



March 20, 2025

BCC Agenda Date/Item: _____

Board of County Commissioners
 Acting as the governing body of Water Environment Services
 Clackamas County

Approval of a Contract with R.L. Reimers Company for pump station construction for the Intertie 2 Pump Station Expansion Project. Contract Value is \$8,178,775 for 2 years. Funding is through Water Environment Services Sanitary Sewer Construction Funds. No County General Funds are involved.

Previous Board Action/Review	<ul style="list-style-type: none"> • August 10, 2023 – Consor North America, Inc Contract #5222: Intertie 2 Expansion Project - force main, and pump station design • September 19, 2024 – Tapani, Inc Contract #9933: Intertie 2 Expansion Project – force main construction 		
Performance Clackamas	<ol style="list-style-type: none"> 1. This project supports the WES Strategic Plan to plan and upgrade WES’ infrastructure to ensure the sustainable delivery of reliable, high-quality, and climate-resilient clean water services that support the growth and vitality of our communities, natural environment, and economy. 2. This project supports the County’s Strategic Plan of building a strong infrastructure. 		
Counsel Review	Yes	Procurement Review	Yes
Contact Person	Jeff Stallard	Contact Phone	503-742-4694

EXECUTIVE SUMMARY: The Intertie 2 Pump Station diverts flow in excess of Kellogg Creek Water Resource Recovery Facility capacity to the Tri-City Water Resource Recovery Facility. The pump station is at capacity and needs to be expanded to increase the capacity from 10 million gallons per day to 30 million gallons per day. This expansion of the Intertie 2 Pump Station was identified as a need in WES’s Sanitary Sewer Master Plan and is in the adopted 2025-2030 Capital Improvement Plan.

The Intertie 2 Pump Station Expansion Project consists of design and construction phases of both the force main and pump station. This contract is for the construction phase of the pump station and includes installation of new permanent force main intertie piping; new pump, valves and process piping; new level sensors in the wet well; new controls and electrical equipment; and a new generator.

A portion of the work will take place at the Tri-City Water Resource Recovery Facility



and includes upsizing piping that connects into the existing influent pump station wet well from 24" to 30" and upsizing a flow meter to 30".

RECOMMENDATION: Staff recommends that the Board of County Commissioners of Clackamas County, acting as the governing body of Water Environment Services, approve Contract #1154 with R.L. Reimers Company for pump station construction for the Intertie 2 Pump Station Expansion Project.

Respectfully submitted,

A handwritten signature in blue ink that reads "Greg Geist". The signature is written in a cursive style with a long horizontal stroke extending to the right.

Greg Geist
Director, WES

Attachment: R.L. Reimers Company Contract #1154

**WATER ENVIRONMENT SERVICES
AGREEMENT BETWEEN OWNER AND CONTRACTOR
FOR CONSTRUCTION CONTRACT**

Contract #1154

This Agreement is entered into by and between Water Environment Services (“Owner”), an intergovernmental entity formed pursuant to Oregon Revised Statutes Chapter 190, and **R.L. Reimers Company** (“Contractor”).

Terms used in this Agreement have the meanings stated in the General Conditions and the Supplementary Conditions, both identified more specifically in Article 7 below. All references to General Conditions implicitly include a reference to any modifications made by the Supplementary Conditions to the same paragraph.

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:

1. The Work at the Intertie 2 pump station includes establishing erosion and sediment control; establishing a bypass of the pump station; demolition of a section of existing 20” yard piping; demolition of existing asphalt and concrete in the station parking lot; demolition of storm sewer piping; installation of new permanent force main intertie piping and vault; installation of a new permanent pigging port, flow meter and vault; new surge valve and expansion of existing surge vault; new yard piping and valves; new storm sewer piping and two manholes; new pump, valves and process piping; new level sensors in the wet well; new controls and electrical equipment; new station parking lot asphalt; new generator; new hoist and rail for pump room; new hoist on the building roof.
2. The Work at the diversion structure includes establishing erosion and sediment control; establishing a bypass of the diversion structure; demolition of the 54” pipe upstream of the diversion structure; relocation/demolition of structures adjacent to the diversion structure, a shed and a fence; new level sensors in the diversion structure; new controls and electrical equipment; expansion of the existing diversion structure including a new concrete chamber, upsized piping, new manhole, two weirs installed in the existing structure and actuated flow control gates.
3. The Work at the Tri-City Water Resource Recovery Facility includes upsizing yard piping that connects into the existing influent pump station wet well from 24” to 30” and upsizing a flow meter to 30”.

ARTICLE 2—THE PROJECT

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

Intertie 2 Diversion Facility – Pump Station Improvement Project

ARTICLE 3—ENGINEER

3.01 The Owner has retained Consor North America (“Engineer”) to act as Owner’s representative, assume all duties and responsibilities of Engineer, and have the rights and authority assigned to Engineer in the Contract.

3.02 The part of the Project that pertains to the Work has been designed by Engineer.

ARTICLE 4—CONTRACT TIMES

4.01 *Time is of the Essence*

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

4.02 *Contract Times:*

A. The Work will be substantially complete by December 31, 2026 as provided in Paragraph 4.01 of the General Conditions, and

B. Completed and ready for final payment in accordance with Paragraph 15.06 of the General Conditions by January 30, 2027.

4.03 *Milestones*

Reserved.

4.04 *Liquidated Damages*

A. Contractor and Owner recognize that time is of the essence as stated in Paragraph 4.01 above and that Owner will suffer financial and other losses if the Work is not completed and Milestones not achieved within the Contract Times, as duly modified. The parties also recognize the delays, expense, and difficulties involved in proving, in a legal or arbitration proceeding, the actual loss suffered by Owner if the Work is not completed on time. Accordingly, instead of requiring any such proof, Owner and Contractor agree that as liquidated damages for delay (but not as a penalty):

1. *Substantial Completion:* Contractor shall pay Owner **\$1626 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 **\$1626 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.

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. Total of Lump Sum Amount and Unit Price Work (subject to final Unit Price adjustment) **eight million one hundred seventy-eight thousand seven hundred seventy-five dollars (\$8,178,775.00)**.
 - B. For all Work, at the prices stated in Contractor's Bid.

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 30 days following receipt of an Application for Payment during performance of the Work as provided in Paragraph 6.02.A.1 below, provided that such Applications for Payment have been submitted in a timely manner and otherwise meet the requirements of the Contract. All such payments will be measured by the Schedule of Values established as provided in the General Conditions (and in the case of Unit Price Work based on the number of units completed) or, in the event there is no Schedule of Values, as provided elsewhere in the Contract.
 1. Prior to Substantial Completion, progress payments will be made in an amount equal to the percentage indicated below but, in each case, less the aggregate of payments previously made and less such amounts as Owner may withhold, including but not limited to liquidated damages, in accordance with the Contract.
 - a. Ninety-five (95) percent of the value of the Work completed (with the balance being retainage). Retainage will be held in an interest-bearing escrow account. Interest on the retainage amount accrues from the date the payment request is approved until the date the retainage is paid to the Contractor.
- B. Upon final completion, Owner shall pay an amount sufficient to increase total payments to Contractor to One-hundred (100) percent of the Work completed, less such amounts set off by Owner pursuant to Paragraph 15.01.E of the General Conditions.
- C. Alternatives to Retainage
 1. In lieu of retainage, Contractor, with the approval of Owner, may deposit a surety bond for all or any portion of the retainage in a form acceptable to Owner. Such bond and any proceeds therefrom shall be made subject to all claims and liens as provided for in ORS 279C.550 to 279C.620.

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.

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. 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 (“General Conditions”), and Owner has plainly shown all modifications to the standard wording of such published document to the Contractor in the Supplementary Conditions.
 - 4. Supplementary Conditions.
 - 5. Specifications.
 - 6. Drawings.
 - 8. Addenda (numbers 1 to 5 inclusive).
 - 9. Prevailing Wage Rates (not attached but incorporated by reference).
 - 10. Payroll and Certified Statement Form (not attached but incorporated by reference).
 - 12. 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 and incorporated herein (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 5—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, if any, 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.
12. Contractor represents and warrants to Owner that (A) Contractor has the power and authority to enter into and perform this Contract; (B) this Contract, when executed and delivered, shall be a valid and binding obligation of Contractor enforceable in accordance with its terms; (C) Contractor shall at all times during the term of this Contract, be qualified, professionally competent, and duly licensed to perform the Work; (D) Contractor is an independent contractor as defined in ORS 670.600; and (E) the Work under this Contract shall be performed in a good and workmanlike manner and in accordance with the highest professional standards. The warranties set forth in this section are in addition to, and not in lieu of, any other warranties provided.
13. Contractor represents and warrants that it has complied, and will continue to comply throughout the duration of this Contract and any extensions, with all tax laws of this state or any political subdivision of this state, including but not limited to ORS 305.620 and ORS chapters 316, 317, and 318. Any violation of this section shall constitute a material breach of this Contract and shall entitle Owner to terminate this Contract, to pursue and recover any and all damages that arise from the breach and the termination of this Contract, and to pursue any or all of the remedies available under this Contract or applicable law.

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.
- B. Contractor shall furnish proof of required insurance in accordance with Paragraph 6.02 of the General Conditions and Supplemental General Conditions. Insurance certificates may be returned with the signed Agreement or may be emailed to Procurement@clackamas.us.

8.03 *Miscellaneous Terms*

- A. Change Order Authorization. Throughout the performance of the Work under this Agreement, the Owner's Designated Representative (identified on the signature page) is hereby granted the authority to verbally authorize change orders in the field for an amount up to \$10,000. As soon as possible following the authorization, the Owner's Designated Representative shall complete the change order form provided by Clackamas County Procurement ("Procurement"), obtain the signature of Owner's Director or other authorized signatory, and submit the form to Procurement for processing. As soon as the Director signs off on the change order form, the Designated Representative may then authorize another change order in the future for up to \$10,000 following the same procedure above. Each change order should include the cumulative cost of the entire change and may not be artificially broken up into multiple change orders to fall under the dollar threshold listed above. The authority granted to the Designated Representative is limited by the Director's authorization to amend the Agreement under Clackamas County's Local Contract Review Board Rules and is subject to the discretion of the Director, who may suspend or restrict the Designated Representative's ability to authorize change orders at any time for any reason.
- B. Counterparts. This Contract may be executed in several counterparts, all of which when taken together shall constitute an agreement binding on all Parties, notwithstanding that all Parties are not signatories to the same counterpart. Each copy of the Contract so executed shall constitute an original.
- C. Required Provisions. All provisions of state law required to be part of this Contract, whether listed in the General Conditions or Supplementary Conditions or otherwise, are hereby integrated and adopted herein. Contractor acknowledges the obligations thereunder and that failure to comply with such terms is a material breach of this Contract.
- D. Integration. The Contract Documents constitute the entire agreement between the parties. There are no other understandings, agreements or representations, oral or written, not specified herein regarding this Contract. Contractor, by the signature below of its authorized representative, hereby acknowledges that it has read this Contract, understands it, and agrees to be bound by its terms and conditions.

[Signature Page Follows]

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

This Agreement will be effective on the last date of signature by the parties below (which is the Effective Date of the Contract).

Owner:
Water Environment Services

By: _____
(individual's signature)

Date: _____
(date signed)

Name: Craig Roberts
(typed or printed)

Title: Chair
(typed or printed)

Attest: _____
(individual's signature)

Title: _____
(typed or printed)

Address for giving notices:

ATTN: Gregory Geist

150 Beaver Creek Road #430

Oregon City, OR 97045

Designated Representative:

Name: Gregory L. Geist
(typed or printed)

Title: Director
(typed or printed)

Address:


150 Beaver Creek Road #430

Oregon City, OR 97045

Phone: 503-742-4567

Email: GGeist@clackamas.us

Approved as to Form:


County Counsel
2/26/2025
Date

Contractor:
R.L. Reimers Company

(typed or printed name of organization)
By: _____
(individual's signature)

Date: 2/11/2024
(date signed)

Name: Ronald Reimers
(typed or printed)

Title: President
(typed or printed)

Attest: _____
(individual's signature)

Title: Secretary
(typed or printed)

Address for giving notices:

3939 Old Salem Rd, Suite 200

Albany, OR 97321

Designated Representative:

Name: Ross Meyer
(typed or printed)

Title: Project Manager
(typed or printed)

Address:

3939 Old Salem Rd, Suite 200

Albany, OR 97321

Phone: 971-304-5661

Email: ross@rlreimers.com

License No.: 60891
(where applicable)

State: Oregon



**CLACKAMAS COUNTY
PUBLIC IMPROVEMENT CONTRACT OPPORTUNITY**

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**CLACKAMAS COUNTY
NOTICE OF PUBLIC IMPROVEMENT CONTRACT OPPORTUNITY**

**INVITATION TO BID #2024-108
Intertie 2 Diversion Facility – Pump Station Expansion Project
November 26, 2024**

Clackamas County (“County”) on behalf of Water Environment Services through their Board of County Commissioners is accepting sealed bids for the Intertie 2 Diversion Facility – Pump Station Expansion Project until **December 19, 2024, 2:00 PM, Pacific Time**, (“Bid Closing”) at the following location:

Bidding Documents can be downloaded from the state of Oregon procurement website (“OregonBuys”) at the following address: <https://oregonbuys.gov/bs0/view/login/login.xhtml>, Document No. S-C01010-00012179.

Prospective Bidders will need to sign in to download the information and that information will be accumulated for a Plan Holder's List. Prospective Bidders are responsible for obtaining any Addenda from Website listed above.

Submitting Proposals: Bid Locker

Proposals will only be accepted electronically thru a secure online bid submission service, **Bid Locker**. *Email submissions to Clackamas County email addresses will no longer be accepted.*

- A. Completed proposal documents must arrive electronically via Bid Locker located at <https://bidlocker.us/a/clackamascounty/BidLocker>.
- B. Bid Locker will electronically document the date and time of all submissions. Completed documents must arrive by the deadline indicated in Section 1 or as modified by Addendum. **LATE PROPOSALS WILL NOT BE ACCEPTED.**
- C. Proposers must register and create a profile for their business with Bid Locker in order to submit for this project. It is free to register for Bid Locker.
- D. Proposers with further questions concerning Bid Locker may review the Vendor’s Guide located at <https://www.clackamas.us/how-to-bid-on-county-projects>.

Engineers Estimate: \$7,900,000.00

Contact Information

Procurement Process and Technical Questions: Ryan Rice, rrice@clackamas.us.

A **Mandatory Pre-Bid Conference** will be conducted on **December 10, 2024 at 10:00 AM**. Bidders shall meet with County representatives at the **IT2 Pump Station Site (Address: 13425 SE Johnson Rd)** for that purpose. Attendance will be documented through a sign-in sheet prepared by the County representative. Prime bidders who arrive more than ten (10) minutes after the start time of the meeting (as stated in the solicitation and by the County’s watch) or after the discussion portion of the meeting (whichever comes first) shall not be permitted to sign in and will not be permitted to submit a bid on the project.

Bids will be opened and publicly read aloud at the above Delivery address after the Bid Closing. Bid results will also be posted to the OregonBuys listing shortly after the opening.

Prevailing Wage

Prevailing Wage Rates requirements apply to this Project because the maximum compensation for all Owner-contracted Work is more than \$50,000. Contractor and all subcontractors shall comply with the provisions of ORS 279C.800 through 279C.870, relative to Prevailing Wage Rates. The Bureau of Labor and Industries (BOLI) wage rates and requirements set forth in the following BOLI booklet (and any

listed amendments to that booklet), which are incorporated herein by reference, apply to the Work authorized under this Agreement:

PREVAILING WAGE RATES for Public Works Contracts in Oregon, July 5, 2024 and amended on October 5, 2024 which can be downloaded at the following web address:, which can be downloaded at the following web address: http://www.oregon.gov/boli/WHD/PWR/Pages/pwr_state.aspx

The Work will take place in Clackamas County, Oregon.

Clackamas County encourages bids from Minority, Women, and Emerging Small Businesses.



CLACKAMAS COUNTY PUBLIC IMPROVEMENT CONTRACT

INSTRUCTIONS TO BIDDERS

Clackamas County Local Contract Review Board Rules (“LCRB Rules”) govern this procurement process. LCRB Rules may be found at: <http://www.clackamas.us/code/documents/appendixc.pdf>. The Instructions to Bidders is applicable to the procurement process for Clackamas County, or any component unit thereof identified on the Notice of Public Improvement Contract Opportunity, herein after referred to as the “Owner.”

Article 1. Scope of Work

The work contemplated under this contract with the Owner, includes all labor, materials, transportation, equipment and services necessary for, and reasonably incidental to, the completion of all construction work in connection with the project described in the Project Manual which includes, but is not necessarily limited to, the Notice of Public Improvement Contract Opportunity, Instructions to Bidders, Supplemental Instructions to Bidders, Bid Form, Bid Bond, Public Improvement Contract Form, Performance Bond, Payment Bond, Clackamas County General Conditions for Public Improvement Contracts (10/13/2021), Supplemental General Conditions, and Plans, Specifications and Drawings.

Article 2. Examination of Site and Conditions

Before making a Bid, the Bidder shall examine the site of the work and ascertain all the physical conditions in relation thereto. The Bidder shall also make a careful examination of the Project Manual including the plans, specifications, and drawings and other contract documents, and shall be fully informed as to the quality and quantity of materials and the sources of supply of the materials. Failure to take these steps will not release the successful Bidder from entering into the contract nor excuse the Bidder from performing the work in strict accordance with the terms of the contract at the

price established by the Bid.

The Owner will not be responsible for any loss or for any unanticipated costs, which may be suffered by the successful Bidder, as a result of such Bidder's failure to be fully informed in advance with regard to all conditions pertaining to the work and the character of the work required, including site conditions. No statement made by an elected official, officer, agent, or employee of the Owner in relation to the physical or other conditions pertaining to the site of the work will be binding on the Owner, unless covered by the Project Manual or an Addendum.

Article 3. Interpretation of Project Manual and Approval of Materials Equal to Those Provided in the Specifications

If any Bidder contemplating submitting a Bid for the proposed contract is in doubt as to the true meaning of any part of the plans, specifications or forms of contract documents, or detects discrepancies or omissions, such Bidder may submit to the Architect (read "Engineer" throughout in lieu of Architect as appropriate) a written request for an interpretation thereof at least ten (10) calendar days prior to the date set for the Bid Closing.

When a prospective Bidder seeks approval of a particular manufacturer's material, process or item of equal value, utility or merit other than that designated by the Architect in the Project Manual, the Bidder may submit to the Architect a written request for approval of such substitute at least ten (10) calendar days prior to the date set for the Bid Closing. The prospective Bidder submitting the request will be responsible for its prompt delivery.

Requests of approval for a substitution from that specified shall be accompanied by samples, records of performance, certified copies of tests by

impartial and recognized laboratories, and such other information as the Architect may request.

To establish a basis of quality, certain processes, types of machinery and equipment or kinds of materials may be specified in the Project Manual either by description of process or by designating a manufacturer by name and referring to a brand or product designation or by specifying a kind of material. Whenever a process is designated or a manufacturer's name, brand or item designation is given, or whenever a process or material covered by patent is designated or described, it shall be understood that the words "or approved equal" follow such name, designation or description, whether in fact they do so or not.

Any interpretation of the Project Manual or approval of manufacturer's material will be made only by an Addendum duly issued. All Addenda will be posted to the OregonBuys listing and will become a part of the Project Manual. The Owner will not be responsible for any other explanation or interpretation of the Project Manual nor for any other approval of a particular manufacturer's process or item for any Bidder.

When the Architect approves a substitution by Addendum, it is with the understanding that the Contractor guarantees the substituted article or material to be equal or better than the one specified.

Article 4. Security to Be Furnished by Each Bidder

Each Bid must be accompanied by either 1) a cashier's check or a certified check drawn on a bank authorized to do business in the State of Oregon, or 2) a Bid bond described hereinafter, executed in favor of the Owner, for an amount equal to ten percent (10%) of the total amount Bid as a guarantee that, if awarded the contract, the Bidder will execute the contract and provide a performance bond and payment bond as required. The successful Bidder's check or Bid bond will be retained until the Bidder has entered into a contract satisfactory to Owner and furnished a one hundred percent (100%) performance bond and one hundred percent (100%) payment bond. The Owner

reserves the right to hold the Bid security as described in Article 10 hereof. Should the successful Bidder fail to execute and deliver the contract as provided for in Article 12 hereof, including a satisfactory performance bond and payment bond within twenty (20) calendar days after the Bid has been accepted by the Owner, then the contract award made to such Bidder may be considered canceled and the Bid security may be forfeited as liquidated damages at the option of the Owner. The date of the acceptance of the Bid and the award of the contract as contemplated by the Project Manual shall mean the date of acceptance specified in the Notice of Intent to Award.

Article 5. Execution of Bid Bond

Should the Bidder elect to utilize a Bid bond as described in Article 4 in order to satisfy the Bid security requirements, such form must be completed in the following manner:

- A. Bid bonds must be executed on the County forms, which will be provided to all prospective Bidders by the Owner.
- B. The Bid bond shall be executed on behalf of a bonding company licensed to do business in the State of Oregon.
- C. In the case of a sole individual, the bond need only be executed as principal by the sole individual. In the case of a partnership, the bond must be executed by at least one of the partners. In the case of a corporation, the bond must be executed by stating the official name of the corporation under which is placed the signature of an officer authorized to sign on behalf of the corporation followed by such person's official capacity, such as president, etc. The corporation seal should then be affixed to the bond.
- D. The name of the surety must be stated in the execution over the signature of its duly authorized attorney-in-fact and accompanied by the seal of the surety corporation.

Article 6. Execution of the Bid Form

Each Bid shall be made in accordance with: (i) the sample Bid Form accompanying these instructions; (ii) the appropriate signatures for a sole individual, partnership, corporation or limited liability corporation shall be added as noted in Article 5C above; (iii) numbers pertaining to base Bids shall be stated both in writing and in figures; and (iv) the Bidder's address shall be typed or printed.

The Bid Form relates to Bids on a specific Project Manual. Only the amounts and information asked for on the Bid Form furnished will be considered as the Bid. Each Bidder shall Bid upon the work exactly as specified and provided in the Bid Form. The Bidder shall include in the Bid a sum to cover the cost of all items contemplated by the Contract. The Bidder shall Bid upon all alternates that may be indicated on the Bid Form. When Bidding on an alternate for which there is no charge, the Bidder shall write the words "No Charge" in the space provided on the Bid Form. If one or more alternates are shown on the Bid Form, the Bidder shall indicate whether each is "add" or "deduct."

Article 7. Prohibition of Alterations to Bid

Bids that are incomplete, or contain ambiguities or have differing conditions required by the Bidder, including requested changes or exceptions to the Public Improvement Contract form or other portions of the Project Manual, may be rejected in Owner's sole and absolute discretion.

Article 8. Submission of Bid

Each Bid shall be sealed in an envelope, properly addressed to the Owner, showing on the outside of the envelope the name of the Bidder and the name of the project. Bids will be received at the time and place stated in the Notice of Public Improvement Contract Opportunity.

Article 9. Bid Closing and Opening of Bids

All Bids must be received by the Owner at the place and time set for the Bid Closing. Any Bids received after the scheduled Bid Closing time for

receipt of Bids will be rejected.

At the time of opening and reading of Bids, each Bid received will be publicly opened and read aloud, irrespective of any irregularities or informalities in such Bids.

Generally, Bid results will be posted to the OregonBuys Website within a couple hours of the opening.

Article 10. Acceptance or Rejection of Bids by Owner

Unless all Bids are rejected, the Owner will award a contract based on the lowest responsive Bid from a responsible Bidder. If that Bidder does not execute the contract, it will be awarded to the next lowest responsible Bidder or Bidders in succession.

The Owner reserves the right to reject all Bids and to waive minor informalities. The procedures for contract awards shall be in compliance with the provisions of the LCRB Rules in effect at that time.

The Owner reserves the right to hold the Bid and Bid security of the three lowest Bidders for a period of thirty (30) calendar days from and after the time of Bid opening pending award of the contract. Following award of the contract the Bid security of the three lowest Bidders may be held twenty (20) calendar days pending execution of the contract. All other Bids will be rejected and Bid security will be returned.

In determining the lowest Bidder, the Owner reserves the right to take into consideration any or all authorized base Bids as well as alternates or combinations indicated in the Bid Form.

If no Bid has been accepted within thirty (30) calendar days after the opening of the Bids, each of the three lowest Bidders may withdraw the Bid submitted and request the return of the Bid security.

Article 11. Withdrawal of Bid

At any time prior to the Bid Closing, a Bidder may withdraw its Bid. This will not preclude the

submission of another Bid by such Bidder prior to the time set for the Bid Closing.

After the time set for the Bid Closing, no Bidder will be permitted to withdraw its Bid within the time frames specified in Article 10 for award and execution, except as provided for in that Article.

Article 12. Execution of Contract, Performance Bond and Payment Bond

The Owner will provide the successful Bidder with contract forms within seven (7) calendar days after the completion of the award protest period. The Bidder is required to execute the contract forms as provided, including a performance bond and a payment bond from a surety company licensed to do surety business in the State of Oregon, within seven (7) calendar days after receipt of the contract forms. The contract forms shall be delivered to the Owner in the number called for and to the location as instructed by the Owner.

Article 13. Recyclable Products

Contractors will use recyclable products to the maximum extent economically feasible in the performance of the Contract.

Article 14. Clarification or Protest of the Solicitation Document or Specifications

Any request for clarification or protest of the solicitation document or specifications must be submitted in the manner provided for in the applicable section of the LCRB Rules to the Procurement Representative referenced in the Notice of Public Improvement Contract Opportunity.

A protest of the Solicitation Document must be received within seven (7) business days of the issuance of the Bid or within three (3) business days of issuance of an addendum.

Requests for clarification may be submitted no less than five (5) business days prior to the Bid Closing Date.

