOLD USE OR CONSUMPTION; OR

II. PRODUCTS THAT COST AUD 40,000 OR LESS,

WHERE THOSE PRODUCTS WERE NOT ACQUIRED FOR THE PURPOSE OF RE-SUPPLY OR FOR THE PURPOSE OF USING THEM UP OR TRANSFORMING THEM IN THE COURSE OF PRODUCTION OR MANUFACTURE OR IN THE COURSE OF REPAIRING OTHER GOODS OR FIXTURES, THEN THIS SECTION C APPLIES.

THE FOLLOWING MANDATORY TEXT IS INCLUDED PURSUANT TO THE AUSTRALIAN CONSUMER LAW AND INCLUDES REFERENCES TO RIGHTS THE USER MAY HAVE AGAINST THE DIRECT SUPPLIER OF THE PRODUCTS: OUR GOODS COME WITH GUARANTEES THAT CANNOT BE EXCLUDED UNDER THE AUSTRALIAN CONSUMER LAW. YOU ARE ENTITLED TO A REPLACEMENT OR REFUND FOR A MAJOR FAILURE AND COMPENSATION FOR ANY OTHER REASONABLY FORESEEABLE LOSS OR DAMAGE. YOU ARE ALSO ENTITLED TO HAVE THE GOODS REPAIRED OR REPLACED IF THE GOODS FAIL TO BE OF ACCEPTABLE QUALITY AND THE FAILURE DOES NOT AMOUNT TO A MAJOR FAILURE. THE INCLUSION OF THIS TEXT DOES NOT CONSTITUTE ANY REPRESENTATION OR ACCEPTANCE BY CATERPILLAR OF LIABILITY TO THE USER OR ANY OTHER PERSON IN ADDITION TO THAT WHICH CATERPILLAR MAY HAVE UNDER THE AUSTRALIAN CONSUMER LAW.

TO THE EXTENT THE PRODUCTS FALL WITHIN THIS SECTION C BUT ARE NOT OF A KIND ORDINARILY ACQUIRED FOR PERSONAL, DOMESTIC OR HOUSEHOLD USE OR CONSUMPTION, CATERPILLAR LIMITS ITS LIABILITY TO THE EXTENT IT IS PERMITTED TO DO SO UNDER THE AUSTRALIAN CONSUMER LAW TO, AT ITS OPTION, THE REPAIR OR REPLACEMENT OF THE PRODUCTS, THE SUPPLY OF EQUIVALENT PRODUCTS, OR THE PAYMENT OF THE COST OF SUCH REPAIR OR REPLACEMENT OR THE ACQUISITION OF EQUIVALENT PRODUCTS.

THE WARRANTY SET OUT IN THIS DOCUMENT IS GIVEN BY CATERPILLAR INC. OR ANY OF ITS SUBSIDIARIES, 100 N. E. ADAMS ST, PEORIA, IL USA 61629, TELEPHONE 1 309 675 1000, THE USER IS RESPONSIBLE FOR ALL COSTS ASSOCIATED WITH MAKING A CLAIM UNDER THE WARRANTY SET OUT IN THIS DOCUMENT, EXCEPT AS EXPRESSLY STATED OTHERWISE IN THIS DOCUMENT, AND THE USER IS REFERRED TO THE BALANCE OF THE DOCUMENT TERMS CONCERNING CLAIM PROCEDURES, CATERPILLAR RESPONSIBILITIES AND USER RESPONSIBILITIES.

TO THE EXTENT PERMISSIBLE BY LAW, THE TERMS SET OUT IN THE REMAINDER OF THIS WARRANTY DOCUMENT (INCLUDING SECTION B) CONTINUE TO APPLY TO PRODUCTS TO WHICH THIS SECTION C APPLIES.

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**Carter****Carter Machinery Co., Inc.**

## **CARTER WARRANTIES AND DISCLAIMERS**

### **NEW PRODUCTS AND COMPONENTS ASSEMBLED OR RECONDITIONED BY OTHERS**

All new products, and all components and exchange assemblies that have been assembled, reconditioned or remanufactured by other than Carter, are sold subject to the applicable manufacturer's or supplier's warranties and disclaimers. Carter makes no warranties with respect to these items unless it expressly does so in writing at the time of sale. Carter will provide services to replace warranted items without charge to Customer only at any one of Carter's facilities, or, at Carter's option, at the job site.