Article 15. Protest of Intent to Award

Owner will name the apparent successful Bidder in a "Notice of Intent to Award" letter. Identification of the apparent successful Bidder is procedural only and creates no right in the named Bidder to the award of the contract. Competing Bidders will be notified by publication of the Notice of Intent to Award on the OregonBuys Website of the selection of the apparent successful Bidder(s) and Bidders shall be given seven (7) calendar days from the date on the "Notice of Intent to Award" letter to review the file at the Procurement Division office and file a written protest of award, pursuant to C-049-0450. Any award protest must be in writing and must be delivered by email, hand delivery, or mail to the Procurement Division Director at: Procurement Division, 2051 Kaen Road, Oregon City, OR 97045.

Article 16. Disclosure of First-Tier Subcontractors

Within two (2) working hours after the Bid Closing, all Bidders shall submit to the County a disclosure form identifying any first-tier subcontractors (those entities that would be contracting directly with the prime contractor) that will be furnishing labor and materials on the contract, if awarded, whose subcontract value would be equal to or greater than: (a) Five percent (5%) of the total contract price, but at least \$15,000; or (b) \$350,000, regardless of the percentage of the total contract price.

Disclosures may be submitted with the Bid or may be hand delivered to the Bid Closing address or emailed to the Contract Information Analyst listed on the Notice of Contract Opportunity.



**CLACKAMAS COUNTY
PUBLIC IMPROVEMENT CONTRACT**

SUPPLEMENTAL INSTRUCTIONS TO BIDDERS

**Project Name #2024-108
Intertie 2 Diversion Facility – Pump Station Expansion Project**

The following modify the Clackamas County “Instructions to Bidders” for this Project. Where a portion of the Instructions to Bidders has been modified by these Supplemental Instructions to Bidders, the unaltered portions shall remain in effect.

- 1. Mandatory Pre-Bid Conference** will be conducted on December 10, 2024 at 10:00 AM. Bidders shall meet with County representatives at the IT2 Pump Station Site (Address: 13425 SE Johnson Rd) for that purpose. Attendance will be documented through a sign-in sheet prepared by the County representative. Prime bidders who arrive more than ten (10) minutes after the start time of the meeting (as stated in the solicitation and by the County’s watch) or after the discussion portion of the meeting (whichever comes first) shall not be permitted to sign in and will not be permitted to submit a bid on the project.
- 2. Electronic Submissions:** The County is requiring all bids for this project be electronically submitted. Complete Bids (including all attachments) will only be accepted electronically thru a secure online bid submission service, Bid Locker. Email submissions to Clackamas County email addresses will no longer be accepted.
<https://bidlocker.us/a/clackamascountry/BidLocker>.

Bids will be publicly read aloud via the computer application, Zoom. Bidders will be allowed to video conference or listen by phone to the bid results. The projects Zoom meeting can be accessed via the information below:

Join Zoom Meeting

<https://clackamascountry.zoom.us/j/84653707874>

Meeting ID: 846 5370 7874

****The Apparent Low bid results will be posted to the projects OregonBuys listing as soon as possible following the bid opening.**

- 3. Good Faith Effort:** Clackamas County encourages participation in contracts by Historically Underrepresented Businesses. “Historically Underrepresented Businesses” are State of Oregon-certified and self-identified minority, women and emerging small business as well as firms that are certified federally or by another state or entity with substantially similar requirements as the State of Oregon.

Bidders must perform Good Faith Effort (defined below) and submit **Form 1 and Form 2** for the Bidders Bid to be considered responsive. **Form 1 and Form 2** must be

submitted within **two (2) hours** after the Closing Date and Time. Form 1 and Form 2 may be submitted to either the Contact Information Analyst listed on Notice of Contract Opportunity or via the <https://bidlocker.us/a/clackamascounty/BidLocker> listing.

“Good Faith Effort” is a requirement of a prime contractor to reach out to at least three Historically Underrepresented Business Subcontractors for each division of work that will be subcontracted out and to complete the required forms. If fewer than three Historically Underrepresented Business Subcontractors are reasonably available for a particular division of work, the Bidder must specifically note the reason for there being fewer than three contacts. The outreach should be performed with sufficient time to give the subcontractors at least 5 calendar days to respond to the opportunity. Form 3, which documents the actual amount of subcontractors on the project, must be submitted with the project final pay application. Compliance with the Good Faith Effort and submission of Forms 1, 2 and 3 is a contractual requirement for final payment.

The sufficiency of the documentation or the performance of Good Faith Effort shall be in the sole and absolute determination of Clackamas County. Only those Bidders that Clackamas County has determined have not sufficiently performed Good Faith Effort shall have protest rights of the determination for such Bidder. No Bidder shall have protest rights of the sufficiency of any other Bidder completing Good Faith Effort.

**CLACKAMAS COUNTY
GOOD FAITH EFFORT
SUBCONTRACTOR AND SELF-PERFORMED WORK LIST
(FORM 1)**

Prime Contractor Name: R.L. Reimers Company

Total Contract Amount: \$8,178,775.00

Project Name: #2024-108

Intertie 2 Diversion Facility – Pump Station Expansion Project

PRIME SELF-PERFORMING: Identify below **ALL** GFE Divisions of Work (DOW) to be self-performed. Good Faith Efforts are otherwise required.

DOW BIDDER WILL SELF-PERFORM (GFE not required)	
Demolition	Trucking
Excavation/Utilities	Division 40 - Mechanical Piping
Concrete	Division 43 - Pumps
Metals	Flagging
	Shoring

PRIME CONTRACTOR SHALL DISCLOSE AND LIST ALL SUBCONTRACTORS, including those Minority-owned, Woman-owned, and Emerging Small Businesses (“M/W/ESB”) that you intend to use on the project. Delivery via bid locker <https://bidlocker.us/a/clackamascounty/BidLocker> within 2 hours of the BID/Quote Closing Date/Time.

LIST ALL SUBCONTRACTORS BELOW Use correct legal name of Subcontractor (No Assumed Business Names)	Division of Work (Painting, electrical, landscaping, etc.) List ALL DOW performed by Subcontractors	DOLLAR AMOUNT OF SUBCONTRACT	If Certified or self-reporting MBE/WBE/ESB Subcontractor		
			Check box <input checked="" type="checkbox"/>		
			MBE	WBE	ESB
Name Team Electric Address 9400 SE Clackamas Rd City/St/Zip Clackamas, OR 97015 Phone# 503-557-7180 OCCB# 173043	Electrical	\$1,407,273.00	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Name MJE Industrial Address PO Box 3434 City/St/Zip Gresham, OR 97030 Phone# 503-936-8934 OCCB# 227416	Paintings/Coatings	\$51,600.00	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Name Griffin Dewatering Address 9021 Waller Rd E City/St/Zip Tacoma, WA 98446 Phone# 253-531-2409 OCCB# 240698	Dewatering	\$112,850.00	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Name Superior Fence & Construction Address 10001 SE Powell Blvd City/St/Zip Portland, OR 97266 Phone# 503-760-7725 OCCB# 70422	Fencing	\$11,867.00	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

GFE SUBCONTRACTOR AND SELF-PERFORMED WORK LIST (FORM 1) cont'd

Prime Contractor Name:

Total Contract Amount:

Project Name: #2024-108

Intertie 2 Diversion Facility – Pump Station Expansion Project

<p align="center">LIST ALL SUBCONTRACTORS BELOW Use correct legal name of Subcontractor (No Assumed Business Names)</p>	<p align="center">Division of Work (Painting, electrical, landscaping, etc.) List ALL DOW performed by Subcontractors</p>	<p align="center">DOLLAR AMOUNT OF SUBCONTRACT</p>	<p align="center">If Certified or self-reporting MBE/WBE/ESB Subcontractor</p>		
			<p align="center">Check box <input checked="" type="checkbox"/></p>		
			MBE	WBE	ESB
<p>Name Eastside Paving Address PO Box 1049 City/St/Zip Gresham, OR 97030 Phone# 503-492-7563 OCCB# 068962</p>	Paving	\$17,250.00	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<p>Name Andres Landscape Address PO Box 1131 City/St/Zip Oregon City, OR 97045 Phone# 503-632-3366 OCCB# 203138</p>	Landscape	\$15,000.00	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<p>Name Address City/St/Zip Phone# OCCB#</p>			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<p>Name Address City/St/Zip Phone# OCCB#</p>			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<p>Name Address City/St/Zip Phone# OCCB#</p>			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<p>Name Address City/St/Zip Phone# OCCB#</p>			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<p>Name Address City/St/Zip Phone# OCCB#</p>			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

**CLACKAMAS COUNTY
GOOD FAITH EFFORT
M/W/ESB CONTACT / BIDS RECEIVED LOG
(FORM 2)**

Prime Contractor: R.L. Reimers Co.
 Project: #2024-108
 Intertie 2 Diversion Facility – Pump Station Expansion Project

Prime Contractor must contact or endeavor to contact at least 3 M/W/ESB Subcontractors for each Division of Work. Prime Contractor shall record its contacts with M/W/ESB Subcontractors through use of this log (or equivalent) entering all required information. All columns shall be completed where applicable. Additional forms may be copied if needed.

NAME OF M/W/ESB SUBCONTRACTOR	Divisions of Work (Painting, electrical, landscaping, etc.)	Date Solicitation Letter / Fax Sent	PHONE CONTACT		BID ACTIVITY Check Yes or No			REJECTED BIDS (if bid received & not used)		Notes
			Date of Call	Person Receiving Call	Will Bid	Bid Received	Bid Used	Bid Amount	Reason Not Used (Price, Scope or Other. If Other, explain in Notes>>)	
Apogee Landscapes	Fencing	12/23/24	12/31/24	Michael L	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No			
Adam's Quality Fence Inc	Fencing	12/23/24	12/31/24	Adam Johnston	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No			
Horizon Fence Co	Fencing	12/23/24	12/31/24	Jeff Grant	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No			
Affordable Electric Inc	Electrical	12/23/24	12/31/24	Jean Wildy Malary	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No			
MD Electrical Services	Electrical	12/23/24	12/31/24	Michael Dutton	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No			
Skyline Electric Co	Electrical	12/23/24	12/31/24	Spencer Sullivan	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No			
Settje Sons Paving LLC	Asphalt/Paving	12/23/24	12/31/24	James Settje	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No			

**CLACKAMAS COUNTY
GOOD FAITH EFFORT
M/W/ESB CONTACT / BIDS RECEIVED LOG
(FORM 2)**

Prime Contractor: R.L. Reimers Co
 Project: #2024-108
 Intertie 2 Diversion Facility – Pump Station Expansion Project

Prime Contractor must contact or endeavor to contact at least 3 M/W/ESB Subcontractors for each Division of Work. Prime Contractor shall record its contacts with M/W/ESB Subcontractors through use of this log (or equivalent) entering all required information. All columns shall be completed where applicable. Additional forms may be copied if needed.

NAME OF M/W/ESB SUBCONTRACTOR	Divisions of Work (Painting, electrical, landscaping, etc.)	Date Solicitation Letter / Fax Sent	PHONE CONTACT		BID ACTIVITY Check Yes or No			REJECTED BIDS (if bid received & not used)		Notes
			Date of Call	Person Receiving Call	Will Bid	Bid Received	Bid Used	Bid Amount	Reason Not Used (Price, Scope or Other. If Other, explain in Notes>>)	
Apogee Landscapes	Landscape	12/23/24	12/31/24	Michael L	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No			
Bridgetown Construction + Landscaping	Landscape	12/23/24	12/31/24	Amber Dickey	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No			
Four Seasons Landscape Maintenance	Landscape	12/23/24	12/31/24	Agustin Rios	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No			
Columbia River Painting LLC	Painting	12/23/24	12/31/24	Leticia Nunez	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No			
E+E Painting	Painting	12/23/24	12/31/24	Bo Edwards	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No			
Bratcher Painting Inc	Painting	12/23/24	12/31/24	Cheryl Bratcher	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No			
MJE Industrial Inc	Painting	12/23/24	12/31/24	Scott Woodward	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	\$51,660.00		

**CLACKAMAS COUNTY
GOOD FAITH EFFORT
M/W/ESB CONTACT / BIDS RECEIVED LOG
(FORM 2)**

Prime Contractor: R.L. Reimers Co.
 Project: #2024-108
 Intertie 2 Diversion Facility – Pump Station Expansion Project

Prime Contractor must contact or endeavor to contact at least 3 M/W/ESB Subcontractors for each Division of Work. Prime Contractor shall record its contacts with M/W/ESB Subcontractors through use of this log (or equivalent) entering all required information. All columns shall be completed where applicable. Additional forms may be copied if needed.

NAME OF M/W/ESB SUBCONTRACTOR	Divisions of Work (Painting, electrical, landscaping, etc.)	Date Solicitation Letter / Fax Sent	PHONE CONTACT		BID ACTIVITY Check Yes or No			REJECTED BIDS (if bid received & not used)		Notes
			Date of Call	Person Receiving Call	Will Bid	Bid Received	Bid Used	Bid Amount	Reason Not Used (Price, Scope or Other. If Other, explain in Notes>>)	
Ortiz and Associates Inc	Asphalt/Paving	12/23/24	12/31/24	Baltazar Ortiz	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No			
Heffner Paving LLC	Asphalt/Paving	12/23/24	12/31/24	Misty Heffner	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No			
					<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No			
					<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No			
					<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No			
					<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No			
					<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No			

**CLACKAMAS COUNTY
GOOD FAITH EFFORT
PROJECT COMPLETION REPORT
(FORM 3)**

Prime Contractor Name:

Total Contract Amount:

Project Name: #2024-108

Intertie 2 Diversion Facility – Pump Station Expansion Project

Complete this form and submit with your request for final payment upon the project completion. Please list all subcontractors used for the project. Use additional sheets as necessary.

<u>LIST ALL SUBCONTRACTORS BELOW</u> Use correct legal name of Subcontractor (No Assumed Business Names)	Division of Work (Painting, electrical, landscaping, etc.) List ALL DOW performed by Subcontractors	FINAL DOLLAR AMOUNT OF SUBCONTRACT	If Certified or self-reported MBE/WBE/ESB Subcontractor Check box <input checked="" type="checkbox"/>		
			MBE	WBE	ESB
Name Address City/St/Zip Phone# OCCB#			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Name Address City/St/Zip Phone# OCCB#			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Name Address City/St/Zip Phone# OCCB#			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Name Address City/St/Zip Phone# OCCB#			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Name Address City/St/Zip Phone# OCCB#			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Name Address City/St/Zip Phone# OCCB#			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

BY SIGNING BELOW, I HEREBY CERTIFY THAT THE ABOVE LISTED FIRMS HAVE BEEN UTILIZED BY OUR COMPANY IN THE AMOUNTS REPRESENTED ABOVE AND THAT THE INFORMATION CONTAINED HEREIN IS COMPLETE AND ACCURATE. .

Authorized Signature of Contractor Representative

Date



PUBLIC IMPROVEMENT CONTRACT

BID BOND

Project Name: #2024-108
Intertie 2 Diversion Facility – Pump Station Expansion Project

We, R.L. Reimers Co., as "Principal,"
(Name of Principal)

and The Hanover Insurance Company, an New Hampshire Corporation,
(Name of Surety)

authorized to transact Surety business in Oregon, as "Surety," hereby jointly and severally bind ourselves, our respective heirs, executors, administrators, successors and assigns to pay unto Water Environment Services ("Obligee") the sum of (\$ 10%)

ten percent of amount bid dollars.

WHEREAS, the condition of the obligation of this bond is that Principal has submitted its proposal or bid to an agency of the Obligee in response to Obligee's procurement document (No.) for the project identified above which proposal or bid is made a part of this bond by reference, and Principal is required to furnish bid security in an amount equal to ten (10%) percent of the total amount of the bid pursuant to the procurement document.

NOW, THEREFORE, if the Obligee shall accept the bid of the Principal and the Principal shall enter into a Contract with the Obligee in accordance with the terms of such bid, and give such bond or bonds as may be specified in the bidding or Contract Documents with good and sufficient surety for the faithful performance of such Contract and for the prompt payment of labor and material furnished in the prosecution thereof, or in the event of the failure of the Principal to enter such Contract and give such bond or bonds, if the Principal shall pay to the Obligee the difference not to exceed the penalty hereof between the amount specified in said bid and such larger amount for which the Obligee may in good faith contract with another party to perform the Work covered by said bid, then this obligation shall be null and void, otherwise to remain in full force and effect.

IN WITNESS WHEREOF, we have caused this instrument to be executed and sealed by our duly authorized legal representatives this 14th day of January, 2025.

Principal: R.L. Reimers Co.

Surety: The Hanover Insurance Company

By: [Signature]
Signature Ron Reimers

By: [Signature]
By: Attorney-In-Fact

President

Todd Brem
Name

Attest: [Signature]
Corporation Secretary

13810 SW 31st Ct.
Address

Beaverton, OR 97008

City State Zip

503-260-1589 503-260-1589

Phone Fax



THE HANOVER INSURANCE COMPANY
MASSACHUSETTS BAY INSURANCE COMPANY
CITIZENS INSURANCE COMPANY OF AMERICA

POWERS OF ATTORNEY
CERTIFIED COPY

KNOW ALL MEN BY THESE PRESENTS: That THE HANOVER INSURANCE COMPANY and MASSACHUSETTS BAY INSURANCE COMPANY, both being corporations organized and existing under the laws of the State of New Hampshire, and CITIZENS INSURANCE COMPANY OF AMERICA, a corporation organized and existing under the laws of the State of Michigan, do hereby constitute and appoint

Todd Brem and/or Carol Brem

of **Beaverton, OR** and each is a true and lawful Attorney(s)-in-fact to sign, execute, seal, acknowledge and deliver for, and on its behalf, and as its act and deed any place within the United States, or, if the following line be filled in, only within the area therein designated any and all bonds, recognizances, undertakings, contracts of indemnity or other writings obligatory in the nature thereof, as follows:

Any such obligations in the United States, not to exceed Thirty Million and No/100 (\$30,000,000) in any single instance

and said companies hereby ratify and confirm all and whatsoever said Attorney(s)-in-fact may lawfully do in the premises by virtue of these presents. These appointments are made under and by authority of the following Resolution passed by the Board of Directors of said Companies which resolutions are still in effect:

"RESOLVED, That the President or any Vice President, in conjunction with any Vice President, be and they are hereby authorized and empowered to appoint Attorneys-in-fact of the Company, in its name and as its acts, to execute and acknowledge for and on its behalf as Surety any and all bonds, recognizances, contracts of indemnity, waivers of citation and all other writings obligatory in the nature thereof, with power to attach thereto the seal of the Company. Any such writings so executed by such Attorneys-in-fact shall be as binding upon the Company as if they had been duly executed and acknowledged by the regularly elected officers of the Company in their own proper persons." (Adopted October 7, 1981 - The Hanover Insurance Company; Adopted April 14, 1982 - Massachusetts Bay Insurance Company; Adopted September 7, 2001 - Citizens Insurance Company of America)

IN WITNESS WHEREOF, THE HANOVER INSURANCE COMPANY, MASSACHUSETTS BAY INSURANCE COMPANY and CITIZENS INSURANCE COMPANY OF AMERICA have caused these presents to be sealed with their respective corporate seals, duly attested by two Vice Presidents, this **6th** day of **September 2013**.



THE HANOVER INSURANCE COMPANY
MASSACHUSETTS BAY INSURANCE COMPANY
CITIZENS INSURANCE COMPANY OF AMERICA

Robert Thomas
Robert Thomas, Vice President

Joe Brenstrom
Joe Brenstrom, Vice President

THE COMMONWEALTH OF MASSACHUSETTS)
COUNTY OF WORCESTER) ss.

On this **6th** day of **September 2013** before me came the above named Vice Presidents of The Hanover Insurance Company, Massachusetts Bay Insurance Company and Citizens Insurance Company of America, to me personally known to be the individuals and officers described herein, and acknowledged that the seals affixed to the preceding instrument are the corporate seals of The Hanover Insurance Company, Massachusetts Bay Insurance Company and Citizens Insurance Company of America, respectively, and that the said corporate seals and their signatures as officers were duly affixed and subscribed to said instrument by the authority and direction of said Corporations.



BARBARA A. GARLICK
Notary Public
Commonwealth of Massachusetts
My Commission Expires Sept. 21, 2018

Barbara A. Garlick
Barbara A. Garlick, Notary Public
My Commission Expires September 21, 2018

I, the undersigned Vice President of The Hanover Insurance Company, Massachusetts Bay Insurance Company and Citizens Insurance Company of America, hereby certify that the above and foregoing is a full, true and correct copy of the Original Power of Attorney issued by said Companies, and do hereby further certify that the said Powers of Attorney are still in force and effect.

This Certificate may be signed by facsimile under and by authority of the following resolution of the Board of Directors of The Hanover Insurance Company, Massachusetts Bay Insurance Company and Citizens Insurance Company of America.

"RESOLVED, That any and all Powers of Attorney and Certified Copies of such Powers of Attorney and certification in respect thereto, granted and executed by the President or any Vice President in conjunction with any Vice President of the Company, shall be binding on the Company to the same extent as if all signatures therein were manually affixed, even though one or more of any such signatures thereon may be facsimile." (Adopted October 7, 1981 - The Hanover Insurance Company; Adopted April 14, 1982 - Massachusetts Bay Insurance Company; Adopted September 7, 2001 - Citizens Insurance Company of America)

GIVEN under my hand and the seals of said Companies, at Worcester, Massachusetts, this 14th day of January 2025.

THE HANOVER INSURANCE COMPANY
MASSACHUSETTS BAY INSURANCE COMPANY
CITIZENS INSURANCE COMPANY OF AMERICA

J. Michael Pete
J. Michael Pete, Vice President



CLACKAMAS COUNTY
PUBLIC IMPROVEMENT CONTRACT

BID FORM

PROJECT: #2024-108 Intertie 2 Diversion Facility – Pump Station Expansion Project
BID CLOSING: December 19, 2024, 2:00 PM, Pacific Time
BID OPENING: December 19, 2024, 2:05 PM, Pacific Time

FROM: R.L. Reimers Company
Bidder's Name (must be full legal name, not ABN/DBA)

TO: <https://bidlocker.us/a/clackamascounty/BidLocker>

1. Bidder is (check one of the following and insert information requested):

- a. An individual; or
- b. A partnership registered under the laws of the State of _____; or
- c. A corporation organized under the laws of the State of Oregon; or
- d. A limited liability corporation organized under the laws of the State of _____;

and authorized to do business in the State of Oregon hereby proposes to furnish all material and labor and perform all work hereinafter indicated for the above project in strict accordance with the Contract Documents on a unit price basis (as defined in Specification Section 01 22 20 Unit Price Measurement and Payment) for the total base bid price of:

Eight million, one hundred and seventy eight thousand, seven hundred and seventy five dollars and no cents Dollars (\$ 8,178,775.00)

and the Undersigned agrees to be bound by the following documents:

- Notice of Public Improvement Contract Opportunity
- Instructions to Bidders
- Bid Bond
- Public Improvement Contract Form
- General Conditions
- Prevailing Wage Rates
- Plans, Specifications and Drawings
- Supplemental Instructions to Bidders
- Bid Form
- Performance Bond and Payment Bond
- Supplemental General Conditions
- Payroll and Certified Statement Form

• ADDENDA numbered 1 through 5, inclusive (fill in blanks)

2. Where work is required but does not appear as a separate item in the proposal, the cost for that work shall be included and absorbed in the unit prices named in the proposal. Any adjustments in the Contract amount will be made in accordance with the General Conditions. Estimated Quantities include:

General Items					
Item No.	Description	Estimated Quantity	Unit	Bid Unit Price	Total Bid Amount
1	Mobilization, Bonds, Insurance and Demobilization	1	LS	520,000.00	520,000.00
2	Intertie 2 Pump Station Upgrades, Complete	1	LS	4,545,500.00	4,545,500.00
3	Wet Well Baffle, Complete-Allowance	1	LS	20,000.00	20,000.00
4	Diversion Structure Upgrades, Complete	1	LS	1,384,725.00	1,384,725.00
5	Upgrades at Tri-City WRRF	1	LS	706,850.00	706,850.00
6	Temporary Bypass Pumping Phase 1-Pump Station Shutdown and Bypass				
	<i>a. General Bid Item</i>	1	LS	95,150.00	95,150.00
	<i>b. Operation of Bypass System</i>	31	DAY	3,900.00	120,900.00
7	Temporary Bypass Pumping Phase 2-Diversion Structure Bypass				
	<i>a. General Bid Item</i>	1	LS	119,925.00	119,925.00
	<i>b. Operation of Bypass System Phase 2A-Gravity Sewer and 96" Manhole</i>	21	DAY	3,575.00	75,075.00
	<i>c. Operation of Bypass System Phase 2B-Diversin Structure</i>	41	DAY	4,900.00	200,900.00
8	Temporary Bypass Pumping Phase 3-Pump Station Shutdown				
	<i>a. General Bid Item</i>	1	LS	89,350.00	89,350.00
	<i>b. Operation of Bypass System</i>	60	DAY	3,425.00	205,500.00
9	Temporary Bypass Pumping Phase 4-Standy Pumps During IT2 Diversion Facilities Operational Testing and Commissioning				
	<i>a. General Bid Item</i>	1	LS	47,775.00	47,775.00
	<i>b. Standby Bypass System</i>	25	DAY	1,200.00	30,000.00
	<i>c. Operation of Bypass System</i>	5	DAY	3,425.00	17,125.00
All Items - Total					\$8,178,775.00

The Undersigned acknowledges that:

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 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.

3. Total Base Bid Price (Lump Sum and Unit Prices):

Base Bid Summary: Enter Amount from Previous Total

Total of All Unit Price Bid Items 1-9	\$ 8,178,775.00
---------------------------------------	-----------------

TOTAL BASE BID PRICE (TOTAL OF ALL LUMP SUM AND UNIT PRICE BIDS):

Eight million, one hundred and seventy eight thousand, seven
hundred and seventy five dollars and no cents

Dollars (\$ 8,178,775.00)

4. The successful 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. The Bidder accepts the provisions of the Agreement as to liquidated damages.