### **PRODUCTS ASSEMBLED, OVERHAULED OR RECONDITIONED BY CARTER**

Unless a different warranty is expressly given in a writing, signed by Carter, at the time of sale, Carter warrants components, exchange assemblies and other products that have been assembled, overhauled, reconditioned, manufactured or remanufactured by Carter to be free from defects in material or workmanship discovered during the first 6 months or the first 1000 hours (or 25,000 miles) of use after sale or overhaul, whichever first occurs, subject to the provisions hereof. Existence of the defect must be expressly brought to Carter's attention during the warranty period, and the defect must have existed at the time of sale or overhaul. Carter agrees to provide labor and materials as needed to repair or replace with new or repaired parts, at its option, defects covered by this warranty. Materials and labor provided under this warranty are warranted only for the remainder of the original warranty period. Carter will repair or replace defective items covered by warranties under this paragraph only at any one of its facilities or, at Carter's option, at the job site. With respect to such items not installed by Carter, the following provision will also apply: (a) Carter shall have no obligation to repair or replace any defect in an overhauled engine unless the radiator or coolers were delivered to Carter and expressly found by it to be in satisfactory condition prior to installation; and (b) Carter shall have no obligation to repair or replace any defect in transmissions, torque dividers, torque converters and engines unless an oil sample was taken by customer and found satisfactory by Carter at the time of installation and also, in the case of engines, again taken and found satisfactory upon the earlier of the first oil change or 30 days after installation.

### **USED PRODUCTS**

Unless a warranty is expressly given in a writing, signed by Carter, at the time of sale, all used products are sold "as is" and "with all faults."

### **REPAIRS, MAINTENANCE OR SERVICE BY CARTER**

Carter warrants items repaired, maintained or serviced by Carter against defects resulting directly and solely from defects in its workmanship discovered within 6 months after such defective workmanship is rendered subject to the provisions hereof. Existence of the defect must be brought to Carter's attention during the warranty period. Carter agrees to provide labor and materials at the place where the work was originally

performed as needed to repair or replace with new or repaired parts, at its option, defects covered by this warranty. Items not repaired, maintained or serviced originally by Carter but damaged solely due to defects in its workmanship may be reviewed for warranty consideration based on usage received. Materials and labor provided under this warranty are warranted only for the remainder of the original warranty period.

### **CUSTOMER'S RESPONSIBILITIES**

Although Carter will endeavor to provide warranty service at convenient times, it only agrees to do so during regular weekday working hours. The overtime or premium time rate differential will be charged to Customer for warranty service provided at other times. All consumable items, such as lubricants, fuels and filters, necessary to complete a warranty service will be charged to Customer. Customer shall provide at its expense labor and lifting equipment required to minimize job time and downtime in making repairs at the job site. Customer will not subject warranted products to extraordinary uses and will at all times operate and maintain them in accordance with the instructions outlined in any maintenance and operation instruction information furnished at time of purchase. Any damage that results from Customer's continued operation after a defect has been recognized by Customer is Customer's sole responsibility and Carter has no responsibility to repair or correct any damage that results from Customer's continued operation after a defect has been recognized by Customer. This warranty does not apply to any item which has been repaired or altered by Customer or others. Customer shall be liable to Carter for all expenses incurred by Carter if servicemen are called to the job by Customer and Customer refuses to permit the requested work to be done or if it is determined by Carter that no work is appropriate.

### **DISCLAIMER OF WARRANTIES**

**THE WARRANTIES AND AGREEMENTS HEREIN SET FORTH ARE EXCLUSIVE AND ARE EXPRESSLY IN LIEU OF ALL OTHER WARRANTIES AND AGREEMENTS, EXPRESS, IMPLIED OR STATUTORY. THERE ARE NO IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.**

### **DISCLAIMER OF TORT LIABILITY**

Carter, its agents and employees, shall not be liable in tort – whether based on negligence, strict liability or other theory – for any act or omission in connection with the service, delivery, sale, lease, preparation, assembly, repair, recondition, or remanufacture of products sold, leased or handled by it.

### **LIMITATION OF REMEDIES AND DAMAGES**

Customer's sole and exclusive remedies and causes of action are limited to those set forth herein. Carter shall have no liability for incidental, special, consequential or punitive damages or other economic loss.





Salient /PSI Control Solutions Inc.  
9900 Twin Lakes Parkway  
Charlotte, NC 28269  
Phone: 704-596-5617

Date: 2/10/2025

Customer: Carter CAT  
PO# 425082RB1-1

**Project: BRWA-WTP Central WTP Improvements**

**Description: 600A Dual Purpose Single Breaker Docking Station**

**QTY: 1**

DPSBX-06-D3-3R-BB-EUXX-RMSKPLK1-C  
Dual Purpose - Single Breaker  
Amps: 600 amps  
Voltage: 480Y/277V  
# of Poles/Phase: 3 Pole  
Wires: 3 wires with neutral and ground  
Enclosure: Type 3R painted steel  
Camlocks: Temp Gen- Male, Load Bank- Female  
Camlock Location: Bottom  
Overcurrent Protection: 500AT Isolation Breaker  
Suitable for Service Entrance: Yes  
Accessories:  
Phase Rotation Monitor  
3 wire auto start terminals  
Pilot Lights  
2 Key interlocks installed

|   |                          |                                                    |  |
|---|--------------------------|----------------------------------------------------|--|
|   | APPROVED                 | REJECTED/RESUBMIT AS SPECIFIED                     |  |
| X | APPROVED AS NOTED        | NO ACTION REQUIRED                                 |  |
|   | REVISE AS NOTED/RESUBMIT | SUBMITTAL NOT REQUIRED/<br>RETURNED WITHOUT REVIEW |  |