5. Accompanying herewith is Bid Security which is equal to ten percent (10%) of the total amount of the Basic Bid, plus the total sum of all Alternatives (if any).

6. The Undersigned agrees, if awarded the Contract, to execute and deliver to Clackamas County, within twenty (20) calendar days after receiving the Contract forms, a Contract Form, and a satisfactory Performance Bond and Payment Bond each in an amount equal to one hundred percent (100%) of the Contract sum, using forms provided by the Owner. The surety requested to issue the Performance Bond and Payment Bond will be:

The Hanover Insurance Company
(name of surety company - not insurance agency)

The Undersigned hereby authorizes said surety company to disclose any information to the Owner concerning the Undersigned's ability to supply a Performance Bond and Payment Bond each in the amount of the Contract.

7. The Undersigned further agrees that the Bid Security accompanying the Bid is left in escrow with Clackamas County; that the amount thereof is the measure of liquidated damages which the Owner will sustain by the failure of the Undersigned to execute and deliver the above-named Contract Form, Performance Bond and Payment Bond, each as published, and that if the Undersigned defaults in either executing the Contract Form or providing the Performance Bond and Payment Bond within twenty (20) calendar days after receiving the Contract forms, then the Bid Security shall become the property of the Owner at the Owner's option; but if the Bid is not accepted within thirty (30) calendar days of the time set for the opening of the Bids, or if the Undersigned executes and timely delivers said Contract Form, Performance Bond and Payment Bond, the Bid Security shall be returned.

8. The Undersigned certifies that: (i) This Bid has been arrived at independently and is being submitted without collusion with and without any agreement, understanding, or planned common course of action with any other vendor of materials, supplies, equipment or services described in the invitation to bid designed to limit independent bidding or competition; and (ii) the contents of the Bid have not been communicated by the Undersigned or its employees or agents to any person not an employee or agent of the Undersigned or its surety on any Bond furnished with the Bid and will not be communicated to such person prior to the official opening of the Bid.

9. The undersigned HAS, HAS NOT (*check one*) paid unemployment or income taxes in Oregon within the past 12 months and DOES, DOES NOT (*check one*) a business address in Oregon. The undersigned acknowledges that, if the selected bidder, that the undersigned will have to pay all applicable taxes and register to do business in the State of Oregon before executing the Contract Form.

10. The Undersigned agrees, if awarded a contract, to comply with the provisions of ORS 279C.800 through 279C.870 pertaining to the payment of the prevailing rates of wage.

11. Contractor's CCB registration number is 60891. As a condition to submitting a bid, a Contractor must be registered with the Oregon Construction Contractors Board in accordance with ORS 701.035 to 701.055, and disclose the registration number. Failure to register and disclose the number will make the bid unresponsive and it will be rejected, unless contrary to federal law.

12. The successful Bidder hereby certifies that all subcontractors who will perform construction work as described in ORS 701.005(2) were registered with the Construction Contractors Board in accordance with ORS 701.035 to 701.055 at the time the subcontractor(s) made a bid to work under the contract.

13. The successful Bidder hereby certifies that, in compliance with the Worker's Compensation Law of the State of Oregon, its Worker's Compensation Insurance provider is SAIF, Policy No. 812835, and that Contractor shall submit Certificates of Insurance as required.

14. Contractor's Key Individuals for this project (supply information as applicable):

Project Executive: Ross Meyer, Cell Phone: 971-304-5661,
Project Manager: Ross Meyer, Cell Phone: 971-304-5661,
Job Superintendent: Phil Chadsey, Cell Phone: 503-871-1913,
Project Engineer: Brandon Hageman, Cell Phone: 541-223-2055.

15. The Undersigned certifies that it has not discriminated against minority, women, or emerging small businesses in obtaining any subcontracts for this project.

16. The Undersigned certifies that it has a drug testing program in accordance with ORS 279C.505.

REMINDER: Bidder must submit the below First-Tier Subcontractor Disclosure Form.

By signature below, Contractor agrees to be bound by this Bid.

NAME OF FIRM R.L. Reimers Company
ADDRESS 3939 Old Salem Rd, Suite 200
Albany, OR 97321
TELEPHONE NO 541-926-7766
EMAIL ross@rlreimers.com
SIGNATURE 1) _____
Sole Individual
or 2) _____
Partner

or 3) RW - Ronald Reimers
Authorized Officer or Employee of Corporation
***** **END OF BID** *****



INVITATION TO BID #2024-108
Intertic 2 Diversion Facility – Pump Station Expansion Project
ADDENDUM NUMBER 1
December 10, 2024

On November 26, 2024, Clackamas County (“County”) published Invitation to Bid #2024-108 (“BID”). The County has found that it is in its interest to amend the BID through the issuance of this Addendum #1. Except as expressly amended below, all other terms and conditions of the original BID and subsequent Addenda shall remain unchanged.

1. The Bid Due date is hereby changed from December 19, 2024 at 2PM to **January 9, 2025 at 2PM.**

End of Addendum



INVITATION TO BID #2024-108
Intertie 2 Diversion Facility – Pump Station Expansion
Project (“BID”) ADDENDUM #2
December 19, 2024

On November 26, 2024, Clackamas County (“County”) published Invitation to Bid #2024-108 (“BID”). The County has found that it is in the interest to amend the BID through the issuance of this Addendum #2. Except as expressly amended below, all other terms and conditions of the original BID shall remain unchanged.

1. Section B-11: Volume 1 - Drawings

- a. Sheet C-120:
 - i. **Replace** the note pointing to the existing shed reading “REMOVE SHED AS REQ'D FOR CONSTRUCTION, REPLACE WHEN WORK IS COMPLETE” **with** “MOVE WOODEN SHED AS REQ'D FOR CONSTRUCTION, MOVE SHED BACK TO EXISTING LOCATION AND IN SAME CONDITION WHEN WORK IS COMPLETE. COORDINATE WITH SHED OWNER (MCFARLANE’S BARK INC) PRIOR TO MOVING SHED.”
- b. Sheet D-001:
 - i. **Replace** with the attached sheet.
- c. Sheet D-502:
 - i. **Replace** with the attached sheet.

2. Section B-11: Volume 2 - Technical Specifications

- a. Section 01 57 19.11 Temporary Sewage Control and Bypass Pumping
 - i. In paragraph 2.1B, **remove** the word “two” from the last sentence.
 - ii. **Add** paragraph 2.1B.3. “Electric pump powered by a metered temporary electric service connection, approved by the power utility. If this option is utilized, the backup pump must be operated by a separate power/fuel source as outlined in items 1 or 2, above.”
- b. Section 09 90 00 – Painting and Coating:
 - i. **Add** to Part 2:

“2.4 Architectural Coating Systems

A. General

"Paint" as used herein means all coating systems materials, including primers, emulsions, enamels, stains, sealers and fillers, and other applied materials whether used as prime, intermediate or topcoat.

Fungus Control: Submit evidence for all paints attesting the passing of Federal Test Method Standard No. 141, Method 6271.1 showing no fungus growth or other approved test results.

Apply to surfaces under recommended environmental conditions and within the limitations established by the material manufacturer.

Acrylics require 60 degrees Fahrenheit (°F) and above temperature and below 50 percent relative humidity. Apply water-base paints only when the temperature of surfaces to be painted and the surrounding air temperatures are between 50°F and 90°F unless otherwise permitted by the paint manufacturer's printed instructions.

1. Paint System 305

Location -- Exterior brick or concrete surfaces.

Surface Preparation -- Surfaces shall be cleaned with a manufacturers approved chemical cleaner and power washed. Surfaces shall be completely dry, free from efflorescence, oils, paint and other contaminants before the coating system is applied. Coating system shall be applied according to the manufacturers published recommendations. A manufacturer’s representative shall be present during application of the coating system, if required by the manufacturer’s warranty.

Coating System -- Apply two coats of masonry water retardant material. The system shall be clear, non-staining, silane-modified-siloxane, Fabrishield 161, Rainstopper 1500, or equal. The selected coating system shall provide a minimum of a five-year manufacturer’s warranty.”

ii. **Add** the following items to the coating schedule in section 3.8:

Item	Location	Material	Coating System
Valves & Couplings	All	--	See note 2
Piping and fittings	Exposed and in vaults (exterior surface)	Steel	Lining per specification Section 40 05 13, coating per system 101
Slide gate	Diversion structure	Per specification Section 40 05 59.21	Per specification Section 40 05 59.21
Exterior concrete slabs	All	Concrete	System 305

iii. **Replace** note 2 in the coating schedule in section 3.8 with “2. Coating of exposed valves and couplings to be shop-applied coating as required by

valve specification. Finish coat shall be same coating system as adjacent piping to match in color, unless otherwise directed by the ENGINEER.

c. Section 40 05 13 – Common Work Results for Process Piping

i. **Replace** section 2.6 “STEEL PIPE AND FITTINGS” with the following:

A. Pump Station Exposed Welded Steel Pipe:

1. Conform to current provisions of AWWA C200.
2. Material:
 - A. ASTM A53, seamless, Grade B.
 - B. Or ASTM A36 steel plate.
3. Pipe Thickness: 3/8”, unless indicated otherwise on Drawings.
4. Provide weldolets or threadolets, as applicable, for taps where shown or where required for testing.
5. Pipe shall be shop-fabricated to the extent possible. Any field welding shall conform to current AWWA C206 provisions.
 - A. Field welds, if necessary, shall be lap-welded slip joint, welded inside and outside, double weld joint, or but strap joint.
 - B. All coatings shall be repaired per coating manufacturer requirements.
6. All shop fabricated piping shall be inspected by the Owner’s Representative and pressure tested at the shop prior to pipe lining and coating applications.

ii. Exposed Welded Steel Fittings:

1. Forged steel conforming to ANSI B16.9 and ASTM A234, Grade B.
2. Mitered fittings will only be permitted where shown on plans.
 - A. Dimensions as provided in AWWA C208.
3. Schedule or wall thickness to match the pipe wall thickness.

iii. Steel Flanges

1. Flanges shall conform to the requirements of AWWA C207 Class D or ANSI B16.5 150-lb class.

2. Flanges shall be welding neck or slip-on forged steel conforming to ANSI B1635 and ASTM A181, Grade 1, flat faced, as adjacent pipe and fittings may dictate.
3. Slip-on flanges shall not be used adjacent to forged fittings unless the fitting is the long-tangent type.
4. Flanges shall be attached with bolt holes straddling the vertical axis unless otherwise shown.
5. Provide bolt torque sequencing per AWWA C604.
6. Drilling - For flanges at insulating flange assemblies, provide bolt holes overdrilled by an additional 1/8 inch to accommodate insulating sleeves or to facilitate alignment with the mating flange.

iv. Gaskets:

1. Shall be Nitrile (NBR) Style 9122 or SBR as manufactured by Garlock or SBR Style 32, as manufactured by Garlock, or approved equal.
2. See section 2.12 of this specification for information on insulating gaskets.

v. Bolts and Nuts:

1. Bolts shall be ASTM A193 grade B7 or ASTM A563 Grade B with ASTM A194 grade 2H heavy hex nuts.
2. Square or hexagonal heads according to ANSI B18.2.1.
3. In plate and above grade piping, fittings and valves shall be provided with nuts and bolts hot dip galvanized per ASTM F2329.

vi. Steel Pipe and Fittings Surface Preparation:

1. Interior of welded steel pipe and fittings shall be given a white-metal blast cleaning conforming to SSPC-SP5 by the pipe manufacturer.
2. Exterior of "wet" exposure piping shall be prepared per SSPC-SP5, white metal blast.
3. Exterior of "dry" exposure piping shall be prepared per SSPC-SP10, near white metal blast.
4. Exterior coating and interior lining to be as described below.

vii. Steel Pipe and Fittings Protective Coatings:

1. Lining:
 - A. Fusion-Bonded lined per AWWA C213 or
 - B. Liquid epoxy lined per AWWA C210
 2. Coating shall be per Section 09 90 00-Painting and Coating
- viii. **Add** section 2.18 to part 2:
 “2.18 Pig Launch Assembly
1. Pig launch assembly as shown in the Plans shall be fabricated from steel pipe as specified in section 2.6 of this specification.
 2. Trap barrel shall be 36-inch diameter.
 3. Fabricated connections include one 1-inch NPT female threaded tap, one 2-inch NPT female threaded tap, and a 6-inch flange pressure inlet as shown on the plans.
 4. Flange connections shall meet ANSI 150 lbs standards.
 5. Provide tool-less closure with handle.
 6. Provide coating and lining as specified in Section 2.6 of this specification.
 7. Assembly as manufactured or fabricated by Flowmore Services, Jamison Products, or approved equal.”
- d. Section 40 05 51.15 – Gate Valves:
- i. **Add** “or AWWA C515” to the end of paragraph 2.2A.1.
- e. Section 40 05 51.21 – Plug Valves:
- i. In paragraph 2.1B.3, **replace** “Round” with “Rectangular”.
 - ii. In paragraph 2.1C.1, **replace** “3” with “6”.
 - iii. **Replace** paragraph 2.1D.4 with “Seats: Seats shall be 1/8” thick welded overlay of not less than 95% pure nickel. Seat shall be at least ½” wide, 1/8” thick through entire width and raised. The raised surface shall be completely covered with nickel to ensure that the resilient plug face contacts only the nickel seat.”
 - iv. **Replace** paragraph 2.1E with “Finishes: Epoxy lining and coating conforming to AWWA C550”
- f. Section 40 05 51.24 – Check Valves:
- i. In paragraph 2.2A.5, **replace** “300” with “150”.
 - ii. **Insert** a paragraph after 2.2B, reading “Finishes: Epoxy lining and coating conforming to AWWA C550.”

- iii. **Add** “VSI series CVI” to the list of manufacturers in paragraph 2.2C
- g. Supplementary Information:
 - i. **Add** the attached item J – Existing Slide Gate Submittal to the supplementary information.

End of Addendum #2

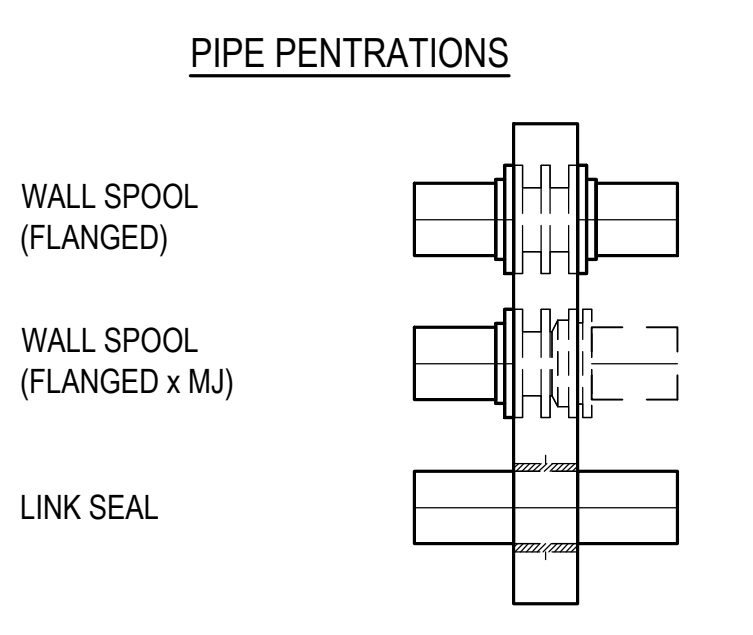
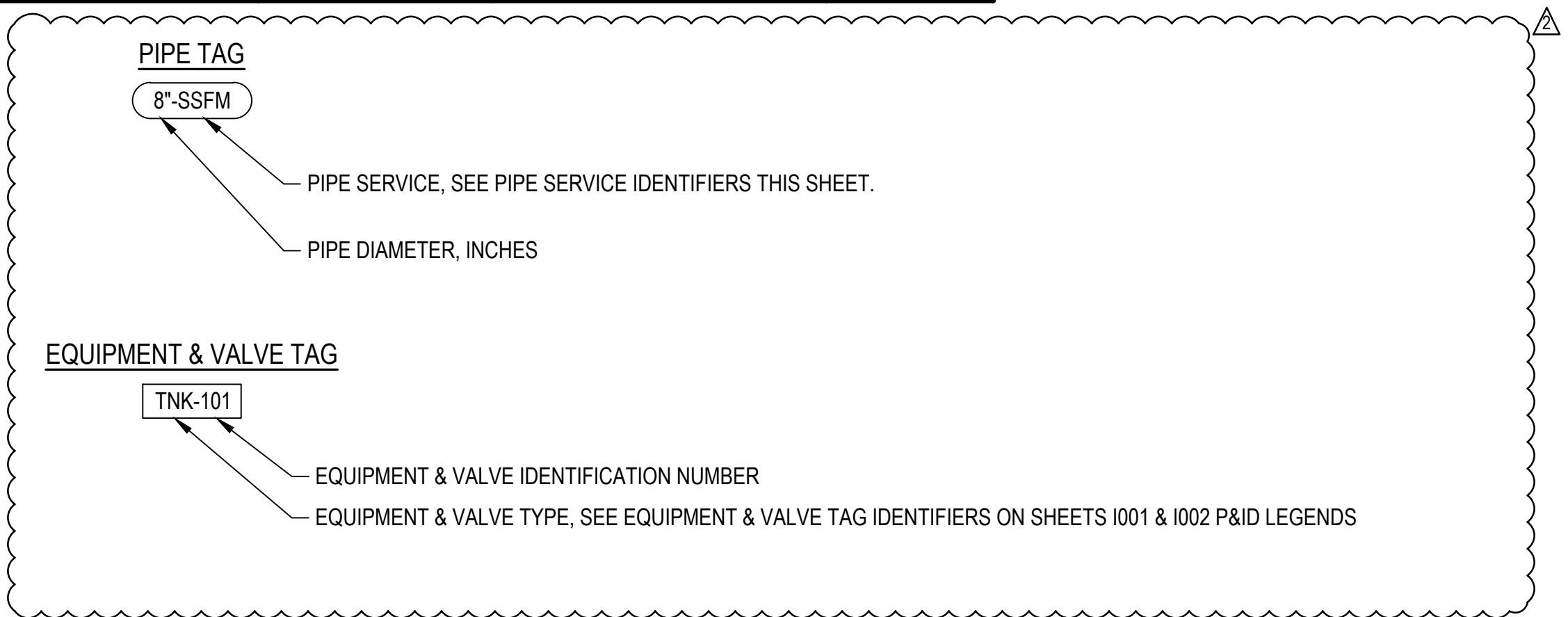
1		2		3				4				5				6		7
PIPE SYMBOLS		PIPE FITTINGS		VALVE SYMBOLS				VALVE SYMBOLS				GENERIC PIPING NOTES:		SPACE RESERVED FOR CLACKAMAS COUNTY APPROVAL STAMP				
DESCRIPTION	SYMBOL	DESCRIPTION	SYMBOL	DESCRIPTION	PLAN	SECTION	SINGLE LINE	DESCRIPTION	PLAN	SECTION	SINGLE LINE							
PROPOSED		90° ELBOW		BALL VALVE				PRESSURE REDUCING VALVE (STRAIGHT)				<p>1. LAY PIPE TO UNIFORM GRADE BETWEEN INDICATED ELEVATION POINTS.</p> <p>2. SIZE OF FITTINGS SHOWN ON DRAWINGS SHALL CORRESPOND TO ADJACENT STRAIGHT RUN OF PIPE, UNLESS OTHERWISE INDICATED. TYPE OF JOINT AND FITTING MATERIAL SHALL BE THE SAME AS SHOWN FOR ADJACENT STRAIGHT RUN OF PIPE.</p> <p>3. LOCATION AND NUMBER OF PIPE HANGERS AND PIPE SUPPORTS SHOWN IS ONLY APPROXIMATE. CONTRACTOR SHALL DESIGN SUPPORTS AS SPECIFIED.</p> <p>4. ALL JOINTS SHALL BE WATERTIGHT. WALL PIPES SHALL BE USED WHEREVER PIPING PASSES FROM A STRUCTURE TO A BACKFILL.</p> <p>5. ALL FLEXIBLE CONNECTORS AND COUPLING ADAPTERS SHALL BE PROVIDED WITH THRUST PROTECTION AS SPECIFIED, UNLESS OTHERWISE NOTED. THRUST PROTECTION SHALL BE ADEQUATE FOR TEST PRESSURES SPECIFIED.</p> <p>6. SYMBOLS, LEGENDS AND PIPE USE IDENTIFICATIONS SHOWN SHALL BE FOLLOWED THROUGHOUT THE DRAWINGS, WHEREVER APPLICABLE. NOT ALL OF THE VARIOUS COMPONENTS ARE NECESSARILY USED IN THE PROJECT.</p> <p>7. ALL BURIED PIPING SPECIFIED TO BE PRESSURE TESTED, EXCEPT FLANGED, WELDED OR SCREWED PIPING, SHALL BE PROVIDED WITH THRUST PROTECTION AS SPECIFIED, UNLESS OTHERWISE NOTED.</p> <p>8. NUMBER AND LOCATION OF UNIONS SHOWN ON DRAWINGS IS ONLY APPROXIMATE. PROVIDE ALL UNIONS NECESSARY TO FACILITATE CONVENIENT REMOVAL OF VALVES AND MECHANICAL EQUIPMENT.</p> <p>9. WHERE A GROOVED END COUPLING IS SHOWN, IT SHALL BE THE RIGID JOINT TYPE, UNLESS OTHERWISE SPECIFIED. WHERE A FLANGED COUPLING ADAPTER IS SHOWN, A STANDARD FLANGE SHALL BE JOINED TO THE COUPLING ADAPTER.</p>						
HIDDEN		45° ELBOW		BUTTERFLY VALVE				PRESSURE REDUCING VALVE (ANGLED)										
BELOW GRADE		22.5° ELBOW		BUTTERFLY VALVE (WAFER / LUGGED)				BACK PRESSURE REGULATOR VALVE (STRAIGHT)										
EXISTING		11.25° ELBOW		CHECK VALVE (SWING)				PRESSURE GAUGE										
EXISTING HIDDEN		BASE ELBOW		CHECK VALVE (BALL)				AIR VALVE (COMBINATION)										
DEMOLISH		TEE		DIAPHRAGM VALVE				AIR VALVE (AIR RELEASE)										
FUTURE		CROSS		GATE VALVE				AIR VALVE (AIR/VACUUM)										
CENTERLINE		LATERAL		GLOBE VALVE				FLOW METER										
PIPE CUT		REDUCER (CONCENTRIC)		KNIFE GATE VALVE														
PIPE BREAK		REDUCER (ECCENTRIC)		PINCH VALVE														
PIPE BREAK (SINGLE LINE)		REDUCING 90° ELBOW		PLUG VALVE														
PIPE JOINTS																		
DESCRIPTION	SYMBOL																	
FLANGED		EXPANSION JOINT (RESTRAINED)																
MECHANICAL JOINT		EXPANSION JOINT (UNRESTRAINED)																
GROOVED		DISMANTLING JOINT																
PVC		FLANGE COUPLING ADAPTER (FCA)																
STEEL		RESTRAINED FLANGE COUPLING ADAPTER (RFCA)																
PUSH-ON		FLANGED x FLARED																
TAP																		
SERVICE SADDLE																		

PIPE SERVICE DESIGNATION:
SEE PIPE MATERIAL SCHEDULE BELOW FOR MATERIALS THAT CORRESPOND TO PIPE SERVICES

DR DRAIN TO SANITARY
SD STORM DRAIN
SS SANITARY SEWER (GRAVITY)
SSFM SANITARY SEWER FORCE MAIN (PRESSURE)

PIPE MATERIAL SCHEDULE:

SD / DR PVC D3034
SS VARIES, AS NOTED ON THE PLANS
SSFM DI CLASS PER SPECS

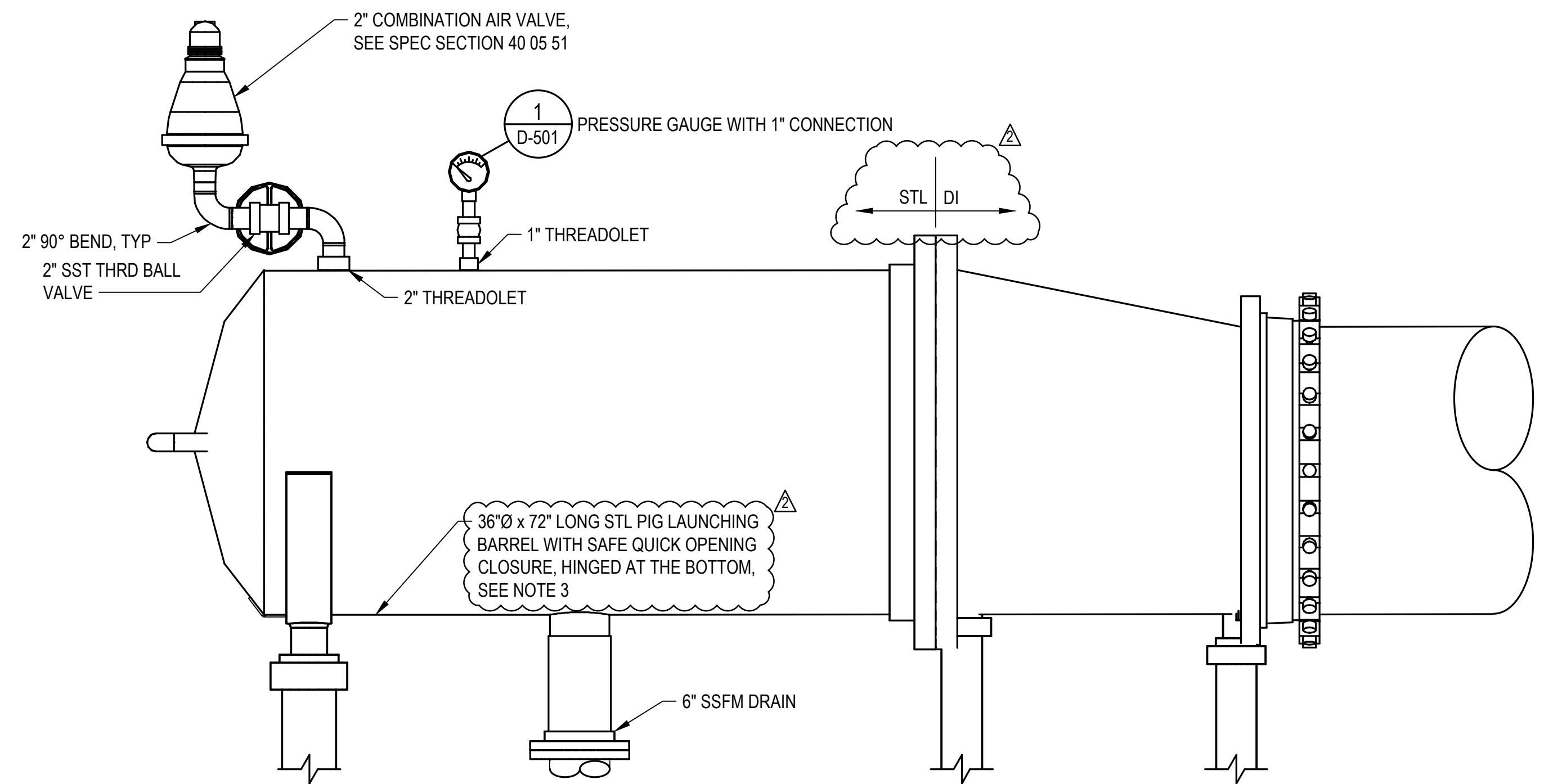


GENERAL NOTES:

1. THIS IS A STANDARD LEGEND, NOT ALL OF THE INFORMATION MAY BE USED ON THIS PROJECT.

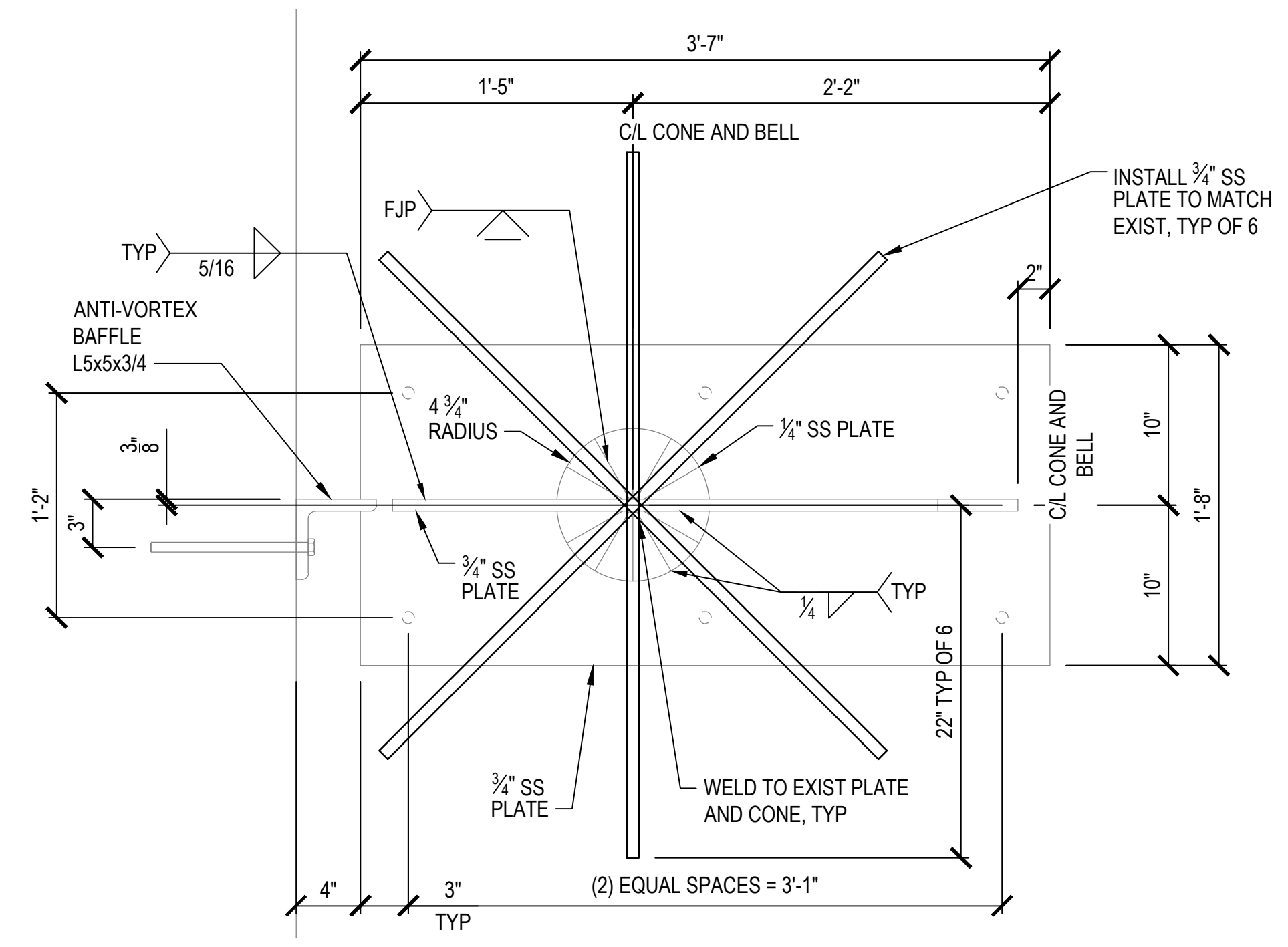
2. ONLY FLANGED END CONNECTIONS ARE SHOWN HERE. OTHER FITTING PATTERNS ARE SHOWN SIMILARLY ON THE CONSTRUCTION DRAWINGS. ALSO SEE PIPING SPECIFICATIONS.

<p>This document, ideas, and designs incorporated herein, are an instrument of professional service, and is not to be used, in whole or in part, for any other project without the written authorization of CONSOR.</p>	Sub Consultant:	Revisions:		Client / Owner: 	Project Title: WATER ENVIRONMENT SERVICES INTERTIE 2 DIVERSION FACILITY - PUMP STATION EXPANSION PROJECT	Designed By: FC Drawn By: JLC Checked By: EPK Approved By: MLC	Consor Project No.: W223440OR Issued On: OCTOBER 2024 Sheet: D-001			
		<table border="1"> <thead> <tr> <th>No.</th> <th>Date</th> <th>By</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>12/18/2024</td> <td>EPK</td> <td>ADDENDUM NO.2</td> </tr> </tbody> </table>						No.	Date	By
No.	Date	By	Description							
1	12/18/2024	EPK	ADDENDUM NO.2							

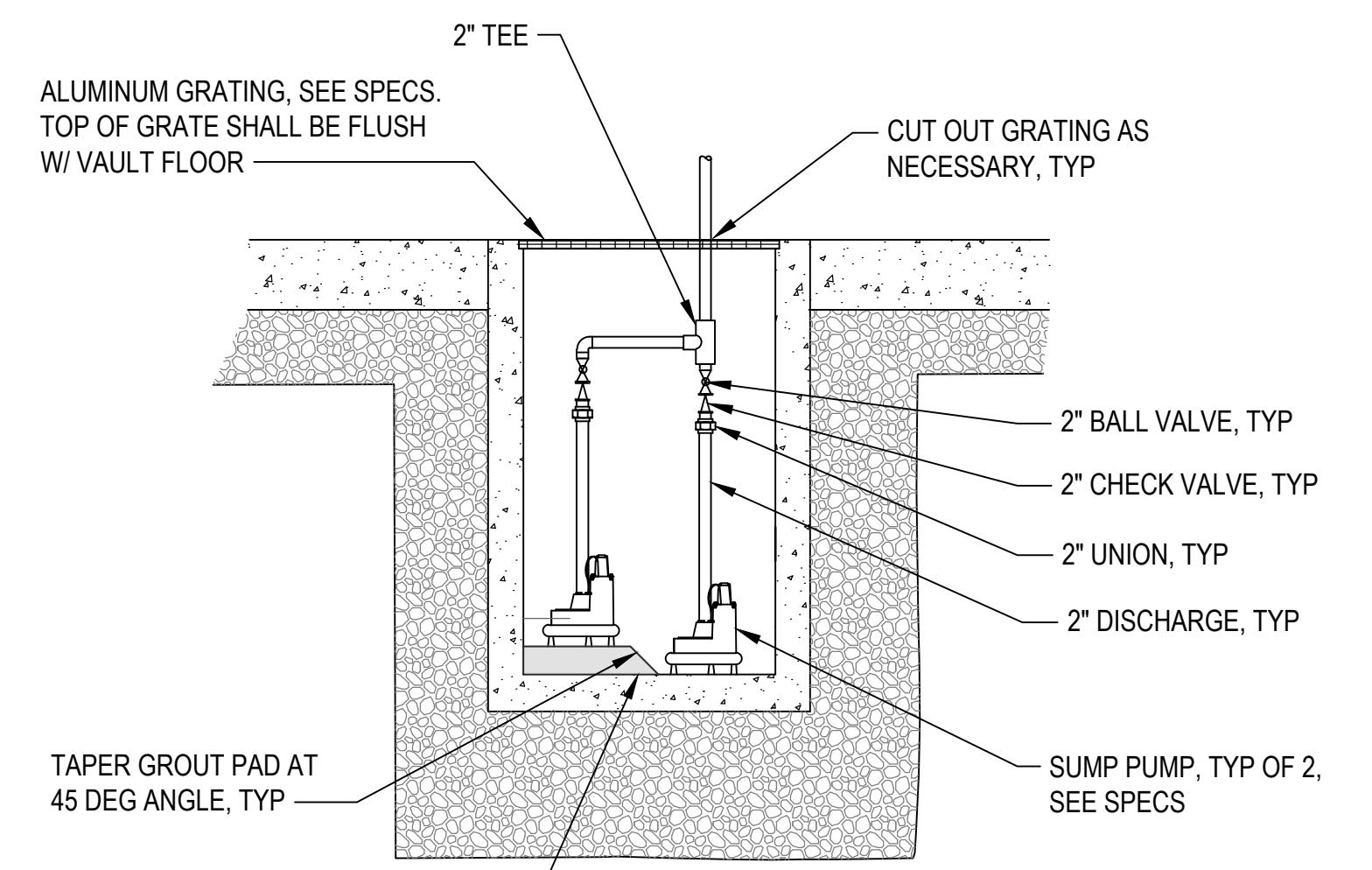


1 PIGGING PORT DETAIL
SCALE: NTS

- NOTES:**
1. INSTALL NIPPLES AS NEEDED
 2. AIR VALVE AND PIGGING PORT PIPING ASSEMBLIES AT PIGGING PORT SHALL BE STAINLESS STEEL
 3. PIG LAUNCHING BARREL TO BE FABRICATED STEEL, SEE SPECIFICATION SECTION 40 05 13

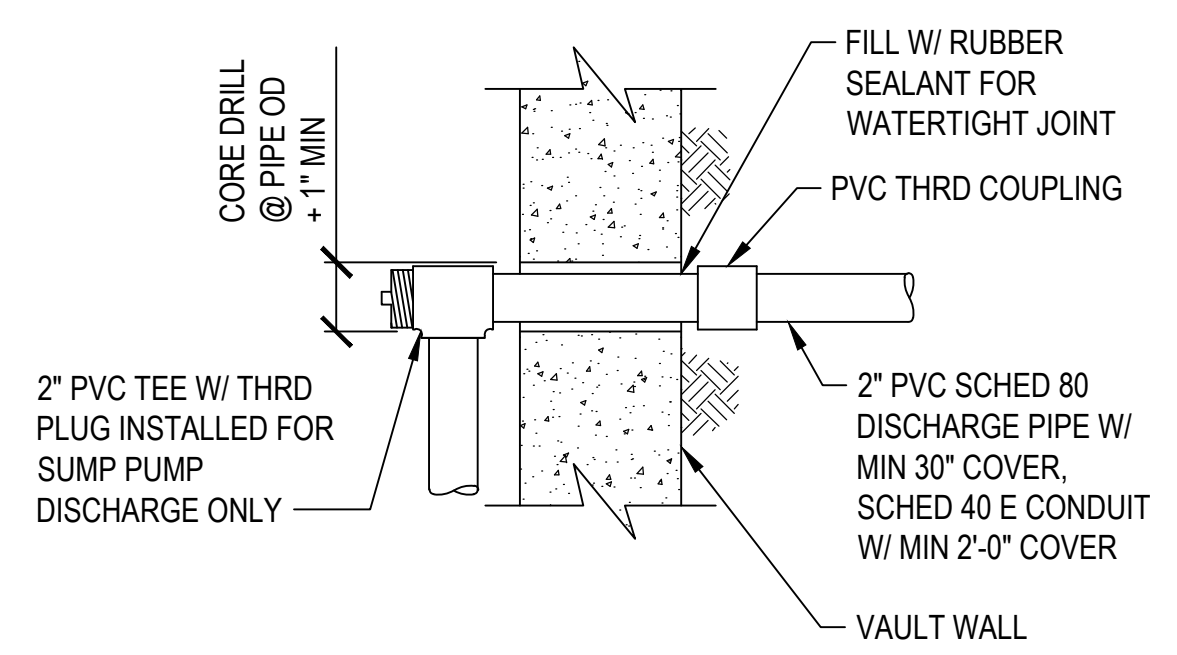


2 INLET CONE DETAIL
SCALE: NTS



3 VAULT SUMP PUMP DETAIL
SCALE: NTS

- NOTES:**
1. SUMP DISCHARGE PIPE TO BE PVC SCHEDULE 40 PIPE UNLESS OTHERWISE NOTED.
 2. SEE ELECTRICAL SHEETS FOR POWER AND SIGNAL INFORMATION.



4 SUMP PIPING WALL PENETRATION
SCALE: NTS

- NOTES:**
1. SUMP DISCHARGE PIPE TO BE PVC SCHEDULE 40 PIPE, UNLESS OTHERWISE NOTED.

SPACE RESERVED FOR
CLACKAMAS COUNTY
APPROVAL STAMP



This document, ideas, and designs incorporated herein, are an instrument of professional service, and is not to be used, in whole or in part, for any other project without the written authorization of CONSOR.

Consultant: **consor**

Sub Consultant:

Revisions:			
No.	Date	By	Description
1	10/25/2024	EPK	UPDATE FOR BID SET
2	12/18/2024	EPK	ADDENDUM NO.2

Engineer's Seal:	
	Client / Owner:

Project Title:

**WATER ENVIRONMENT SERVICES
INTERTIE 2 DIVERSION FACILITY -
PUMP STATION EXPANSION
PROJECT**

Designed By: **FC**

Drawn By: **JLC**

Checked By: **EPK**

Approved By: **MLC**

Process:

PROCESS

DETAILS - 2

Consor Project No.: **W223440OR**

Issued On: **OCTOBER 2024**

Sheet: **D-502**

Scale: **0 1/2 1** IF BAR DOES NOT MEASURE 1" DRAWING IS NOT TO SCALE

J – EXISTING SLIDE GATE SUBMITTAL

TRANSMITTAL OF CONTRACTOR'S SUBMITTAL

PROJECT:

CCSD #1 Intertie #2 Diversion Project A – P111895
Diversion Structure, Diversion Pipeline

GC Submittal No: 105 REV.NO: 0

WES Submittal No: I2PS - 105 REV.NO: 0

Spec Section No: 15115

(COVER ONLY ONE SECTION WITH EACH SUBMITTAL TRANSMITTAL)

CONTRACTOR: McClure and Sons, Inc.

15714 Country Club Drive, Mill Creek, WA 98012

TRANSMITTAL RECORD	DATE SENT	DATE REC'D	DATE REQ'D
Contractor to WES	2/15/2012	2/15/2012	
WES to Design Engineer	2/15/2012	2/15/2012	
Design Engineer to WES	3/02/2012	3/02/2012	
WES to Contractor	3/02/2012		3/01/2012

THE FOLLOWING ITEMS ARE HEREBY SUBMITTED FOR YOUR REVIEW AND ACTION:

LEGEND: **A)** Approved as Submitted **B)** Approved as Noted **C)** Disapproved Revise & Resubmit **D)** Rejected Incomplete Resubmit **E)** Eng Review Not Req'd

Item NO.	QTY	Spec Section & Para	DESCRIPTION	(A)	(B)	(C)	(D)	(E)
1	Elec.	15115	O&M draft, Water Control Gates			X		
2								
3								
4								
5								
6								
7								

Remarks:

Response:

HDR Comments:

1. No comments.

WES Comments:

1. Equipment Summary Sheet is not dated by signee.
2. Equipment Summary Sheet – Label each “Equipment Number” with 401 – Diversion Structure (drawing #1412684-01), 402 – Pump Station (drawing #1412684-02)
3. Insert Equipment Summary Form into electronic copy Section 1.
4. Remove Maintenance Summary Form in Section 1, and put in Section 3. NOTE: Question the need for Item #6 Maintenance Requirements & #7 Lubricant List (on these pages) appears to be “templates” because they are already provided under Category 3 (page 12-13) with details listed.

Date: **03/02/2012**

Response By: **Sean Willows, URS**

CONTRACTOR'S CERTIFICATION:

CHECK ONE OF THE FOLLOWING:

- Submittal contains no deviations to requirements specified or shown.
- Submittal contains deviations to requirements specified or shown as noted and justified in the letter attached to this transmittal sheet.

Contractor hereby certifies that (I) Contractor has complied with the

Corrections or comments made on contractor's shop drawings during this review do not relieve the contractor from compliance with contract drawings and specifications. This submittal has been reviewed for conformance with the design concept and general compliance with the contract documents only. Contractor is responsible for confirming and correlating all quantities and dimensions; fabrication processes and techniques; coordinating work with



TRANSMITTAL OF CONTRACTOR'S SUBMITTAL

requirements of Contract Documents in preparation, review, and submission of designated Submittal and (ii) the Submittal is complete and in accordance with the Contract Documents and requirements of laws and regulations and governing agencies.

Submitted By: Joe Aal
McClure and Sons, Inc.

other trades; and satisfactory and safe performance of the work.

Reviewed By: Nesh Mucibabic, PE
Engineer, HDR

Returned By: Matt House
WES CM





EQUIPMENT SUMMARY SHEET

Clackamas County Service District No. 1
Intertie 2 Diversion Project A – Pump Station

MECHANICAL

Equipment Name: CAST IRON SLIDE GATES
SECTION 15115 WATER CONTROL GATES

Equipment Number: SLG - 401 Diversion Structure (dwg. #1412684-01)
SLG - 402 Pump Station (dwg. #1412684-02)

Exact Part or Model Number of the Supplied Equipment: HG 560 CAST IRON
SLIDE GATES

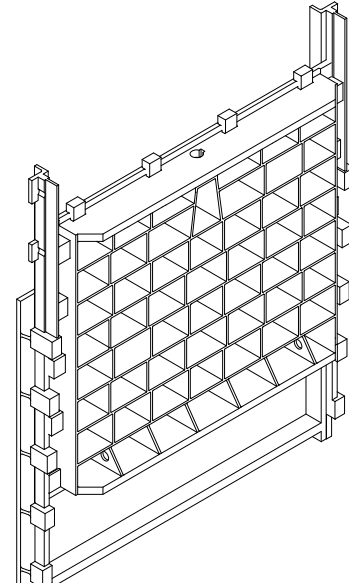
Process Area in Which the Equipment is Installed: WET WELL & DIVERSION
STRUCTURE

Preparer's Signature and Date



INSTALLATION OPERATION & MAINTENANCE MANUAL

CAST IRON SLIDE GATES



EQUIPMENT
MANUFACTURER:

Hydro Gate
A division of Henry Pratt Company
7010 Broadway, Suite 400
Denver, CO 80221
Tel: (303) 288-7873 Fax: (303) 287-8531
Contact: Tim Frazier

CONTRACTOR:

McClure and Sons Inc.
15714 Country Club Drive
Mill Creek, WA 98012
Phone: (425) 316-6999 Fax: (425) 316-6789

HYDRO GATE
REPRESENTATIVE:

Beaver Equipment Specialty Co.
18115 S. Shiloh Lane
Oregon City, OR 97045
Tel: 530-631-8905 Fax: (503) 631-8910

**Project: Intertie 2 Diversion Project A Clackamas County
Service District No. 1, Portland, Oregon**


Sales Order Number: 1412684

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7. LUBRICANT LIST

Reference Symbol	Shell	Standard Oil	Gulf	Arco	Or Equal
List symbols used in No.6. above.	List equivalent lubricants, as distributed by each manufacturer for the specific use recommended.				
(A)	Shell Alvania Number1 *	Fisk Bro's Lubriplate No.:630 AAA *	Gulfcrown Grease #2 *		Mobilux EP 2*
(B)	Shell Alvania Number1	Fisk Bro's Lubriplate No.:630 AAA	Gulfcrown Grease #2		Mobilux EP 2
					Dayton Pipe Thread Sealant Paste with Teflon

* Grease to be mixed with La Co Slic-Tite and 24 fluid ounces of Paste per gallon grease.

8. RECOMMENDED SPARE PARTS FOR OWNER'S INVENTORY

Part No.	Description	Unit	Quantity	Unit Cost
N O T	R E Q U I R E D			

OPERATION

General Operation Information

Cast Iron Slide gates are used to control flow of or retain a volume of water, effluent, or other fluids. Typical applications include industrial water treatment facilities, municipal water treatment facilities, irrigation, dams, flood control, and many other applications that require accurate control of liquid flow.

The simplicity of a Cast Iron Slide Gates makes it a popular choice when designing flow controls. From the basic hand-cranked manual model to the microprocessor-controlled, fully integrated electric Cast Iron Slide Gates, actuation consists of the basic open or closed operation. An open gate allows flow and a closed one does not.

Depending on size, most Cast Iron Slide Gates can operate without error in diverse conditions. Some extenuating circumstances may include large amounts of ice or other solids that will obstruct the travel path of the gate. In most cases, when the obstruction is removed, normal operation can be resumed without adjustment to the gate.

Cast Iron Slide Gate Operation Procedures

The following sections cover the general operating procedures associated with two manual-operation systems (handwheel and handcrank) and an electrical-operation system. Read and follow the operating procedures for the applicable system. If you have any questions concerning safe operation of this Hydro Gate Cast Iron Slide Gates, contact Hydro Gate immediately.

HB Series Actuator (Manual Handwheel or Tee Wrench)

Opening – To open this Cast Iron Slide Gate observe the direction of rotation noted on the handwheel. Turn in the direction of opening. If the gate has been closed for an extended period the gate may be difficult to “unseat.” If, after several turns of the wheel, the rotation becomes increasingly difficult stop rotation when a **moderate** pressure is achieved. Allow the pressure in the stem to unseat the gate (a “POP” sound typically signals the gate has begun to travel. Continue to turn the hand wheel until the desired gate position has been achieved. Observe the relative position of the top of the stem in relation to the Mylar decal on the stem cover (if equipped.) When the top of the stem is equal to the OPEN or 100% indicator the gate is considered to be FULL open and should not be opened further.

Operation Note

Do not over-open the gate. Serious damage to the gate stem and sealing surfaces can result.

Closing – To close this Cast Iron Slide Gate turn the handwheel in the direction opposite of the Open indicator until the stopnut on the stem has **moderately** seated on the top of the lift. When the top of the stem is equal in height to the bottom/zero height indicator, the gate is considered to be FULL CLOSED and should not be closed further. Should the gate or stop nut require adjustment, refer to the appropriate section of the Installation, Operation, and Maintenance Manual or call Hydro Gate **before** any adjustments are made.

Operation Note

Do not attempt to adjust the position of the stopnut to achieve additional closing stem travel. Serious damage to the gate stem and sealing surfaces can result.

CPS Series Actuator (Manual Handcrank)

Opening – To open this Cast Iron Slide Gate observe the direction of rotation noted on the lift housing. Crank in the direction of opening. If the gate has been closed for an extended period the gate may be difficult to “unseat.” If, after several turns of the handcrank, the rotation becomes increasingly difficult stop rotation when a **moderate** pressure is achieved. Allow the pressure in the stem to unseat the gate (a “POP” sound typically signals the gate has begun to travel. Continue to turn the handcrank until the desired gate position has been achieved.

Operation Note

Do not over-open the gate. Serious damage to the gate stem and sealing surfaces can result.

Closing – To close this Cast Iron Slide Gate turn the crank in the direction opposite of the Open indicator until the stopnut on the stem has **moderately** seated on the top of the lift. After the gate has been closed as noted on the indicator, the gate is considered to be FULL CLOSED. Then reverse the rotation of the crank and relieve the pressure on the stem and lift. Should the gate or actuator require adjustment, refer to the appropriate section of the Installation, Operation, and Maintenance Manual or call Hydro Gate **before** any adjustments are made.

Operation Note

Do not attempt to adjust the position of the stopnut to achieve additional closing stem travel. Serious damage to the gate stem and sealing surfaces can result.

MAINTENANCE

Field Cleaning and Painting

Hydro Gate's standard paint system on Cast Iron Slide Gates is commercial grade blast and Hi-build epoxy paint. It does not require top coating. Should blast cleaning be needed to condition the gate for top coating, the gate should be fully closed and any exposed metallic seating faces, wedges, and wedge blocks protected from blast and paint. Before painting, blow all grit off gate, particularly in and around the seating faces. Do not remove any wedges or disassemble the gate except as described in the next paragraph.

Hydro Gate does not usually recommend removing the slide from the frame to apply finish/top coats because of the risk of damage to the seating faces during handling. If sufficient reasons exist for removal of the slide, (e.g., badly deteriorated paint on an old gate or a complete change of paint system that is incompatible with the existing paint) then completely disassemble and thoroughly blast clean all surfaces to obtain a quality recoated product.

When disassembling the gate or gates, keep parts segregated and match-marked so that parts are not mixed gate-to-gate because interchangeability between gate parts is not always certain. Protect all seating surfaces on the slide and frame with duct or masking tape. Use special care in handling the slide and frame to avoid damage to the seating faces.

Blast clean and paint the frame and slide as required by the specifications or the paint manufacturer's recommendations. Do not paint the contact faces of the wedges or metal seat. Remove masking tape or other material used to protect machined faces. Clean all faces thoroughly and relubricate. Reinsert slides in the proper frame.

With the gate in the fully closed position, recheck maximum clearance between the seating faces with .004-inch thickness feeler gauge. Readjust wedges, if required, per the instructions in this Manual.

Maintenance and Lubrication

Occasional adjustment, lubrication, and painting of Hydro Gate Cast Iron Slide Gate components will be required. The frequency will depend upon how often the gate is used, location, and operating conditions. Periodic inspection, adjusting, cleaning, and repainting are recommended as conditions at the site permit.

When excess leakage through the gate seating surfaces occurs or when the gate has been in the closed or opened position for long periods of time without movement, the seating faces and wedging surfaces should be cleaned and greased and the wedges should be readjusted per the instructions in this manual.

Lift and Stem Maintenance

Maintenance of the threaded operating portion of the gate stem is critical and should be performed as frequently as the operating environment requires.

Maintenance Note

Failure to maintain stem thread lubrication causes operating difficulties and premature failure of the lift nut and stem threads.

Recommended inspection frequency and procedures are as follows:

- Initial inspection - after 25 cycles of gate operation.
- Subsequent inspection - after 50 cycles of gate operation.
- Operational inspection - after each 100 cycles of gate operation or six months, whichever occurs first.

A “cycle” of gate operation is operation of the gate slide from closed to open to closed position. At each inspection, verify the following items:

- Inspect the stem threads and lift nut threads for wear and verify the trueness and dimension of the thread form.
- Check the amount of lubricant remaining and add if necessary.
- Relubricate if necessary - threads should be cleaned and relubricated with fresh lubricant.

More severe conditions or operating modes require a slightly different schedule of inspection and service. For example: Modulating gates with electric motor operators may make position changes several times a day but seldom go full stroke. There is a portion of the stem that gets a lot of use. These stems should be inspected at least weekly. The lubricant on the stem threads should be monitored closely. As the lubricant is depleted and becomes contaminated, it should be cleaned away and replenished.

When excess dried grease or other foreign material is carried into the threads of the lift nut, extremely hard operation will result. If serious binding occurs, the only way to correct it is to remove the threaded stem from the lift nut and clean the thread interior. If this foreign material is not cleaned from the interior threads of the lift nut, heavy pulls on the handcrank or seizure will result.

Stem threads may be cleaned with solvent, rags, and brushes. Run the gate open. While in the process of opening (running the stem out above the lift nut), clean off the old grease. Inspect the threads for

roughness. If the threads are rough, they may be filed and polished. Be careful to keep filings and grit out of the lift nut. Rough stem threads accelerate the wear of the lift nut threads.

Relubricate the stem threads by brushing or smearing grease onto/into the threads as the gate is closing (the stem is going into the lift). This puts fresh lubricant into the lift nut and carries out the old contaminated grease. It is recommended that the contaminated grease be cleaned from the stem as it exits underneath the lift where the stem is accessible from below. Of course, replenish grease on the underside stem.

The recommended stem thread lubricant is a mixture of "La Co Slic-Tite Paste" and Fiske Bros. "Lubriplate No. 630 AAA" in the ratio of 24 ounces of paste per gallon of grease. "Slic-Tite Paste" is a pipe dope with Teflon fibers and is available from most plumbing supply stores or from:

La Co Industries, Inc.
1201 Pratt Blvd.
Elk Grove Village, IL 60007
Phone: 847-956-7600
Fax: 847-956-9885
Web site: www.laco.com

An equal alternate for La Co's "Slic-Tite" is "Dayton Pipe Thread Sealant Paste with Teflon", Stock Nos. 4X222 or 5X998, which is available at W. W. Grainger Inc. stores in major cities nationwide.

Equivalent lubricants to Fiske Brothers' "Lubriplate 630AAA" include:

Conoco's "All Purpose Superlube"
Texaco's "Multi Fak Heavy Duty No. 2"
Shell Oil Company's "Alvania No. 1"
Mobil's "Mobilux EP2"
BP Energrease LS 2
Fiske Brothers' "Lubriplate No. 630 AA"

A recommended lubricant for potable water service is a vegetable-based lubricant, "Lubriplate Super FML-2".

Lifts may be furnished with optional "stem lubricator flanges" to facilitate lubrication of stem threads with pressure greasing equipment. The flanges are located either under the lift housing or incorporated into the aluminum stem cover housing. To be effective, lubricant should be injected while the stem is moving through the lift.

Manual lifts have zerk-type fittings for relubrication of the bearings and gears. These fittings do not lubricate the stem threads (except for the optional lubricator flange or the lubricator in the stem cover adapter). Recommended greases for the lift bearings and gears are any of the above lubricants without the Teflon paste.

Recommended service and maintenance of the electric motor lifts is covered in the respective manufacturer's maintenance manual.

Exercise of infrequently operated lifts and gates is recommended. An annual exercise will ensure the gate is operable when needed and the lubrication condition will be maintained.

Removal of the stem nuts for thread inspection of frequently modulated gates is recommended. This avoids "surprise" when the nut threads have worn so thin they strip out and drop the gate. Replacement or spare nuts can be ordered from Hydro Gate. Spare parts are usually not needed or recommended, since they are readily available on short notice from Hydro Gate. In those cases where equipment operation or downtime is critical and the gate is operated extremely often, a spare lift nut may be wise to have on hand.

Most electric operator nuts can be removed from either the top or the bottom of the operator without total disassembly of the operator. See the electric motor operator maintenance manual.

Maintenance Note

Whenever the nut is removed and reinstalled in an electric operator, the position limit switches will need readjustment. This is also true of lift assemblies that consist of an electric actuator attached to a gearbox lift.

Maintenance Schedule and Lubrication Summary

Activity	Frequency	Lubricant
General Cleaning and Inspection	As often as conditions require or permit, or every 6 months.	N/A
Stem Thread and Lift Nut Wear Inspection	Initial inspection after 25 cycles. Subsequent inspection after 50 cycles. Operational inspection after each 100 cycles, or every 6 months.	N/A
Stem Thread Lubrication and Cleaning Inspection	After 100 cycles or 6 months. Clean grease if dried or contains foreign material.	Mixture of 24 fluid ounces La Co Slic-Tite Paste and 1 gallon of Fiske Bros. Lubriplate No. 630 AAA or AA. (An equal alternate is Dayton Pipe Thread Sealant Paste with Teflon, Stock Nos. 4X222 or No. 5X998)
Pressure Greasing of Lift	After each 100 cycles or 6 months.	*Fiske Bros. Lubriplate No. 630 AAA or AAA
Clean and Grease Seating Faces and Wedge Surfaces	Annually or whenever the gate is dewatered. Exercise gate, at least partially, every 6 months if dewatering, inspection, cleaning, and lubrication are not possible.	*Fiske Bros. Lubriplate No. 630 AAA or AA.
		*Equivalent lubricants to Fiske Bros. Lubriplate No. 630 AAA or AA include the following: Conoco's All Purpose Superlube Texaco's Multi Fak Heavy Duty No. 2 Shell Oil Company's Alvania No. 1 Mobil's Mobilux EP2 Exxon's Ronex MP
<p>Notes</p> <p>For potable water treatment plants use a vegetable-based lubricant such as Lubriplate Super FML-2. La Co Slic-Tite Paste is available at plumbing supply stores or from La-Co Industries, 1201 Pratt Blvd., Elk Grove Village, IL 60007 (847) 956-7600.</p>		

Lubrication Equivalents

Hydro Gate considers any of the following greases/lubricants to be acceptable:

- A. Fiske Brothers "Lubriplate" No. 630 AAA or AA
- B. Sta-Lube "Sta-Lube" No. 3121
- C. Conoco "All Purpose Superlube"
- D. Texaco "Multi Fak Heavy Duty" No. 2
- E. Shell Oil Company "Alvania" No. 1
- F. Mobil "Mobilux EP2"
- G. Exxon "Ronex MP"

Hydro Gate recommends the following pipe thread sealants with Teflon:

- A. La-Co Slic-Tite Paste
- B. Dayton Pipe Thread Sealant with Teflon\
- C. McMaster-Carr Pipe Thread Sealant with Teflon
- D. Any other commercially available pipe thread sealants containing Teflon.

For water treatment plants, Hydro Gate recommends using a vegetable-based lubricant such as Lubriplate Super FML-2.

Interchangeable

Lubrication Requirements for Gate Stems with Modulating Controls

Lubricant – A mixture of pipe thread sealant and lubricant as previously described.

Lubricant Application – Apply lubricant to the stem threads with a brush or by hand smearing. Optional stem lubricator flanges are available to aid application. To use a lubricator flange, attach the grease gun or pump to the lube fitting in the flange, which is mounted under the lift. The lubricator works best if the lubricant is injected while the stem is moving upward, thus carrying lubricant into the stem nut threads.

Hand or brush application works best by applying the lubricant to the stem above the operator while the stem is moving down through the nut. Remove the stem cover, if the gate is so equipped, and start with the gate up. The stem nut is located down inside the actuator, so that a natural well or pool of lubricant is formed above the nut. Apply lubricant so the entire working length of the thread is completely covered.

Initial Lubrication – Lubricate the stem threads during the “Stem and Lift Installation” or before the gate is operated for the first time.

Initial Inspection – Inspect the stem threads after 25 complete gate operations. (A complete operation is defined as a full stroke of the gate from closed to open to closed position.) Inspection may require the cleaning of threads to visually check the thread surfaces for gouges, galling, tears, roughness, or other damage. After inspection, relubricate with the recommended lubricant.

Relubrication Frequency – Depends on actual conditions, such as, wind-blown dirt, rain, moisture, and frequency of modulation.

A "cycle" for a modulating gate is one passage of a given stem thread up and down through the nut. Since the gate typically modulates over a short span, which is often much less than full gate travel, the used length of thread and the nut threads complete a high number of "cycles". This highly used length of thread must be relubricated frequently to prevent wear and premature failure of the stem nut threads.

The actual frequency of relubrication can be determined by observation during the first days and weeks of operation. Begin by using the general rule of 100 cycles to inspect and lubricate.

Example

The gate modulates (moves) over the same span every 30 minutes throughout the day. The used or modulating length of stem should be relubed every four days ($100 / 24 = 4.17$).

Do not let the used length of stem become dry looking. If, following the example, the stem is well greased and the pool of lubricant is maintained above the stem nut, the length of time between relubrication can be increased.

Periodic Thread Inspection – Thoroughly inspect the stem threads after 1000 "cycles" or 1 month of operation. The recommended procedure for thread inspection is as follows:

1. Remove the stem cover, if so required.
2. Take samples of the used grease from above and below the stem nut.
 1. Check for wear particles from the stem or nut, or other grit and dirt.

Maintenance Note

The recommended mixture of La-Co Slic-Tite and grease feels "gritty". The La-Co paste contains Teflon particles, like sawdust. These are easily distinguished from other particles by washing the sample in solvent. The Teflon particles are white or cream colored. The stem nut may be bronze or nylon. The nylon is either blue or black.

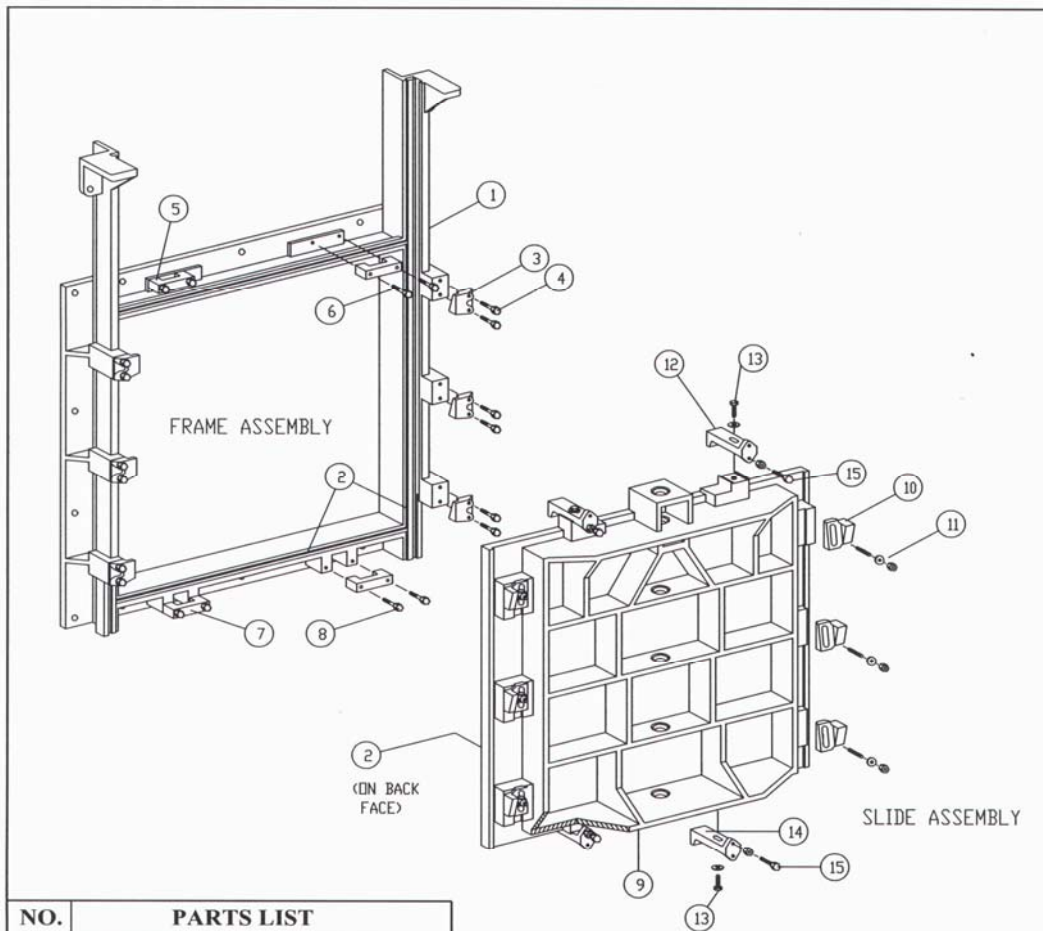
2. Thoroughly degrease and clean the used length of stem threads. Watch for bronze (yellow) or nylon particles (blue or black). Check threads for roughness. If particles or roughness are found, removal of the stem nut for inspection is recommended.

Maintenance Note

See the Electric Operator Manual for instructions on how to remove and install the nut and how to set limits. Recalibration of electronic modulating controls should generally not be required.

3. Correct conditions causing any unusual wear. Some suggested corrections follow:
 - Increase lubrication frequency.
 - Slow down modulation frequency.
 - Remove or block sources of outside grit and dirt.
 - Smooth out minor roughness of the stem threads with a file and emery. Be sure to clean out filings and grit.
 - Consult Hydro Gate if extreme roughness of the stem exists.
 - Maintain spare stem nuts.

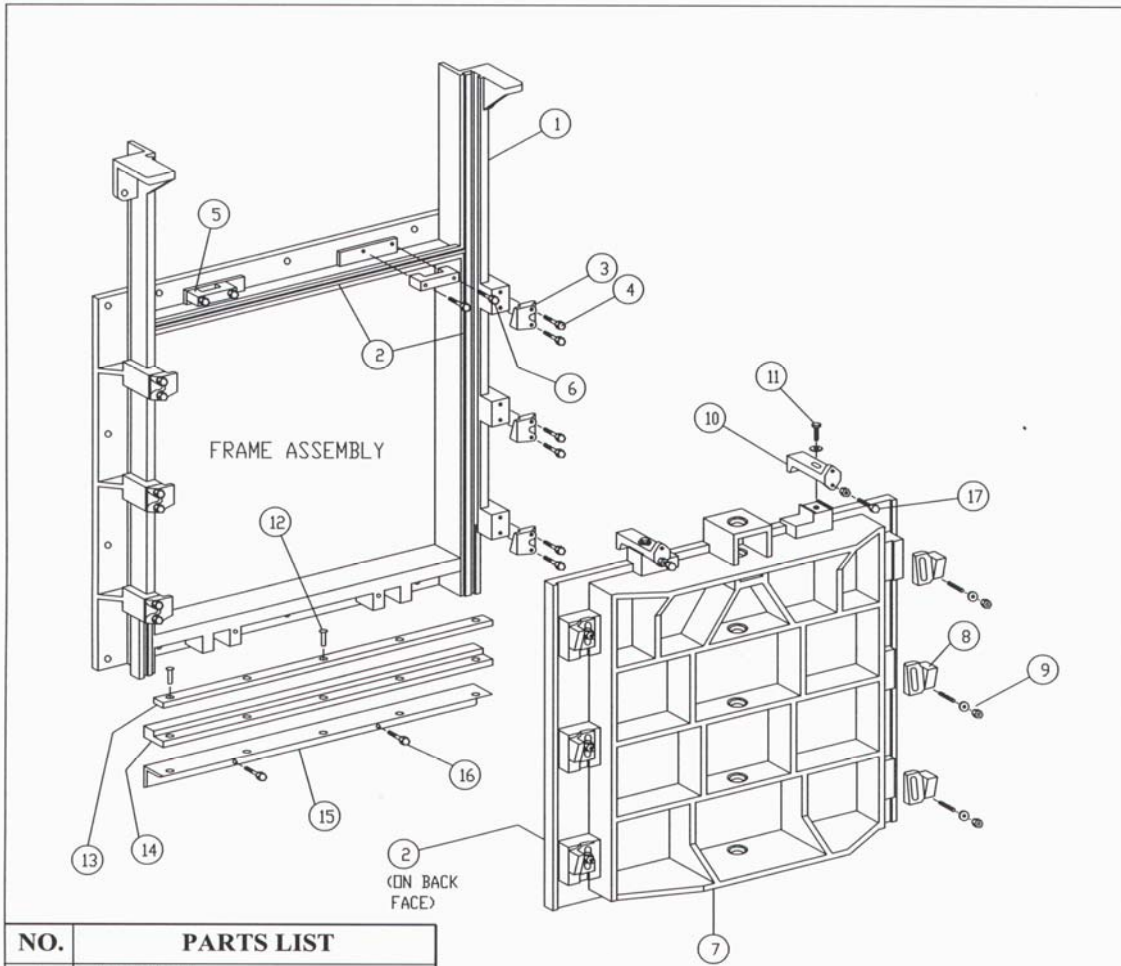
Limitations – Modulation or "cycle" frequency greater than one "cycle" every 5 minutes is not recommended. It greatly increases relubrication frequency and generates heat in the nut, which leads to lubricant depletion and highly accelerated wear of the threads and the entire machine.



NO.	PARTS LIST
1.	FLANGE FRAME
2.	DOVETAIL METAL SEATING FACES
3.	SIDE WEDGE BLOCK
4.	SIDE WEDGE BLOCK FASTENERS
5.	TOP WEDGE
6.	TOP WEDGE FASTENERS
7.	BOTTOM WEDGE
8.	BOTTOM WEDGE FASTENERS
9.	STANDARD BOTTOM SLIDE
10.	SIDE WEDGE
11.	SIDE WEDGE FASTENER SET
12.	TOP WEDGE HOOK
13.	TOP & BOTTOM WEDGE HOOK FASTENER SET
14.	BOTTOM WEDGE HOOK
15.	TOP & BOTTOM WEDGE HOOK ADJUSTING SCREW SET

**EXPLODED VIEW
SERIES 501 HEAVY DUTY SLUICE GATE
STANDARD BOTTOM
NOT SELF CONTAINED, FULL WEDGING**

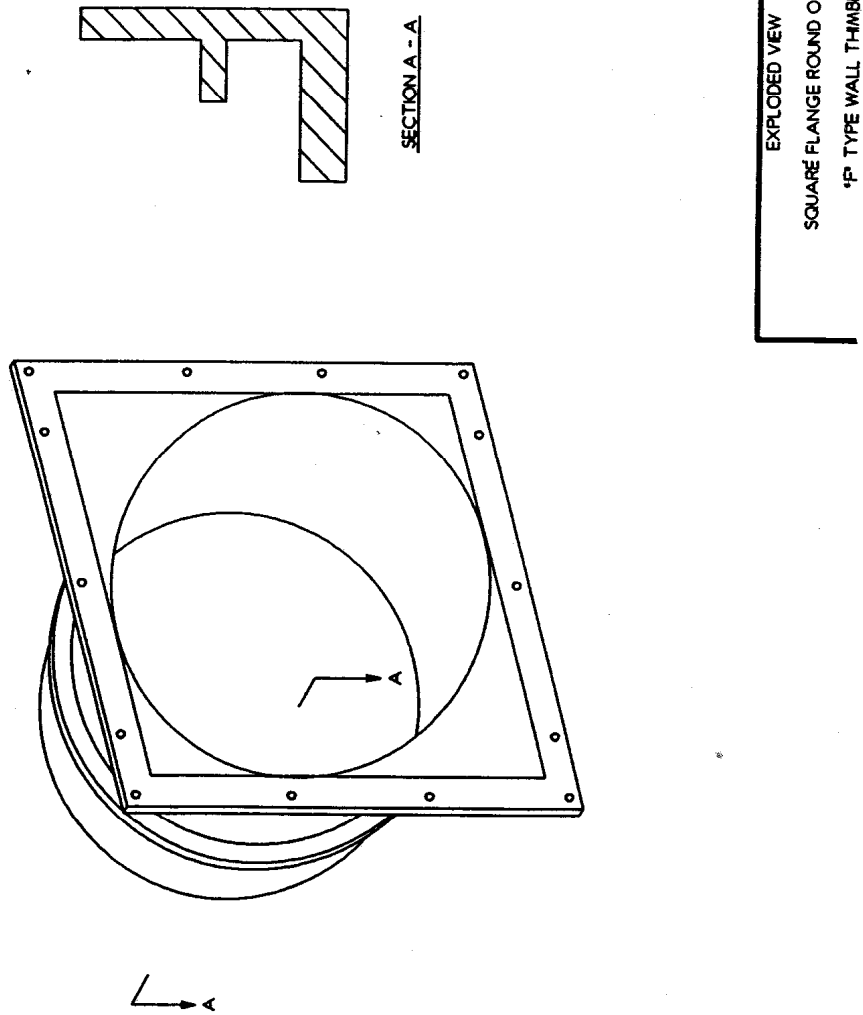


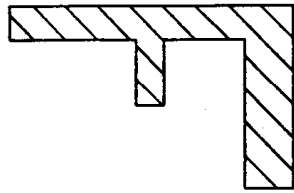


NO.	PARTS LIST
1.	FLANGE FRAME
2.	DOVETAIL METAL SEATING FACES
3.	SIDE WEDGE BLOCK
4.	SIDE WEDGE BLOCK FASTENERS
5.	TOP WEDGE
6.	TOP WEDGE FASTENERS
7.	FLUSH BOTTOM SLIDE
8.	SIDE WEDGE
9.	SIDE WEDGE FASTENER SET
10.	TOP WEDGE HOOK
11.	TOP WEDGE HOOK FASTENER SET
12.	FLUSH BOTTOM SEAL RETAINER FASTENERS
13.	SEAL RETAINER FLAT
14.	FLUSH BOTTOM RESILIENT SEAL
15.	FLUSH BOTTOM ANGLE
16.	FLUSH BOTTOM ANGLE FASTENERS
17.	WEDGE HOOK ADJUSTING SCREW SET