Approval is only for general conformance with the Project's design concept and the information given in the Contract Documents. Contractor is responsible for dimensions to be confirmed and correlated at the job site; information that pertains solely to the fabrication process or to the means and methods of construction; coordination of the work of all trades; and performing work in a safe and satisfactory manner. This approval does not modify Contractor's duty to comply with the Contract Documents.

By: *Rachel C. Cornwell* Date: 02/28/25 

Comments:

1. Verify that the docking station is equipped with a load dump functionality for safe disconnection of load bank per section 263600 2.4.E.
2. Submitted docking station is larger than basis of design product - coordinate footprint of equipment with equipment pad and generator to maintain clearances.
3. Product is shown with neutral to ground bond. Note that device will feed the alternate source of a 3-pole ATS, so the neutral to ground bond in the docking station is not required.
4. Verify auxiliary contacts available and make hardwired connections to provide the preferred and alternate source inputs to the SCADA system per sheet EP640.





|                                    | Product Family<br>(5 digits) | Ampacity<br>(2 digits) | Ground/Neutral<br>(2 digits) | Enclosure Rating<br>(2 digits) | Camlocks<br>(2 digit)      | Overcurrent Protection<br>(1 Digit) | Accessories<br>(Sequential 2 digit pairs) | Custom<br>(1 digit)                               |                                  |
|------------------------------------|------------------------------|------------------------|------------------------------|--------------------------------|----------------------------|-------------------------------------|-------------------------------------------|---------------------------------------------------|----------------------------------|
| Single Purpose<br>Docking Stations | GTBWM                        | 01 100 amps            | A 120/240V                   | 2 2 Pole                       | T1 Type 1                  | M Male                              | R Right side                              | RM Phase Rotation Monitor                         | C Not fully website configurable |
|                                    | GTBFM                        | 02 200 amps            | B 208Y/120V                  | 3 3 Pole                       | 3R Type 3R painted steel   | F Female                            | L Left Side                               | SK 3 wire auto start terminals                    |                                  |
|                                    | GTBWB                        | 04 400 amps            | C 240 Delta                  | 4 4 Pole                       | 4R Type 3R/4R/5R/6R/7R/8R  | B Both                              | B Bottom                                  | K1 2 Kirk Key interlocks installed                |                                  |
|                                    | LBCWM                        | 06 600 amps            | D 480Y/277V                  | 5 5 Pole                       | T4 Type 4                  | X No camlocks                       | X N/A or Other                            | K2 2 Kirk Key installed, 1-matching shipped loose |                                  |
|                                    | LBCFM                        | 08 800 amps            | E 480 Delta                  | 6 6 Pole                       | 4X Type 4X Stainless Steel |                                     |                                           | K3 1 Kirk Key installed only                      |                                  |
| Dual Purpose<br>Docking Stations   | TBLTL                        | 10 1000 amps           | F 600Y/347V                  |                                |                            |                                     |                                           | PM Trumeter, Power Meter                          |                                  |
|                                    | DPSB                         | 12 1200 amps           | G 575/600 Delta              |                                |                            |                                     |                                           | GF Ground Fault 120V, 20A GFI receptacle          |                                  |
|                                    | DPTB                         | 16 1600 amps           |                              |                                |                            |                                     |                                           | R3 30 amp receptacle                              |                                  |
|                                    |                              | 20 2000 amps           |                              |                                |                            |                                     |                                           | RF 50 amp receptacle                              |                                  |
|                                    |                              | 24 2400 amps           |                              |                                |                            |                                     |                                           | PL Pilot Lights                                   |                                  |
| Switches                           | ATS                          | 28 2800 amps           |                              |                                |                            |                                     |                                           | WH Wall Mount Heater                              |                                  |
|                                    | MTS                          | 32 3200 amps           |                              |                                |                            |                                     |                                           | SP Surge protection device                        |                                  |
|                                    | MTSWC                        | 40 4000 amps           |                              |                                |                            |                                     |                                           |                                                   |                                  |
|                                    | MTSDB                        |                        |                              |                                |                            |                                     |                                           |                                                   |                                  |
|                                    | DS                           |                        |                              |                                |                            |                                     |                                           |                                                   |                                  |

Generator tap box-wall mount, 400AMP, 480Y/277Volt, 3 Pole, Type 3R Painted Steel Enclosure, Male Camlok connectors, Bottom Mounted.