EXPLODED VIEW
SERIES 501 HEAVY DUTY SLUICE GATE
FLUSH BOTTOM
NOT SELF CONTAINED, FULL WEDGING

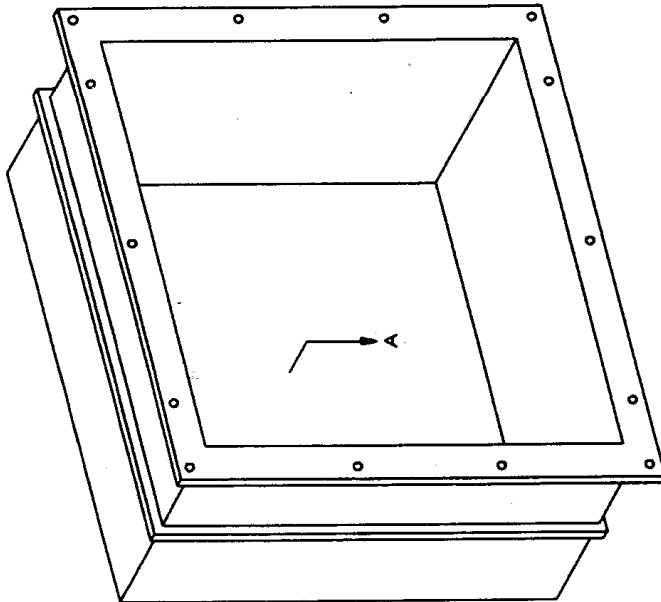


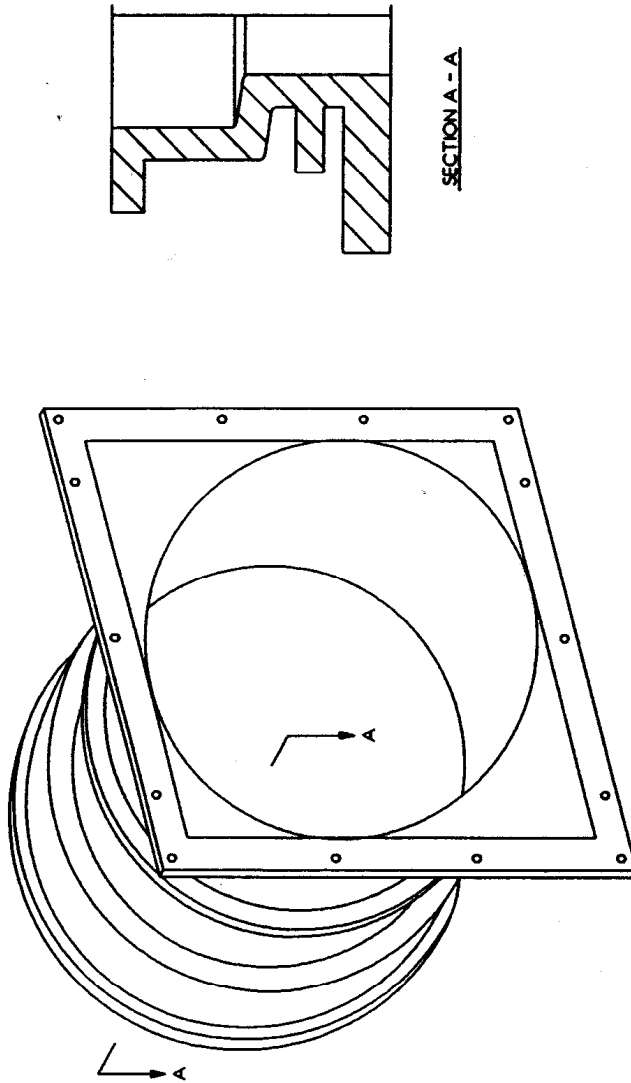




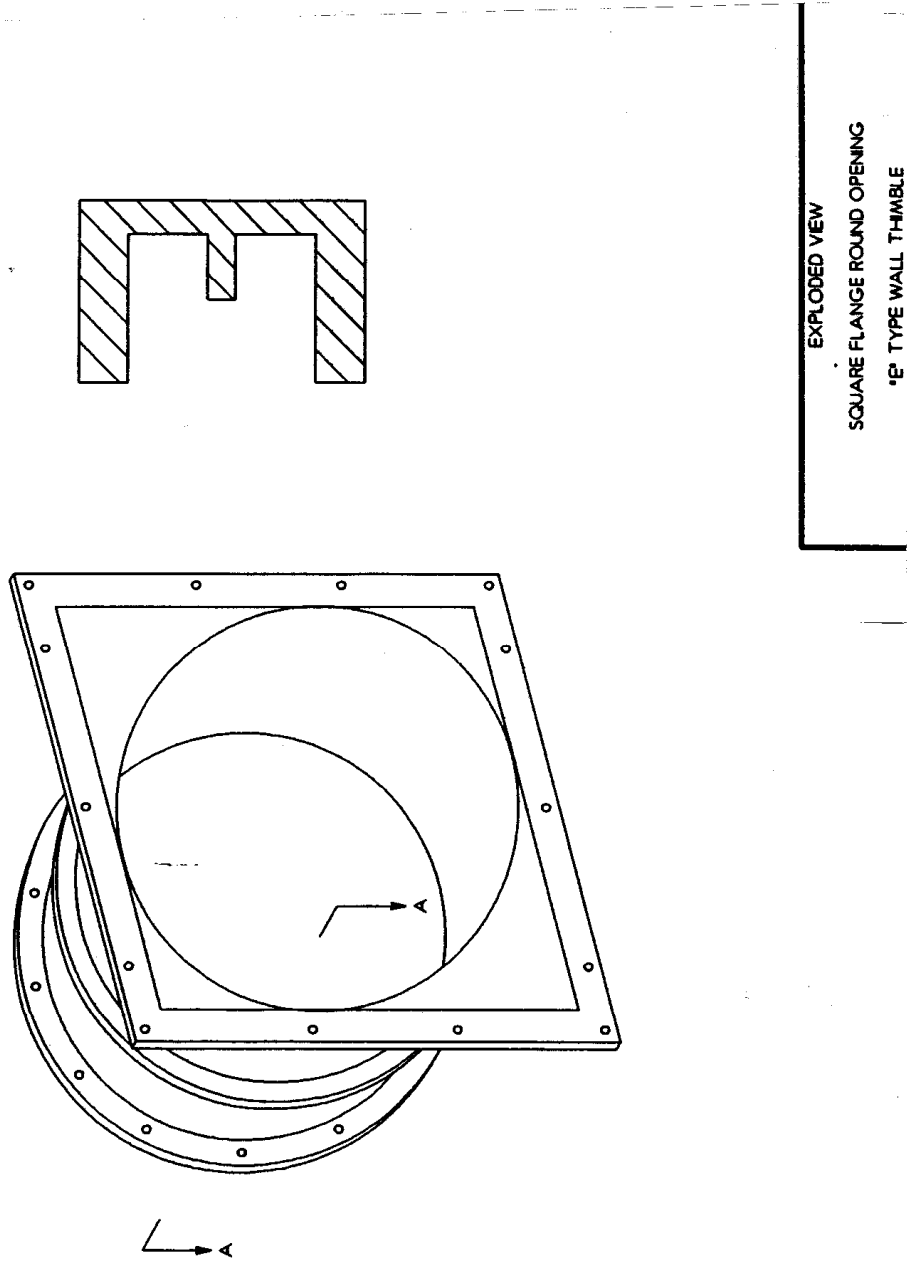
SECTION A - A

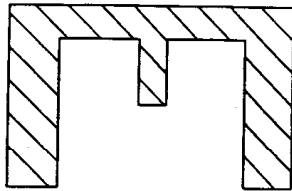
**EXPLODED VIEW
SQUARE 'F' TYPE
WALL THIMBLE**





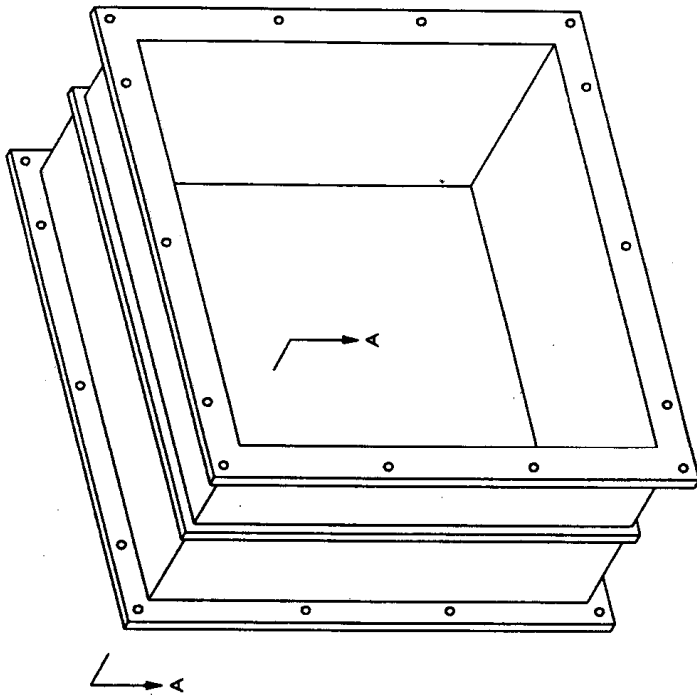
EXPLODED VIEW
SQUARE FLANGE ROUND OPENING
MECHANICAL JOINT TYPE WALL THIMBLE



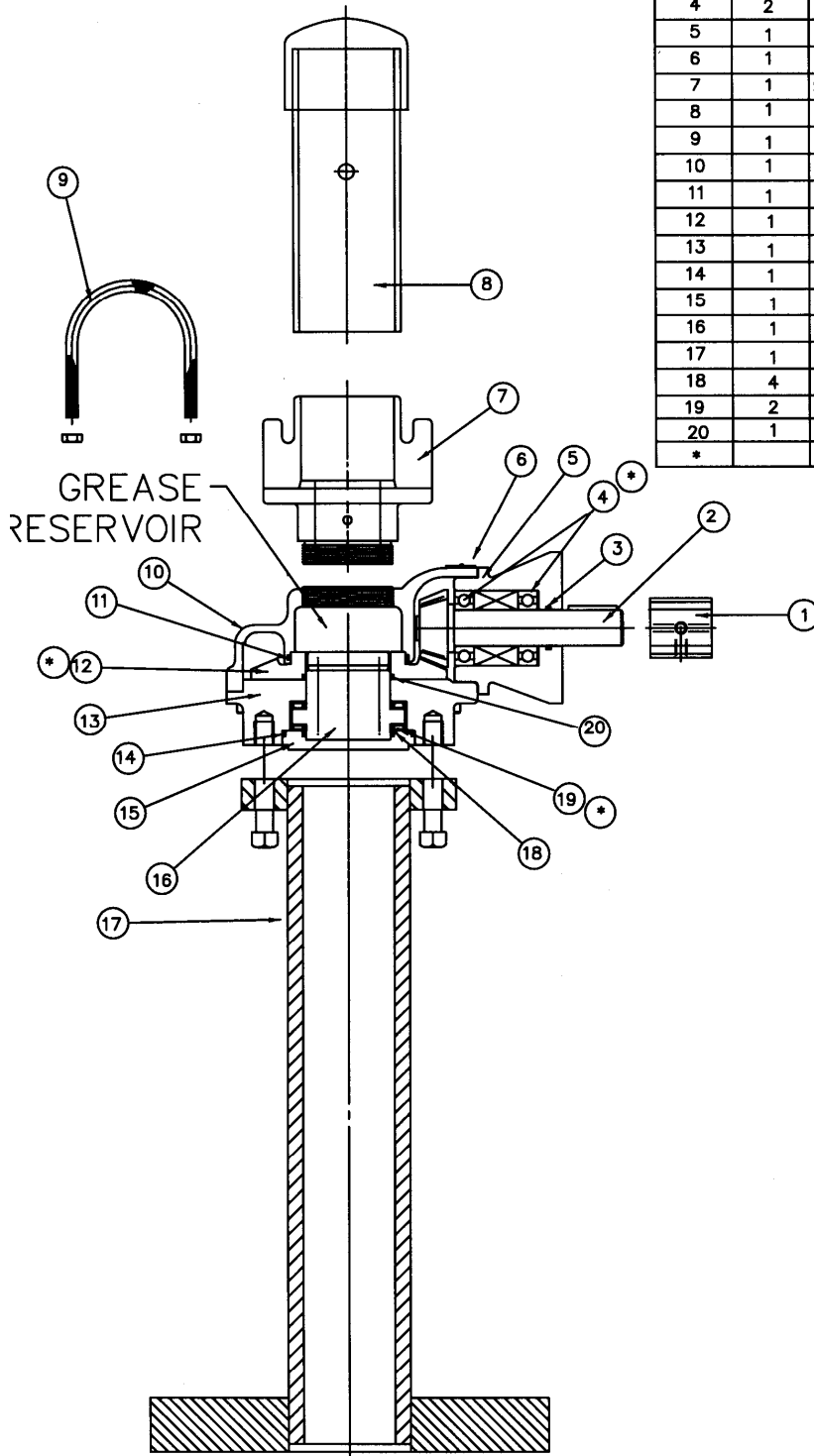


SECTION A - A

EXPLODED VIEW
SQUARE 'E' TYPE
WALL THIMBLE



NO.	QTY.	PARTS LIST
1	1	AWWA 2" SQ. CRANK ADAPTOR
2	1	INPUT SHAFT/PINION GEAR
3	1	INPUT SHAFT O RING SEAL
4	2	INPUT SHAFT BEARINGS
5	1	INPUT HOUSING
6	1	IDENTIFICATION TAG
7	1	STEM COVER ADAPTOR W/ ZERK
8	1	STEM COVER
9	1	STEM COVER MOUNTING U BOLT
10	1	PRIMARY GEAR HOUSING
11	1	BEVEL GEAR O RING SEAL
12	1	BEVEL GEAR
13	1	BASE PLATE
14	1	SPIGOT RING O RING SEAL
15	1	SPIGOT RING
16	1	LIFT NUT
17	1	FABRICATED PEDESTAL
18	4	THRUST WASHERS
19	2	THRUST BEARINGS
20	1	DRIVE NUT O RING SEAL
*		LUBRICATION PRESENT



HYDRO GATE CPS SERIES LIFTS

N/A

SPARE PARTS**Warnings**

- Check size of parts before attempting to store them
- Spare parts should be stored in clean, dry and protected warehouse until ready for installation.

HOW TO ORDER REPLACEMENT OR SPARE PARTS

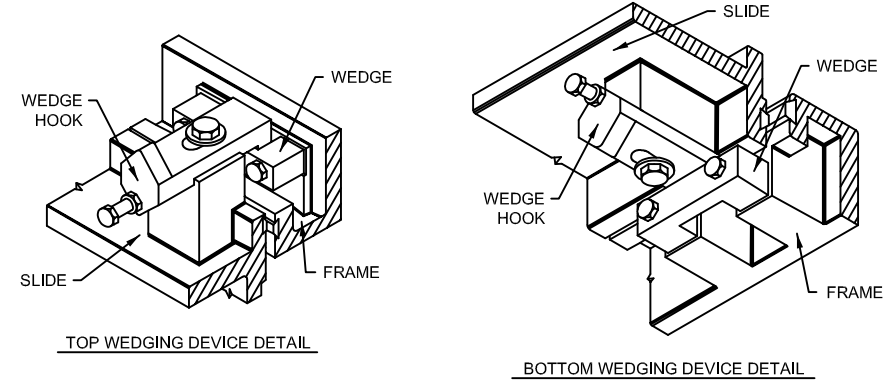
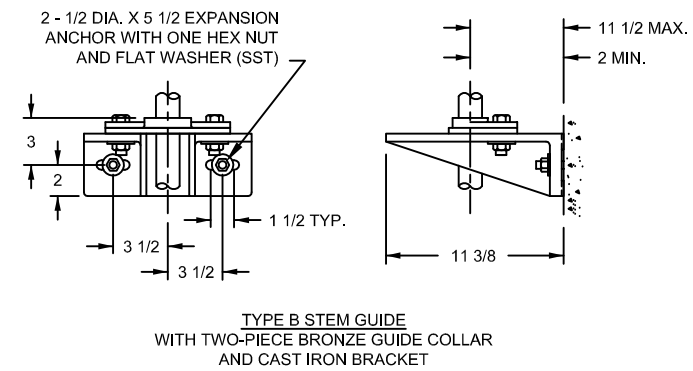
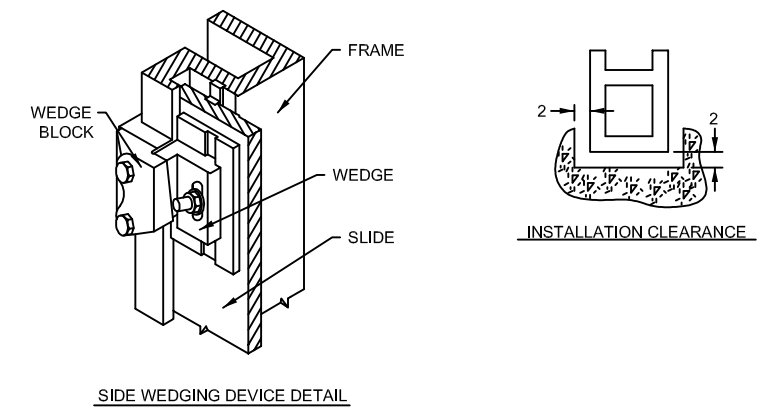
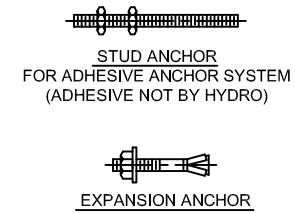
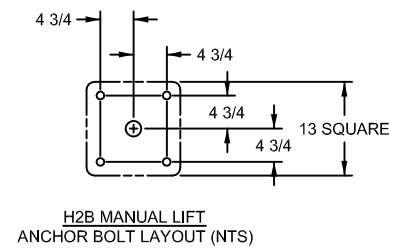
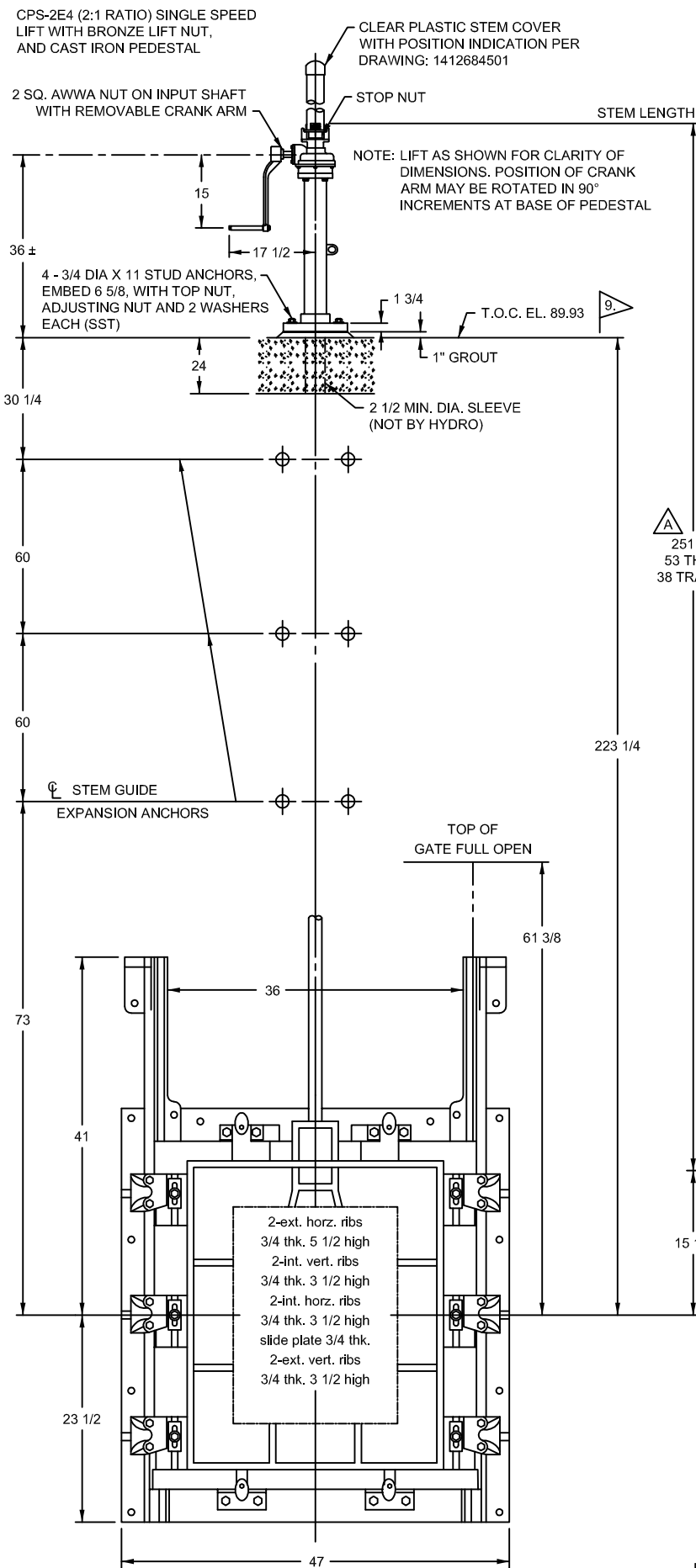
Parts may be ordered from your local Hydro Gate Representative or direct from Hydro Gate.

Please have the following information:

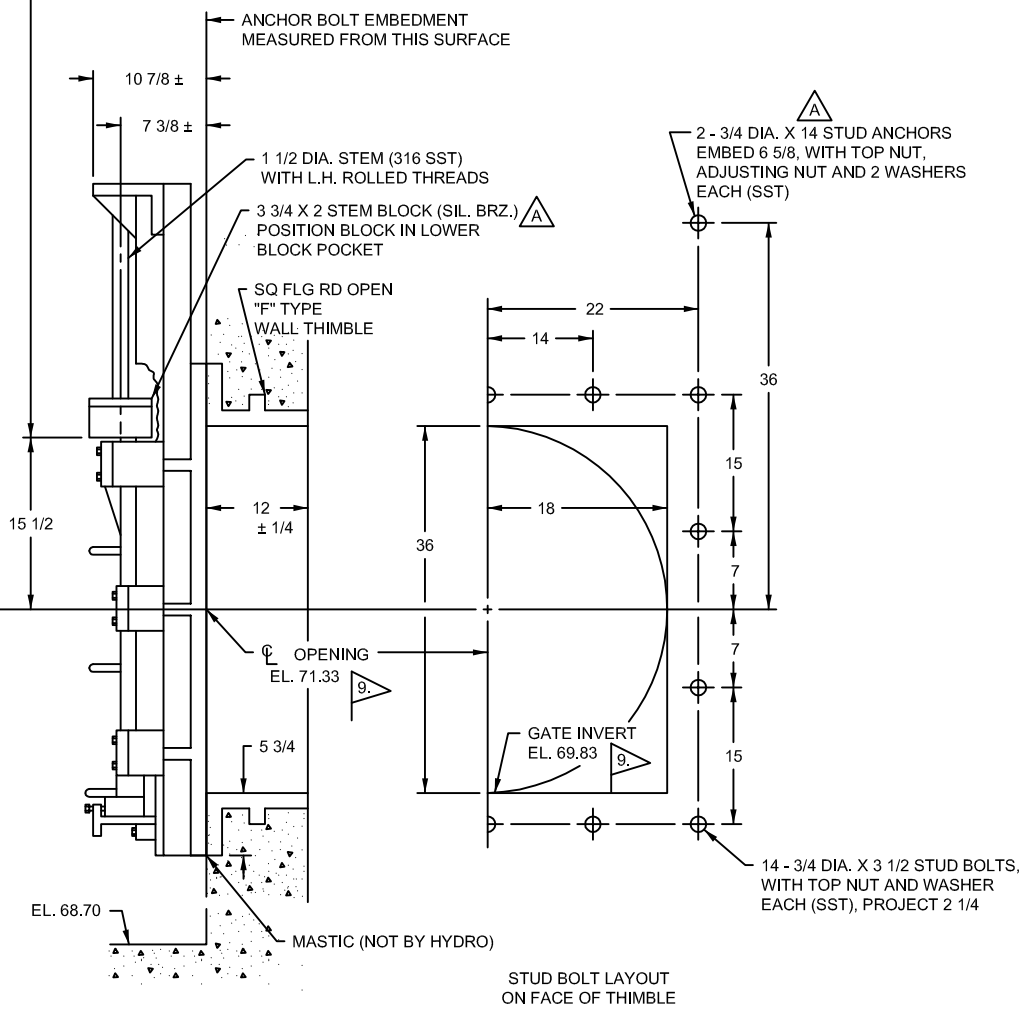
1. Hydro Gate sales information found on the blue anodized tag located on the gate or pedestal.
2. The item and/or tag number must be relayed to Hydro Gate
3. Description of replacement Part(s)

Spare Parts List

1	Stop Nut
2	Stop Collar
3	Lift Nuts
4	Stem Cover
5	Thrust Bearing for Gate lift



- NOTES:
- ALL DIMENSIONS IN INCHES UNLESS NOTED OTHERWISE.
 - OUTLINE DIMENSIONS FOR CASTING OR STRUCTURAL EQUIPMENT HAVE A TOLERANCE OF + OR - 1/4 INCH. DIMENSIONS FOR BOLT LOCATIONS A TOLERANCE OF + OR - 1/16 INCH AS MEASURED FROM THE APPLICABLE AXIS AT CENTERLINE OF GATE OPENING.
 - MATERIAL SPECIFICATIONS AND COATINGS PER DRAWING 1412684500
 - OPERATING DESIGN HEAD: 0 FEET SEATING
MEASURED FROM GATE CENTERLINE 10 FEET UNSEATING
GATE DESIGN HEAD: 55 FEET SEATING
MEASURED FROM GATE CENTERLINE 20 FEET UNSEATING
 - SEE MANUAL G-1000 FOR INSTALLATION AND ADJUSTMENT INSTRUCTIONS.
 - TAG: SLG-01
 - LOCATION: DIVERSION STRUCTURE - INTERTIE 2 DIVERSION PROJECT A CLACKAMAS COUNTY SERVICE DISTRICT NO. 1 - PORTLAND, OREGON
 - REFERENCE SPECIFICATION: 15115
REFERENCE CONTRACT DRAWING SHEET: M-301, M-302, S-301 AND S-302
 - CONFIRM ELEVATIONS.
CONFIRMED AS SUBMITTED BY RETURN SUBMITTAL RECEIVED 03/11/11.