\* Note: All units with camlocks include phase rotation monitor and three wire auto start terminals as standard.

| Accessories |    |    |    |    |    |    |    |    |    |    |    | Other Custom? |
|-------------|----|----|----|----|----|----|----|----|----|----|----|---------------|
| RM          | SK | GE | K1 | K2 | K3 | PM | R3 | R5 | PI | WH | SP | (y/n)         |

|                                 |                                       | Amps |    |    |    |    |    |    |    |    |    |    |    |    |    | Enclosure Rating |    |    |    | 1-Phase |   | 3-Phase |   | Male/Female |   |   |   | Location |   |   |   | Brk Mfg |   |   |   | Brk Loc. |   |   |   | Fused Options |   |   |   | NOFB | Accessories |    |    |    |    |    |    |    |    |    |    |    | Other Custom |   |  |
|---------------------------------|---------------------------------------|------|----|----|----|----|----|----|----|----|----|----|----|----|----|------------------|----|----|----|---------|---|---------|---|-------------|---|---|---|----------|---|---|---|---------|---|---|---|----------|---|---|---|---------------|---|---|---|------|-------------|----|----|----|----|----|----|----|----|----|----|----|--------------|---|--|
|                                 |                                       | 01   | 02 | 04 | 06 | 08 | 12 | 16 | 20 | 24 | 28 | 32 | 36 | 40 | T1 | 3R               | 3X | T4 | 4X | 2       | 3 | 3       | 4 | M           | F | B | X | R        | L | B | X | A       | L | E | S | U        | G | L | # | U             | G | L | # |      | RM          | SK | GF | K1 | K2 | K3 | PM | R3 | R5 | PL | WH | SP | (y/n)        |   |  |
| Single Purpose Docking Stations |                                       |      |    |    |    |    |    |    |    |    |    |    |    |    |    |                  |    |    |    |         |   |         |   |             |   |   |   |          |   |   |   |         |   |   |   |          |   |   |   |               |   |   |   |      |             |    |    |    |    |    |    |    |    |    |    |    |              |   |  |
| GTBWM                           | Generator Tap Box - Wall Mount        | -    | -  | 1  | -  | 1  | 1  | 1  | 1  | -  | -  | -  | -  | -  | -  | S                | P  | -  | -  | P       | - | S       | P | S           | - | - | - | -        | S | - | - | -       | - | - | - | -        | - | - | - | -             | - | - | S | S    | S           | P  | -  | P  | -  | P  | P  | P  | P  | P  | -  |    |              |   |  |
| GTBFM                           | Generator Tap Box - Floor Mount       | -    | -  | -  | -  | -  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | -  | S                | P  | -  | -  | P       | - | S       | P | S           | - | - | - | -        | S | - | - | -       | - | - | - | -        | - | - | - | -             | - | - | - | S    | S           | S  | P  | -  | P  | -  | P  | P  | P  | P  | P  | -  |              |   |  |
| GTBWB                           | Generator Tap Box - with Breaker      | -    | 1  | 1  | 1  | 1  | -  | -  | -  | -  | -  | -  | -  | -  | -  | S                | P  | -  | -  | P       | P | S       | P | S           | - | - | - | -        | S | - | - | -       | - | - | - | -        | P | S | P | -             | - | - | - | -    | -           | S  | S  | S  | P  | -  | P  | -  | P  | P  | P  | P  | P            | P |  |
| LBCWM                           | Load Bank Cabinet - Wall Mount        | -    | -  | 1  | -  | 1  | 1  | 1  | 1  | 1  | -  | -  | -  | -  | -  | S                | P  | -  | -  | P       | - | S       | P | -           | S | - | - | -        | S | - | - | -       | - | - | - | -        | - | - | - | -             | - | - | - | S    | S           | S  | P  | -  | P  | -  | P  | P  | P  | P  | P  | -  |              |   |  |
| LBCFM                           | Load Bank Cabinet - Floor Mount       | -    | -  | -  | -  | -  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | -  | S                | P  | -  | -  | P       | - | S       | P | -           | S | - | - | -        | S | - | - | -       | - | - | - | -        | - | - | - | -             | - | - | - | S    | S           | S  | P  | -  | P  | -  | P  | P  | P  | P  | P  | -  |              |   |  |
| TBLTL                           | Termination Box - Lug to Lug          | -    | -  | 1  | -  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | -  | S                | -  | -  | P  | P       | - | S       | P | -           | - | - | S | -        | - | - | S | -       | - | - | - | -        | - | - | - | -             | - | - | - | -    | S           | -  | P  | -  | -  | -  | P  | P  | S  | P  | -  |    |              |   |  |
| Dual Purpose Docking Stations   |                                       |      |    |    |    |    |    |    |    |    |    |    |    |    |    |                  |    |    |    |         |   |         |   |             |   |   |   |          |   |   |   |         |   |   |   |          |   |   |   |               |   |   |   |      |             |    |    |    |    |    |    |    |    |    |    |    |              |   |  |
| DPDS_                           | Dual Purpose - Docking Station        | -    | -  | 1  | -  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | -  | S                | P  | -  | -  | P       | - | S       | P | -           | - | S | - | -        | S | - | - | -       | - | - | - | -        | - | - | - | -             | - | - | - | S    | S           | S  | P  | -  | S  | -  | P  | P  | P  | S  | P  | -  |              |   |  |
| DPSB_                           | Dual Purpose - Single Breaker         | -    | 1  | 1  | 1  | 1  | -  | -  | -  | -  | -  | -  | -  | -  | -  | S                | P  | -  | -  | P       | P | S       | P | -           | - | S | - | -        | S | - | - | -       | - | - | - | -        | - | - | - | -             | - | - | - | -    | S           | S  | S  | P  | P  | S  | -  | P  | P  | P  | S  | P  | P            |   |  |
| DPDB_                           | Dual Purpose - Dual Breaker           | -    | 1  | 1  | 1  | 1  | -  | -  | -  | -  | -  | -  | -  | -  | -  | S                | P  | -  | -  | P       | P | S       | P | -           | - | S | - | -        | S | - | - | -       | - | - | - | -        | - | - | - | -             | - | - | - | -    | S           | S  | S  | P  | S  | -  | P  | P  | P  | S  | P  | P  |              |   |  |
| DPTB_                           | Dual Purpose - Triple Breaker         | -    | 1  | 1  | 1  | 1  | -  | -  | -  | -  | -  | -  | -  | -  | -  | S                | P  | -  | -  | P       | P | S       | P | -           | - | S | - | -        | S | - | - | -       | - | - | - | -        | - | - | - | -             | - | - | - | -    | S           | S  | S  | P  | S  | -  | P  | P  | P  | S  | P  | P  |              |   |  |
| Switches                        |                                       |      |    |    |    |    |    |    |    |    |    |    |    |    |    |                  |    |    |    |         |   |         |   |             |   |   |   |          |   |   |   |         |   |   |   |          |   |   |   |               |   |   |   |      |             |    |    |    |    |    |    |    |    |    |    |    |              |   |  |
| ATS_                            | Automatic Transfer Switch             | 1    | 1  | 1  | -  | 1  | 1  | -  | -  | -  | -  | -  | -  | -  | -  | S                | P  | -  | -  | -       | S | S       | S | -           | - | - | - | -        | - | - | - | -       | - | - | - | -        | - | - | - | -             | - | - | S | -    | -           | -  | -  | -  | -  | -  | -  | -  | -  | -  |    |    |              |   |  |
| MTS_                            | Manual Transfer Switch                | 1    | 1  | 1  | 1  | 1  | 1  | 1  | 1  | -  | -  | -  | -  | -  | -  | P                | S  | P  | P  | P       | P | S       | S | -           | - | - | S | -        | - | - | S | -       | - | - | - | -        | - | - | - | -             | - | - | S | -    | P           | P  | -  | -  | -  | P  | P  | S  | P  | P  |    |    |              |   |  |
| MTSWC                           | Manual Transfer Switch - Combination  | 1    | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | -  | -  | -  | -  | -  | S                | P  | -  | -  | P       | P | S       | S | S           | P | P | - | S        | P | - | - | -       | - | - | - | -        | - | - | - | -             | - | - | S | -    | P           | P  | -  | -  | -  | P  | P  | P  | P  | P  |    |    |              |   |  |
| MTSDB                           | Manual Transfer Switch - Dual Breaker | 1    | 1  | 1  | 1  | 1  | -  | -  | -  | -  | -  | -  | -  | -  | -  | S                | P  | -  | -  | P       | P | S       | S | S           | P | - | - | -        | P | P | - | -       | - | - | - | -        | - | - | - | -             | - | - | S | S    | P           | S  | -  | -  | -  | P  | P  | P  | P  | P  |    |    |              |   |  |
| DS_                             | Disconnect Switch                     | 1    | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | -  | -  | -  | -  | -  | -                | S  | P  | -  | -       | P | P       | S | S           | - | - | S | -        | - | - | S | -       | - | - | - | -        | - | - | - | -             | - | - | - | -    | P           | P  | P  | P  | -  | -  | -  | S  | -  | P  |    |    |              |   |  |
| CS_                             | Company Switch - with Breaker         | 1    | 1  | 1  | 1  | 1  | -  | -  | -  | -  | -  | -  | -  | -  | -  | P                | S  | P  | -  | -       | P | P       | S | S           | S | P | - | -        | - | S | - | -       | - | - | - | -        | - | - | - | -             | - | - | - | -    | -           | -  | S  | S  | P  | -  | -  | -  | P  | P  | P  | P  | P            |   |  |