IMPORTANT: SEE DETAIL FOR CLEARANCE

		36" X 36" MODEL 560 HEAVY DUTY SLUICE GATE	
		NOT SELF-CONTAINED, STANDARD BOTTOM, RISING STEM	
QUANTITY: ONE		MATERIAL: CAST IRON	
SCALE: NTS		THIS IS A PROPRIETARY DESIGN OF HYDRO GATE. THE DESIGN, DATA AND INFORMATION RELATING THERETO IS NOT TO BE USED, DISSEMINATED OR REPRODUCED IN WHOLE OR IN PART WITHOUT THE EXPRESS WRITTEN CONSENT OF HYDRO GATE.	
REV. A	DATE 7/16/11	INITIALS MAA	
DRAWN BY MAA		CUSTOMER NO. 3156-103	SALES ORDER 1412684
CHECKED BY MAA		DATE 02/11/11	DRAWING NO. 1412684-01

MATERIAL SPECIFICATIONS

GATE PART OR ITEM OF ASSEMBLY	MATERIAL DESCRIPTION	MATERIAL CODE	MATERIALS SHOWN IN ASTM SPECIFICATION UNLESS NOTED OTHERWISE
<u>EMBEDMENTS</u>			
ANCHOR BOLTS	STAINLESS STEEL	(L)	A276, TYPE 304
ANCHOR BOLT NUTS	STAINLESS STEEL	(L)	F594, ALLOY GROUP 1 (304)
WALL THIMBLE	CAST IRON	(A)	A126, CLASS B
WALL THIMBLE STUDS	STAINLESS STEEL	(L)	A276, TYPE 304
WALL THIMBLE NUTS	STAINLESS STEEL	(L)	F594, ALLOY GROUP 1 (304)
<u>GATE ASSEMBLY</u>			
FRAME AND SLIDE	CAST IRON	(A)	A126, CLASS B
SEATING FACES	△ SILICON BRONZE	(J)	B98, ALLOY 651
SIDE WEDGE BLOCKS	△ STAINLESS STEEL	(L)	A296, GRADE CF-8M (316)
SIDE WEDGES	△ STAINLESS STEEL	(L)	A747, CONDITION SA (316)
TOP AND BOTTOM WEDGES	△ STAINLESS STEEL	(L)	A296, GRADE CF-8M/A747, CONDITION SA (316)
FASTENERS	STAINLESS STEEL	(P)	F593 (BOLTS), ALLOY GROUP 2 (316) F594 (NUTS), ALLOY GROUP 2 (316)
STOP PLATE AND RETAINER	STAINLESS STEEL	(L)	A276, TYPE 304
FLUSH BOTTOM SEAL	NEOPRENE	(BB)	D2000, GRADE 1BE625
<u>STEM AND ACCESSORIES</u>			
STEM	STAINLESS STEEL	(P)	A276, TYPE 316
STEM SPLICE	STAINLESS STEEL	(P)	A276, TYPE 316
STEM BLOCK	△ SILICON BRONZE	(J)	B584, ALLOY 873
KEY	STAINLESS STEEL	(P)	A276, TYPE 316
<u>LIFT ASSEMBLY</u>			
LIFT PEDESTAL	CAST IRON	(A)	A126, CLASS B
GEARED LIFT HOUSING	CAST IRON	(A)	A126, CLASS B
CRANK ARM	CAST ALUMINUM	(R)	B26, ALLOY AA713
LIFT NUT	MANGANESE BRONZE	(K)	B584, ALLOY 865
STOP NUT	ALUMINUM	(R)	B211, ALLOY 6061-T6
CLAMP TYPE STOP COLLAR	STAINLESS STEEL	(P)	A276, TYPE 316
FASTENERS	STAINLESS STEEL	(L)	F593 (BOLTS), ALLOY GROUP 1 (304) F594 (NUTS), ALLOY GROUP 1 (304)
<u>STEM GUIDE AND WALL BRACKET</u>			
STEM GUIDE BRACKET	CAST IRON	(A)	A126, CLASS B
STEM GUIDE COLLAR	SILICON BRONZE	(J)	B584, ALLOY 873
FASTENERS	STAINLESS STEEL	(L)	F593 (BOLTS), ALLOY GROUP 1 (304) F594 (NUTS), ALLOY GROUP 1 (304)
BASE PLATE STEM GUIDE	CARBON STEEL	(V)	A36
BASE PLATE STEM GUIDE BUSHING	TIN BRONZE	(E)	B584, ALLOY 932
WALL BRACKET	CAST IRON	(A)	A126, CLASS B

COATING SPECIFICATIONS

CLEANING: STANDARD CLEAN – REMOVAL OF LOOSE RUST, MILL SCALE AND PAINT BY AIR HOSE, SCRAPING, AND WIRE BRUSH.
 BLAST CLEAN (PER STEEL STRUCTURES PAINTING COUNCIL)
NEAR WHITE BLAST GRADE SSPC-SP10

SUBMERGED COATING: AMERON, AMERLOCK 400 HIGH SOLIDS EPOXY COLOR GR-2 MEDIUM GRAY
2 - 3 SHOP COATS FOR A TOTAL DRY FILM THICKNESS OF 12 MILS MIN.

FOR THE FOLLOWING COMPONENTS:

- WALL THIMBLE GATE STEM GUIDE BRACKET
 WALL BRACKET

NON-SUBMERGED COATING: (PRIME COAT) AMERON, AMERLOCK 400 HIGH SOLIDS EPOXY COLOR GR-2 MEDIUM GRAY
ONE SHOP COATS FOR A TOTAL DRY FILM THICKNESS OF 5 MILS MIN.

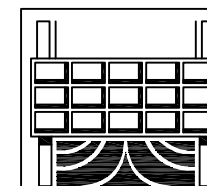
NON-SUBMERGED COATING: (TOP COAT) AMERON, AMERCOAT 450H POLYURETHANE COLOR GR-2 MEDIUM GRAY
ONE SHOP COATS FOR A TOTAL DRY FILM THICKNESS OF 3 MILS MIN.

FOR THE FOLLOWING COMPONENTS:

- CAST IRON LIFT PEDESTAL CAST IRON LIFT HOUSING
 BASE PLATE STEM GUIDE

NOTES:

- SEATING SURFACES MACHINED TO 63 MICRO-INCH FINISH.
- .004 CLEARANCE CHECK PROVIDED ON SEATING SURFACES BETWEEN FRAME AND SLIDE.
- SURFACES EMBEDDED IN CONCRETE ARE NOT PAINTED.
- WALL THIMBLES ARE STAMPED WITH THE WORD "TOP" FOR ALIGNMENT.

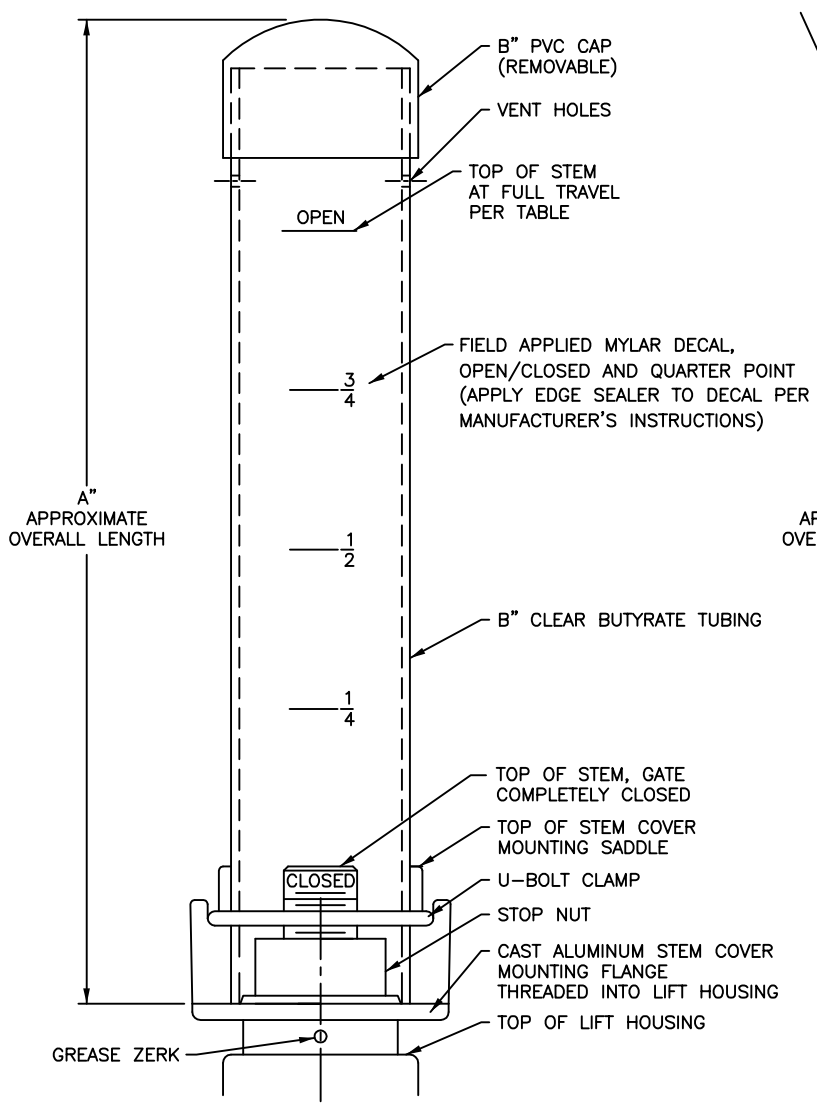


Hydro Gate

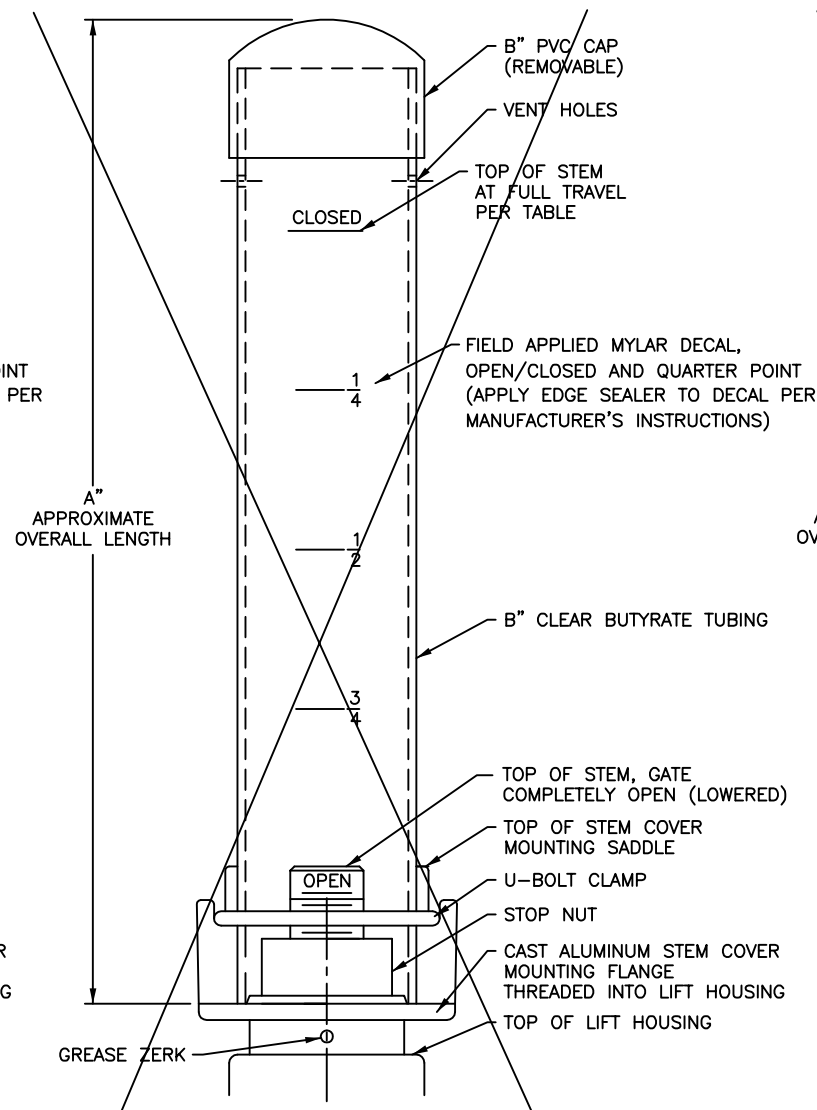
MATERIAL AND COATING SPECIFICATIONS FOR HYDRO GATE MODEL 560 HEAVY DUTY CAST IRON SLIDE GATES

THIS IS A PROPRIETARY DESIGN OF HYDRO GATE. THE DESIGN, DATA AND INFORMATION RELATING THERETO IS NOT TO BE USED, DISSEMINATED OR REPRODUCED IN WHOLE OR IN PART WITHOUT THE EXPRESS WRITTEN CONSENT OF HYDRO GATE.

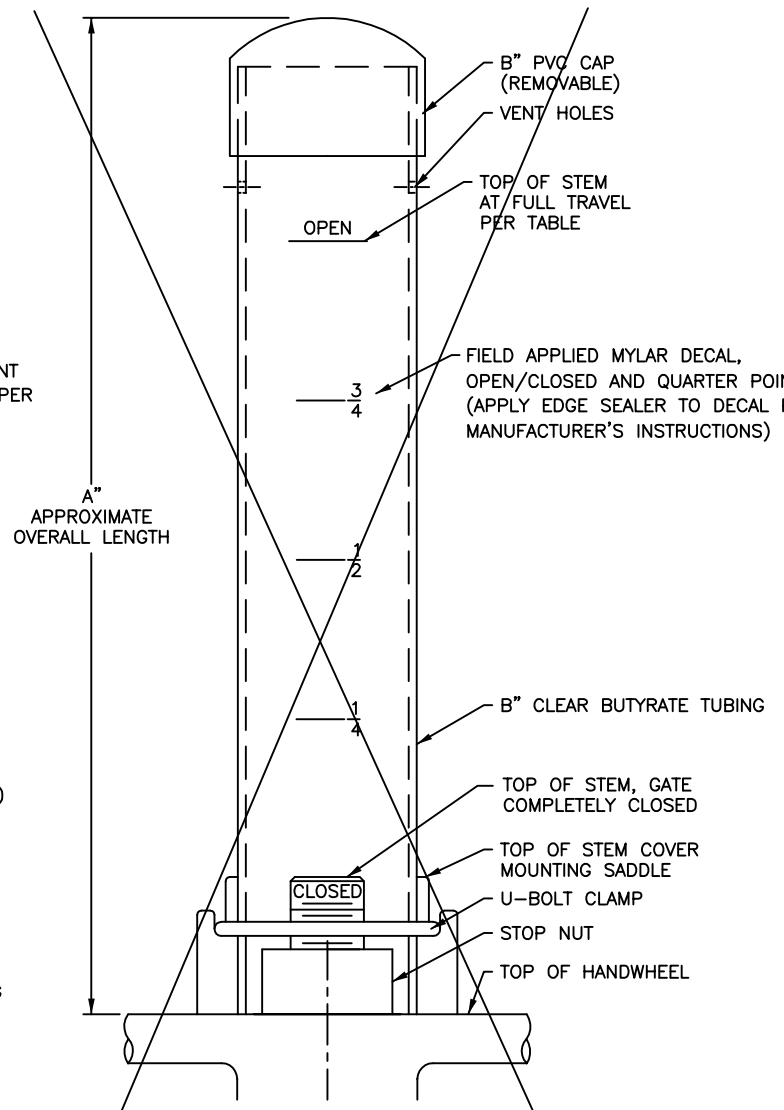
REV.	DATE	INITIALS				DRAWN BY	CUSTOMER NO.	SALES ORDER
A	7/16/11	MAA				MAA	3156-103	1412684
						CHECKED BY	DATE	DRAWING NO.
						MAA	1412684	1412684500



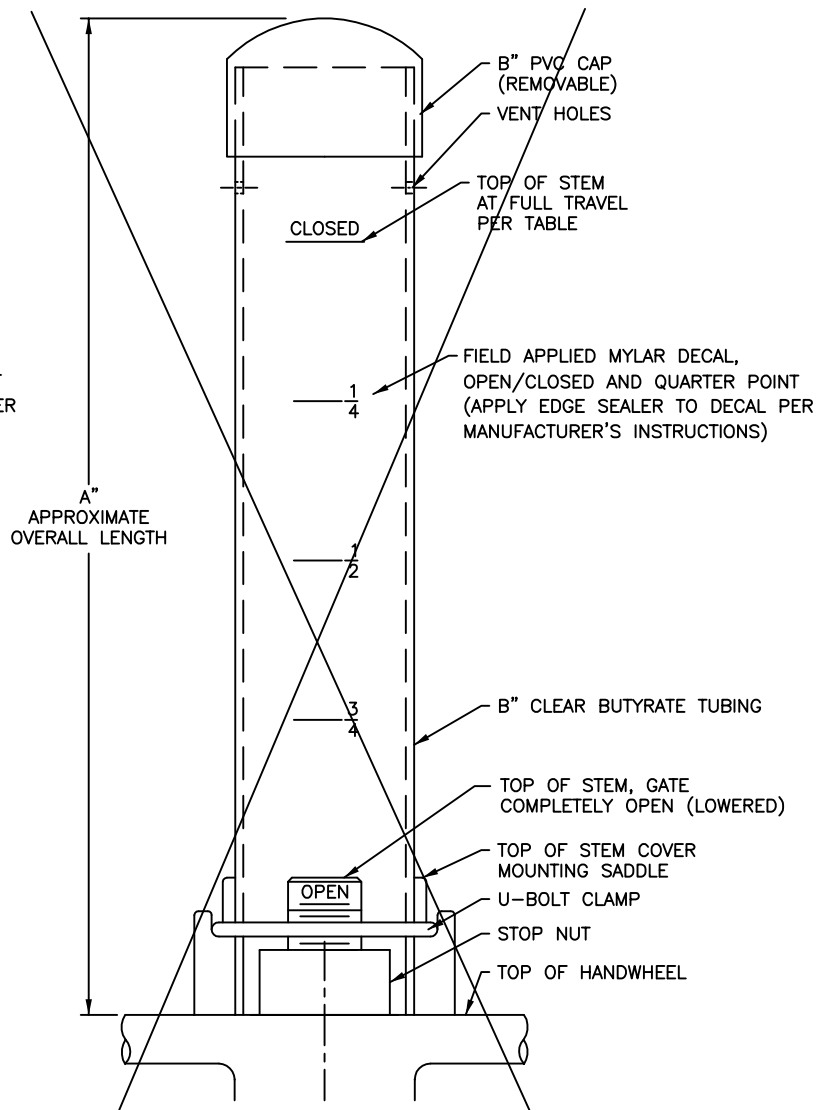
DETAIL A
TYPICAL STEM COVER FOR
MANUALLY OPERATED GEARED LIFT
UPWARD OPENING GATE



DETAIL B
TYPICAL STEM COVER FOR
MANUALLY OPERATED GEARED LIFT
DOWNWARD OPENING GATE



DETAIL C
TYPICAL STEM COVER FOR
MANUALLY OPERATED NON-GEARED LIFT
UPWARD OPENING GATE



DETAIL D
TYPICAL STEM COVER FOR
MANUALLY OPERATED NON-GEARED LIFT
DOWNWARD OPENING GATE

REFERENCE INSTALLATION DRAWING	GATE SIZE	STEM COVER DETAIL	A"	B"	FULL GATE TRAVEL	STEM COVER PART NUMBER	QUANTITY
1412684-01	36 X 36	DETAIL A	46	3	38	H34816--T	ONE
1412684-02	36 x 36 ^A	DETAIL A	46 ^A	3	36 ^A	H34816--T ^A	ONE

**CLEAR PLASTIC STEM COVER
WITH REMOVABLE CAP AND
MYLAR DECAL POSITION INDICATION**

THIS IS A PROPRIETARY DESIGN OF HYDRO GATE. THE DESIGN, DATA
AND INFORMATION RELATING THERETO IS NOT TO BE USED,
DISSEMINATED OR REPRODUCED IN WHOLE OR IN PART WITHOUT THE
EXPRESS WRITTEN CONSENT OF HYDRO GATE.

REV.	DATE	INITIALS			DRAWN BY	CUSTOMER PO.	SALES ORDER
A	7/16/11	MAA			MAA	3156-103	1412684
					CHECKED BY	DATE	DRAWING NO.
					MAA	02/13/11	1412684501

SAFETY INSTRUCTIONS FOR HYDRO GATES

When operating gates and accessories, stand clear of all moving parts, serious injury can result from contact with moving parts. Use caution when performing operations and maintenance. Watch for loose or damaged parts. Stop all functions until any damage has been corrected.

Carefully, read and follow the instructions set forth in Hydro Gate's Installation, Operation and Maintenance Manual. Do not attempt operational procedures outside those set forth in the manual.

Do not use any mechanical devices other than the factory-supplied equipment to operate gates.

WARNINGS

DO NOT – place bodily obstructions in the path of moving parts

DO NOT – use any mechanical devices other than the factory supplied equipment to operate the gates for this project.

DO NOT – operate gates before carefully reviewing the following installation, operation and maintenance manual.

DO NOT- attempt operational procedures outside those set forth in the following manual.

SAFETY

Do's & Don'ts

In order for you to insure workers' safety, we recommend that the personnel responsible for installation, operation and maintenance of the gates for this project read and study the instructions in the installation, operation and maintenance manual before the gate shipment arrives, and follow the directions carefully.

DON'T ---- Stack gates too high for storage. Always use heavy wood blocking between gates.

DO – Wear proper protective clothing when working on or around gates, i.e., hard hats, heavy boots, safety glasses, and breathing apparatus, if necessary.

DO – Use proper equipment when lifting or unloading heavy items.

DO – Adequately supported and brace heavy items during placement of gates.

DO – Contact your Hydro Gate representative with any questions you may have regarding safety in handling Hydro Gate's equipment.

WATER CONTROL GATE GUARANTEE

For a period of one year from the date indicated, Hydro Gate hereby guarantees that its water control gates will be free from defects in material and in workmanship and agrees to repair or, at its discretion, to replace any part or parts found defective within such one year, provided the Purchaser gives immediate notice of such defect, and such defect, in the opinion of Hydro Gate clearly demonstrates the existence of defective materials or workmanship.

This guarantee is applicable only if the product is properly stored and protected as prescribed by us, between the interval of its receipt by the Buyer and actual installation and if the product is properly installed and lubricated in accordance with our instructions.

The liability of Hydro Gate shall not in any case exceed the cost of repairing or replacing the defective parts. The guarantee and the remedies provided for defective parts set forth above are in lieu of and shall supersede any and all guarantees or warranties, express or implied, or remedies provided by law or otherwise (including those set forth in purchase order forms or other sales documents). In no event shall Hydro Gate be liable for loss of income, any other expenses, consequential damages or incidental damages. At the end of said one year, all liability of Hydro Gate shall cease and terminate.

Hydro Gate guarantees equipment of other manufacturers only insofar as such equipment is guaranteed to it. Information with respect to such guarantees is available on request.



INVITATION TO BID #2024-108
Intertie 2 Diversion Facility – Pump Station Expansion Project
ADDENDUM NUMBER 3
January 6, 2025

On November 26, 2024, Clackamas County (“County”) published Invitation to Bid #2024-108 (“BID”). The County has found that it is in its interest to amend the BID through the issuance of this Addendum #3. Except as expressly amended below, all other terms and conditions of the original BID and subsequent Addenda shall remain unchanged.

1. The Bid Due date is hereby changed from January 9, 2025 at 2PM to **January 14, 2025 at 2PM.**

End of Addendum



INVITATION TO BID #2024-108
Intertie 2 Diversion Facility – Pump Station Expansion Project
("BID") ADDENDUM #4
January 8, 2025

On November 26, 2024, Clackamas County ("County") published Invitation to Bid #2024-108 ("BID"). The County has found that it is in the interest to amend the BID through the issuance of this Addendum #4. Except as expressly amended below, all other terms and conditions of the original BID shall remain unchanged.

1. Section B-5: Bid Form

- a. In Section 3 Total Base Bid Price:
 - i. **Replace** text "Bid Items 1-8" with "Bid Items 1-9"

2. Section B-6: Public Improvement Contract

- a. In Section 4 Contract Dates:
 - i. **Revise** the final completion date to: January 30, 2027

3. Section B-11: Volume 1 - Technical Specifications

- a. In Section 01 10 00 - Summary of Work make the following update:
 - i. **Replace** paragraph 1.9 Railroad Crossings with:

"No WORK is allowed to cross the railroad or to be located within the railroad right-of-way. Contractor shall obtain Railroad Authorization for shoring work for the diversion structure and 54-inch gravity sewer and associated manhole. Railroad guidelines for shoring are provided in the supplementary information. The owner will pay for fees or permits associated with obtaining authorization from the railroad."

- b. In Section 01 12 16 -Work Sequence make the following updates:
 - i. **Add** the following as a new item "C" after 3.2.B:

"C. To facilitate control system software development and testing, Contractor shall procure and ship control panel HMI (Human Machine Interface: Siemens Unified Comfort Panel), and PLC (programmable logic controller) processor and power supply (Siemens S7-1500 CPU), as called out on drawings, to owner's software programmer before 2025 IT2 Pump Station shutdown."