# DPSB Series

## Dual Purpose Single Breaker

DUAL PURPOSE DOCKING STATION

MALE AND FEMALE CAM LOKS FOR CONNECTION OF TEMPORARY GENERATOR AND LOAD BANK FOR PERMANENT GENERATOR CONNECTION

CABINET IS WALL MOUNTED 800 AMPS AND BELOW, AND FLOOR OR PAD MOUNTED 1600 AMPS TO 6000 AMPS.

AVAILABLE IN TYPE Type 1 and 3R PAINTED ENCLOSURE OR TYPE 3R 316 STAINLESS STEEL 800 AMP AND BELOW RATINGS

AVAILABLE IN TYPE 1 OR 3R IN 1000 TO 4000 AMP RATINGS

LUGS PROVIDED FOR PERMANENT CONNECTION IN THE EVENT OF LOSS OF CAM LOK CONNECTORS

TRAPPED KEY INTERLOCKS AVAILABLE

UL Listed

UL 891 Construction in Padmount

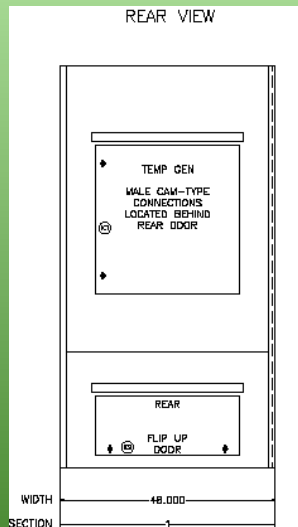
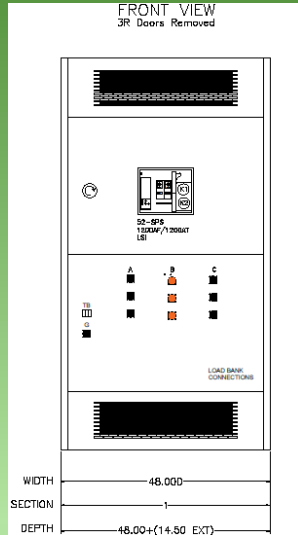
1000-6000 Amps, up to 600 Volts Pad Mount

100-800 Amps, up to 600 volts Wall Mount



100 Ka available

3 OR 4 POLE BREAKERS WITH MULTIPLE CONFIGURATIONS





A

B

C

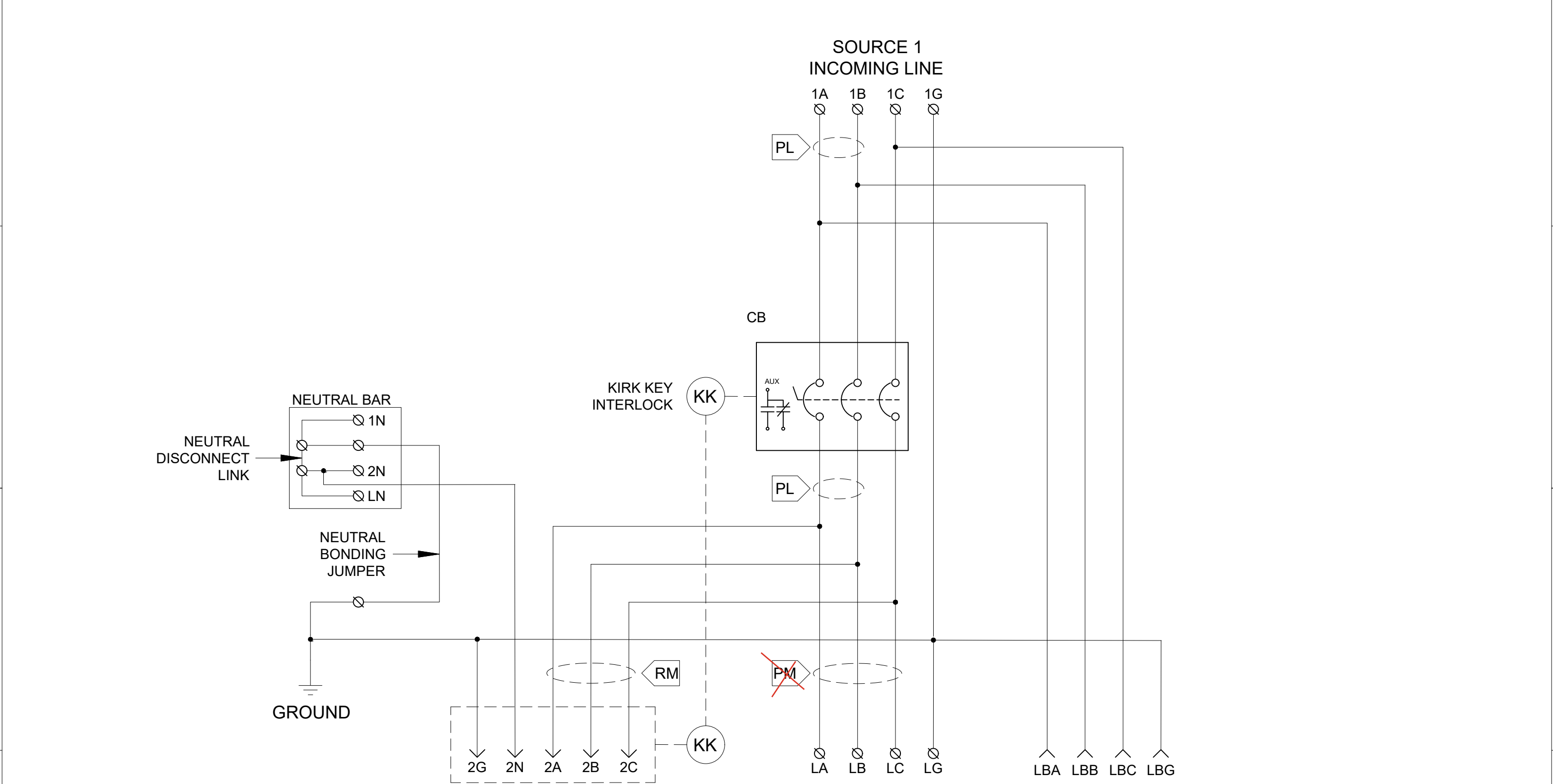
D

A

B

C

D



| AMPS | BONDING JUMPER | CAM-LOCK |                     |
|------|----------------|----------|---------------------|
|      | MIN. SIZE      | QTY      | MIN. WIRE SIZE      |
| 60   | 8 AWG          | 1        | #6 DLO              |
| 100  | 6 AWG          | 1        | #2 DLO              |
| 200  | 4 AWG          | 1        | 3/0 DLO             |
| 400  | 2/0 AWG        | 2        | 535 DLO (3) 3/0 DLO |
| 600  | 2/0 AWG        | 2        | 373 DLO             |
| 800  | 2/0 AWG        | 2        | 535 DLO             |
| 1200 | 3/0 DLO        | 3        | 535 DLO             |
| 1600 | 3/0 DLO        | 4        | 535 DLO             |
| 2000 | 313 DLO        | 5        | 535 DLO             |
| 2500 | 313 DLO        | 7        | 535 DLO             |
| 3000 | 313 DLO        | 8        | 535 DLO             |

|      |         |            |                          |
|------|---------|------------|--------------------------|
| C    | 10OCT24 | JTR        | ADDED FUSE SIZING FOR RM |
| REV. | DATE.   | REVISED BY | DESCRIPTION.             |

|                                                                                       |                             |                |                  |
|---------------------------------------------------------------------------------------|-----------------------------|----------------|------------------|
|  | DESCRIPTION                 |                |                  |
|                                                                                       | GENERATOR TAP BOX           |                |                  |
|                                                                                       | SINGLE BREAKER DUAL PURPOSE |                |                  |
|                                                                                       | DRAWN: MWS                  | DRAWING NUMBER | REV              |
|                                                                                       | CHECKED: DJF                | ES110544       | C                |
|                                                                                       | LAYOUT:                     |                |                  |
|                                                                                       | APPROVAL SIGNATURE          | DATE           | DRAWING TYPE     |
|                                                                                       |                             |                | WIRING SCHEMATIC |
|                                                                                       |                             |                | 1 OF 2           |

1

2

3

4

5

6

NOTES:

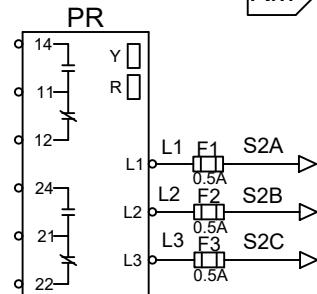
1. ACCESSORY CODE & SELECTION CHECK BOX IN UPPER RIGHT CORNER OF EACH ACCESSORY.

PHASE ROTATION MONITOR (480V & BELOW)



AUX. CONTACTS 1  
5A @300VAC

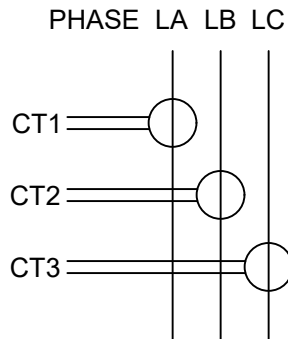
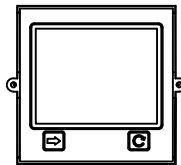
AUX. CONTACTS 2  
5A @300VAC



NOTE:

- \* ALL CONDUCTORS ARE 14AWG BLACK
- \* WIRE MAINS TO EMERGENCY CONNECTIONS
- \* NORMAL CONDITION:  
Y LED INDICATOR IS ON (R IS OFF)
- \* FAULT CONDITION:  
R LED INDICATOR IS FLASHING (Y IS OFF)

TRUMETER APM POWER METER



NOTE:

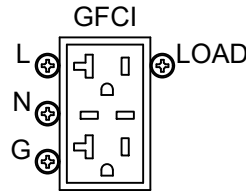
- \* SEE ES11TRUMETER DRAWING FOR DETAILED WIRING

GENERATOR 3-WIRE AUTO START TERMINALS



SK1Q  
SK2Q  
SK3Q

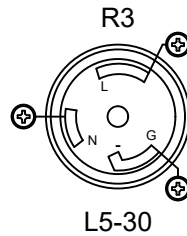
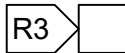
20A GFCI RECEPTACLE



NOTE:

- \* ALL CONDUCTORS, INCOMING POWER & CIRCUIT PROTECTION SUPPLIED BY OTHERS

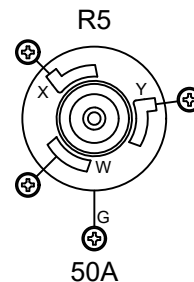
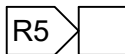
30A 1PH RECEPTACLE



NOTE:

- \* ALL CONDUCTORS, INCOMING POWER & CIRCUIT PROTECTION SUPPLIED BY OTHERS

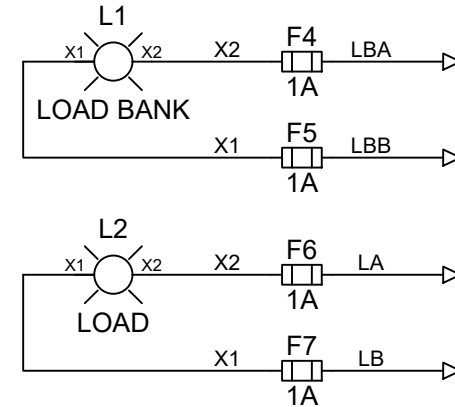
50A 3PH RECEPTACLE



NOTE:

- \* ALL CONDUCTORS, INCOMING POWER & CIRCUIT PROTECTION SUPPLIED BY OTHERS

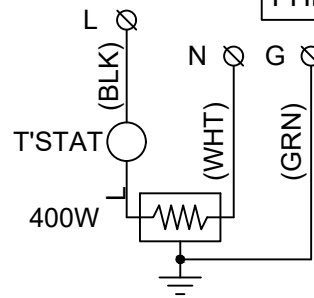
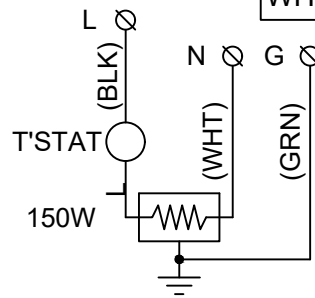
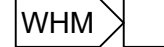
PHASE PILOT LIGHT ACCESSORY



NOTE:

- \* ALL CONDUCTORS ARE 14AWG BLACK

ENCLOSURE SPACE HEATER w/ THERMOSTAT



NOTE:

- \* ALL CONDUCTORS ARE 14AWG
- \* 115V-230Vac INCOMING VOLTAGE SUPPLIED BY OTHERS
- \* WHM IS WALL MOUNT
- \* FHM IS FLOOR MOUNT

|                    |                                                  |        |
|--------------------|--------------------------------------------------|--------|
|                    | DESCRIPTION                                      |        |
|                    | GENERATOR TAP BOX<br>SINGLE BREAKER DUAL PURPOSE |        |
| DRAWN: MWS         | DRAWING NUMBER                                   | REV    |
| CHECKED: DJF       | ES110544                                         | C      |
| LAYOUT:            | DRAWING TYPE                                     | B      |
| APPROVAL SIGNATURE | DATE                                             | 2 OF 2 |
| WIRING SCHEMATIC   |                                                  |        |

CONSTANT PROGRESS