- ii. **Replace** 3.2.K with the following (new text in red)

K. **Temporary Bypass Pumping Phase 4-Standby Pumps During IT2 Diversion Facilities Operational Testing and Commissioning:**

1. **Pump Station Shutdown and Bypass Phase 4 Timeframe:** Anticipated to be approximately from August 31st, 2026 to September 30th 2026
2. **Work Description:**
 - a. Provide temporary bypass pumping system that matches the same system as temporary bypass phase 1 and 3 and sheet C-100, except that the pump system is intended for standby use and not continuous operation. These pumps will be on standby and ready for operation if there are any equipment failures or deficiencies during the operational testing period of startup.
 - b. **The work required at the pump station includes, but is not limited to, the following**
 - 1) **Application Software Testing.**
 - 2) **Operational Testing.**
3. **Contractor shall reserve 2 weeks in the schedule for application software testing after functional testing is complete and before operational testing can commence.**

c. In Section 01 75 16 – Testing, Training, and System Startup make the following updates:

- i. **Replace 1.3.B.1 with the below language (new text in red)**

B. Testing and Startup Plan:

1. Not less than 30 Days prior to performing field testing, the CONTRACTOR shall submit for review a detailed Testing Plan. The Plan shall include schedules for equipment certifications, schedules for submitting final Operations and Maintenance Manuals, schedule for training the OWNER's personnel, list of OWNER furnished supplies or equipment, electrical testing schedule, and detailed schedule of operations to achieve successful field testing, functional acceptance testing, **application software testing**, and activities to implement the operational test. |

- ii. **Add new part 1.10:**

1.10 APPLICATION SOFTWARE TESTING SUPPORT

- A. Description: Application software testing refers to testing PLC (Programmable Logic Controller) and HMI (Human Machine Interface) software integration with IT2 Pump Station equipment and instrumentation.
 - B. Application software testing can commence upon successful acceptance of functional acceptance test report.
 - C. Application software testing includes the following tests:
 - 1. Software Functional Test part 2 (FT2) which repeats the contractor functional testing of PLC IO (input/output signals) to ensure proper installation and integration.
 - 2. Software Functional Acceptance Test (FAT) which tests the PLC and HMI software functions on a loop-by-loop basis. FAT includes operating equipment and instruments to fully vet the PLC and HMI software.
 - D. Contractor shall support application software testing with equipment and instrumentation availability, responsive troubleshooting, and process staging for equipment operation.
- iii. In part 1.11-Operational Testing (originally part 1.10), replace part A with the following (new text in red)

1.11 OPERATIONAL TESTING

- A. Following operator training, functional testing, **and software testing support**, conduct operational testing of the entire facility. Demonstrate satisfactory operation of equipment and systems in actual operation.
- d. **Add** Section 26 23 13 – Low Voltage Paralleling Switchgear to the specifications and add the specification title to the table of contents for the project.
- e. In Section 03 30 00 – Cast-in-Place Concrete Work:
- i. **Replace** part 2.7.A with the below language:

2.7 RELATED MATERIALS

- A. Waterstops
 - 1. Provide flat, or centerbulb type waterstops at construction joints and other joints as shown. Size to suit joints or as shown. Provide PVC waterstops complying with Corps of Engineer's CRD-C 572. Waterstops provided to be Sika Greenstreak 679 or approved equal. Split face waterstops will not be acceptable under any circumstances.
 - 2. For new concrete cast against existing concrete and around cast-in pipes, provide a continuous, non-bentonite, hydrophilic waterstop with a CJ-0725-3K profile. Hydrophilic strips shall be Sika Hydrotite or approved equal. Follow manufacturer guidelines for proper installation and adhesive requirements appropriate for bonding surface.

- ii. **Add** part 3.15:

3.15 DIVERSION STRUCTURE EXFILTRATION HYDROSTATIC TESTING

- A. Hydrostatic exfiltration test shall be performed on the Diversion Structure Extension and the Existing Diversion Structure main chamber to test for leakage of the new 54-inch pipe penetration. Fill the structure with water after the 28-day design strength of the concrete has been obtained and all piping connections have been made and have been temporarily plugged. Groundwater shall be lowered by the Contractor during the duration of the test.
 - 1. If the excavation has not yet been backfilled and observation indicates no visible leakage after four hours, the structure may be considered to be satisfactorily water-tight.
 - 2. If the test described above is unsatisfactory or if the wet well excavation has been backfilled, the test shall be continued. The structure shall be refilled and up to 24 hours may be permitted to allow for absorption, if requested by the Contractor. At the end of this period, the wet well shall be refilled to the top, if necessary, and a measuring time of at least eight hours begun.
 - 3. At end of the test period, the structure shall be refilled to the top and the volume of water added shall be measured. This amount shall be extrapolated to a 24-hour rate and the leakage determined on the basis of depth.
- B. Leakage shall not exceed 0.1 percent of the volume contained in the chamber in a 24-hour period. Any structure with leakage in excess of the allowable amount shall be considered not watertight and shall be repaired to reduce leakage.
- C. In the event that the structure is not watertight, outline a procedure for repair prior to proceeding with the repair work. Repair any visible leakage. Complete any repairs to new work as per specifications at the CONTRACTOR's expense.
- D. Approved repairs can include, but not necessarily be limited to, one or a combination of the following. Use of these techniques is not to be construed as a warranty by the ENGINEER declaring that the methods outlined will satisfy leakage repair requirements.
 - 1. Replace defective concrete.
 - 2. Grouting of the joint by drilling grout holes to the center of the structural unit and forcing grout into the joint under pressure.

3. Cutting of a bevel groove on the pressure side of the joint. Groove 1/2 to 3/4 inch in width and depth caulked with epoxy joint sealer in accordance with the manufacturer's instructions.

E. Repeat leakage test until a test satisfactory to the ENGINEER has been achieved.

f. **Replace** Section 31 23 19 – Dewatering with the attached version.

g. In Section 33 34 00 – Sanitary Utility Sewerage Force Mains part 2.3 **add** a subsection E:

“E. In plant, vaults and above grade piping, fittings and valves shall be provided with nuts and bolts hot dip galvanized per ASTM F2329.”

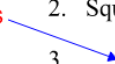
h. **Replace** Section 40 05 59.21 – Slide Gates **with** the attached version.

i. In Section 40 05 13 – Common Work Results for Process Piping, **modify** the language in part 2.6.v Bolts and Nuts as shown:

v. Bolts and Nuts:

1. Bolts shall be ASTM **A 307** Grade B with
AST **A 563A** heavy hex nuts **and ASTM F844 washers.**

In-plant, vaults 2. Square or hexagonal heads according to ANSI B18.2.1.

3.  and above grade piping, fittings and valves shall be provided with nuts and bolts hot dip galvanized per ASTM F2329.

j. In Section 40 92 00 – Control Panels and Components **make** the following **updates** to part 2.4.A.3.a.2) (new text in **red**)

3. Temperature Control:

a. Freestanding Panels:

1) Nonventilated Panels: Size to adequately dissipate heat from equipment mounted inside panel and on panel.

2) Ventilated Panels:

a) Furnish with louvers and forced ventilation as required to prevent temperature buildup from equipment mounted inside panel and on panel.

b) Required for panels with uninterruptable power supplies (UPS) installed in them.

c) Ventilation Fans:

(1) Furnish where required to provide adequate cooling.

(2) Create positive internal pressure within panel.

(3) Fan motor power: 120 VAC, 60-Hz, thermostatically controlled.

(4) For panels with UPSs installed in them, be sure fan placement forces air across the UPS.

d) Air Filters: Washable aluminum.

k. **Add** Section 43 41 43.2 – Chemical Feed Storage Tank to the specifications and add the specification title to the table of contents for the project.

4. Section B-11: Volume 2 – Supplementary Information

a. **Add** the attached item I – Summary of Pump Test Results and Review of Dewatering Requirements Pump Station and Diversion Structure, September 3, 2010. This technical memorandum was completed during the original design phase of the existing pump station.

b. **Add** the attached item K – Switchgear Submittal and O&M, Caterpillar Project #36368. This submittal and O&M is from the original construction phase of the IT2 pump station and provides additional information on the existing switchgear.

c. **Add** the attached item L – MCC Submittal and O&M. This submittal and O&M is from the original construction phase of the IT2 pump station and provides additional information on the existing MCC.

d. **Add** the attached item M – UPRR Guidelines for Temporary Shoring. This design guide provides requirements for shoring near a railroad and is relevant to the diversion structure construction.

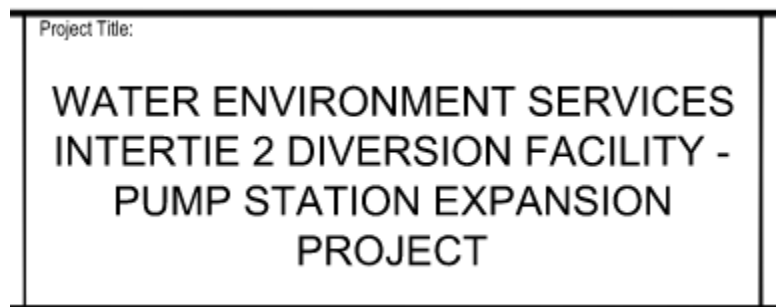
5. Section B-11: Volume 3 - Drawings

a. Sheet G-005

- i. **Add** note #18 to the GENERAL NOTES:
“18. FORCE MAIN PIPING SHALL BE PRESSURE TESTED AT 150 PSI”

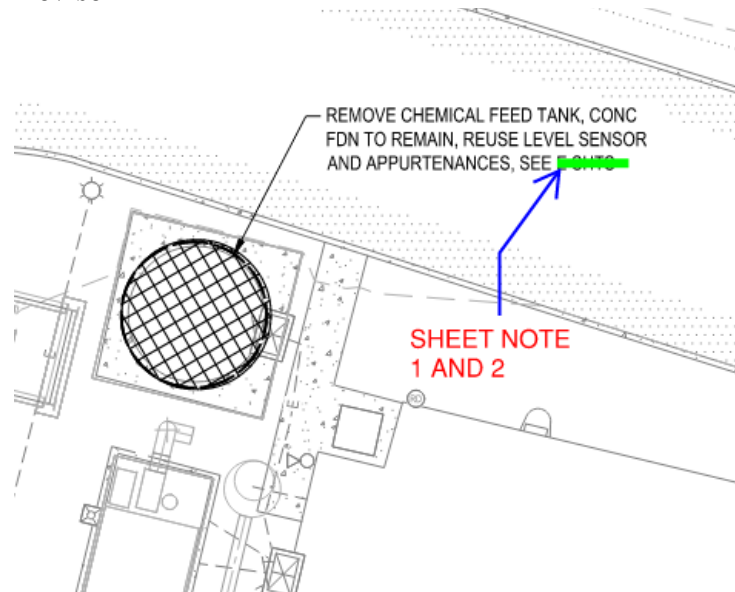
b. Sheet C-100

- i. **Replace** Project Title in title block with correct project title:



c. Sheet C-110

- i. **Revise** chemical feed tank removal callout to the following:



- ii. **Add** “NOTES” with notes 1 and 2 being:
“1. CONTRACTOR SHALL CAREFULLY REMOVE CHEMICAL FEED PUMP SYSTEM, LEVEL INSTRUMENT, AND CONTAINMENT BASIN FOR REUSE ON NEW CHEMICAL TANK. CONTRACTOR SHALL RETURN EXISTING STORAGE TANK TO OWNER.

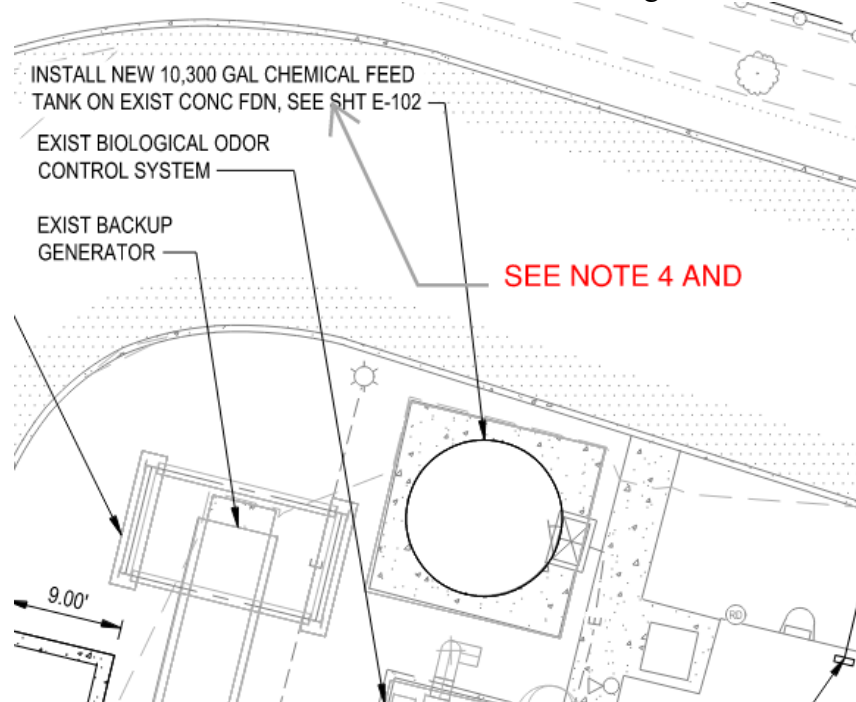
2. COORDINATE WITH OWNER TO DRAW DOWN TANK PRIOR TO TANK DEMOLITION ACTIVITIES. THE REMAINING CHEMICAL AT THE BOTTOM OF THE TANK CAN BE PUMPED OUT AND DISPOSED OF BY THE CONTRACTOR INTO THE GRAVITY SEWER SYSTEM UPSTREAM OF THE WET WELL. COORDINATE WITH OWNER AND OWNER'S REPRESENTATIVE ON THIS ACTIVITY.”

d. Sheet C-111

i. **Add** note 3 to the “NOTES”:

“3. CONTRACTOR SHALL PROVIDE ALL LABOR, MATERIALS AND EQUIPMENT NECESSARY TO DEWATER TRENCH AND STRUCTURE EXCAVATIONS IN ACCORDANCE WITH THE REQUIREMENTS OF THE CONTRACT DOCUMENTS. IT IS ANTICIPATED THAT THE ENTIRE PUMP STATION YARD PIPING AND VAULT CONSTRUCTION AREAS WILL REQUIRE DEWATERING WITH DEEP WELLS, WELLPOINTS AND/OR SUMP PUMPS. SEE SPECIFICATION 31 23 19.”

ii. **Revise** chemical feed tank callout to the following:

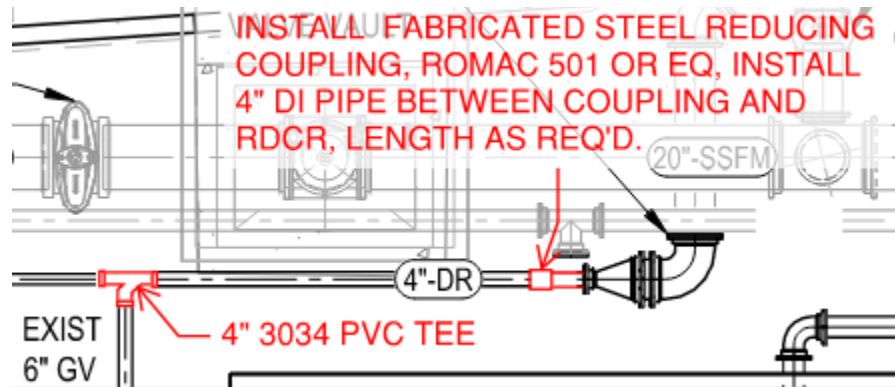


iii. **Add** note 4 to the “NOTES”:

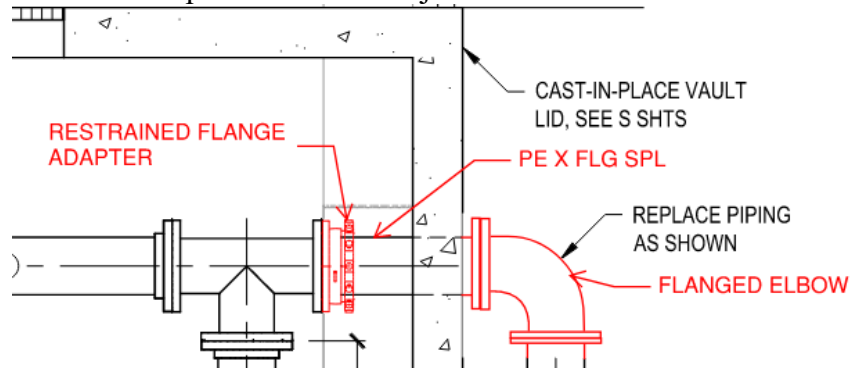
“4. CONTRACTOR SHALL REUSE CHEMICAL FEED PUMP SYSTEM, LEVEL INSTRUMENT, AND CONTAINMENT BASIN THAT WERE REMOVED FROM EXISTING TANK AND REINSTALL ON NEW TANK, WITH SOME MODIFICATIONS OR ADJUSTMENTS AS

IDENTIFIED BELOW:

- a. REINSTALL LEVEL TRANSDUCER, SIGNAL WIRES AND CONDUIT AND EXTEND AS NEEDED, SEE ELECTRICAL AND I&C SHEETS.
 - b. RECONNECT PIPING TO CONTAINMENT BASIN
 - c. RECONNECT ALL PIPING FOR CHEMICAL FEED PUMP SYSTEM TO NEW PIPING ON NEW TANK.
 - d. BURIED DISCHARGE PIPING TO WET WELL SHALL NOT BE DAMAGED DURING DEMOLITION AND SHALL BE RECONNECTED TO.
- e. Sheet C-113
- i. **Revise** the 4" drain piping as shown below:

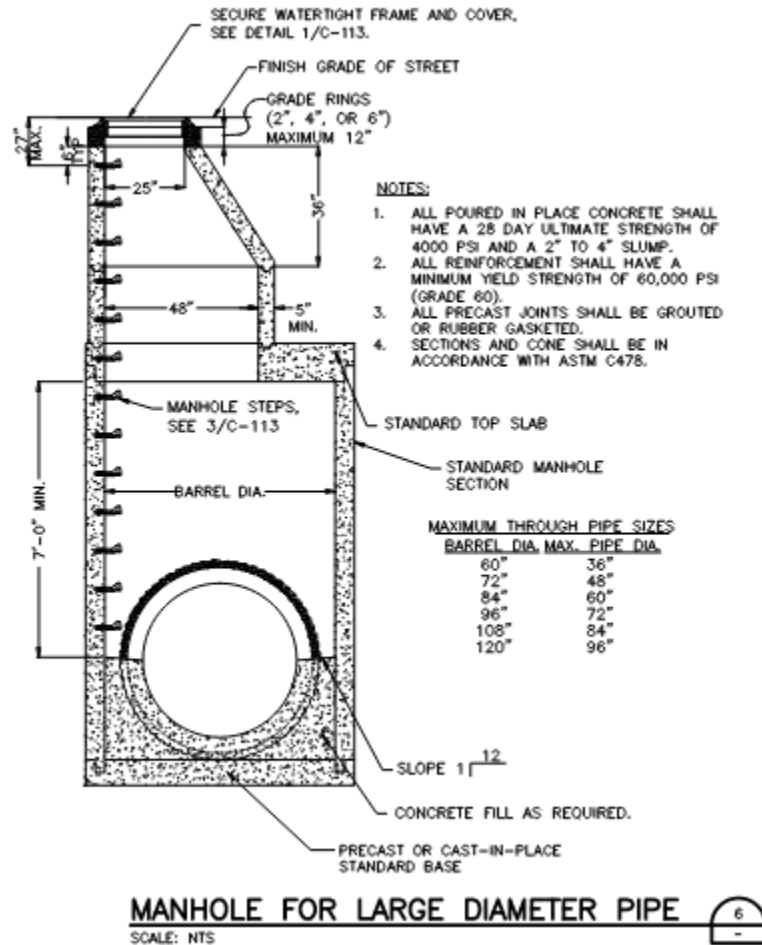


- f. Sheet C-121
 - i. **Replace** with the attached sheet.
- g. Sheet C-413
 - i. **Revise** the exposed mechanical joint as shown below:



h. Sheet C-501:

i. **Add** the following as detail 6:



i. Sheet C-502:

i. **Replace** Note #7 of the NOTES on Detail 1, Sheet C-502 with the following (new text in red):

“REPLACE REMOVED ASPHALT **AT THE IT2 PUMP STATION SITE** PER DETAIL 3 ON SHEET C-501.

ii. **Add** note #8 to the NOTES of Detail 1, Sheet C-502:

“8. FOR RESTORATION OF EXISTING PAVED SURFACES WITHIN TRI-CITY TREATMENT PLANT SITE AND AGNES AVENUE, ASSOCIATED WITH FORCE MAIN IMPROVEMENTS SHOWN ON SHEET FM-C130, PROVIDE PERMANENT T-CUT TRENCH PATCH AS SHOWN WITH 1' (MIN) T-CUT WIDTH PAST TRENCH LIMITS ON EITHER SIDE, AND MATCH EXISTING PAVEMENT THICKNESS FOR UP TO 6" THICKNESS WITH NEW LEVEL 3 HMAC. PROVIDE 2" THICK TEMPORARY TRENCH

PATCH PAVING PRIOR TO COMPLETING PERMANENT TRENCH RESTORATION AS REQUIRED BY WES AND OREGON CITY FOR TEMPORARY RESTORATION OF ROADWAY WITHIN THE TREATMENT PLANT SITE AND AGNES AVENUE, RESPECTIVELY.

j. Sheet S-320

i. **Replace** with the attached sheet.

k. Sheet S-501

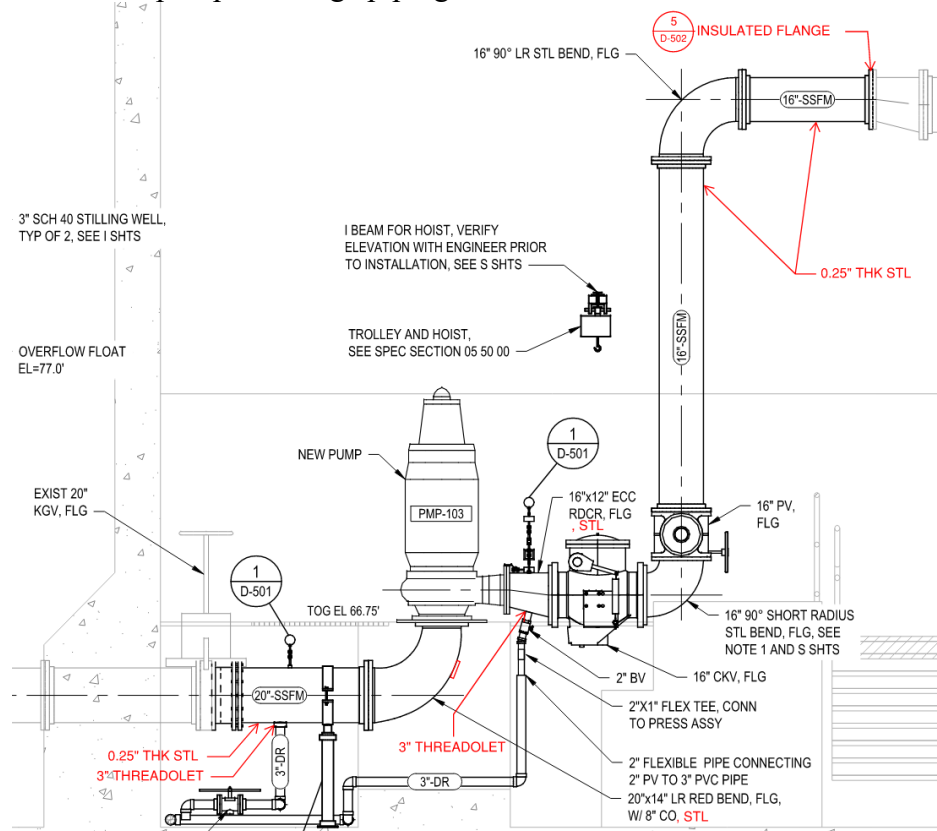
i. **Replace** with the attached sheet.

l. Sheet S-503

i. **Replace** with the attached sheet.

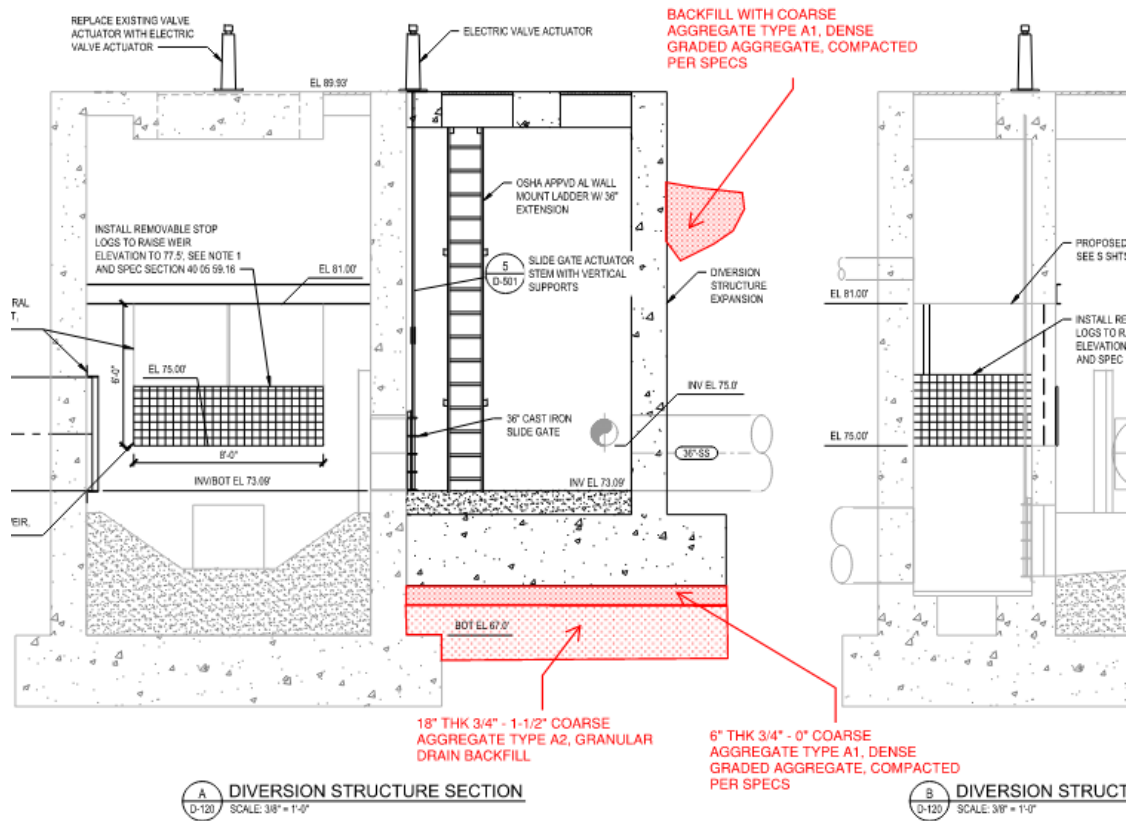
m. Sheet D-310

i. **Revise** the pump discharge piping as shown:



n. Sheet D-320

i. **Add** the following linework and callout notes for bedding and backfill requirements for the Diversion Structure extension:

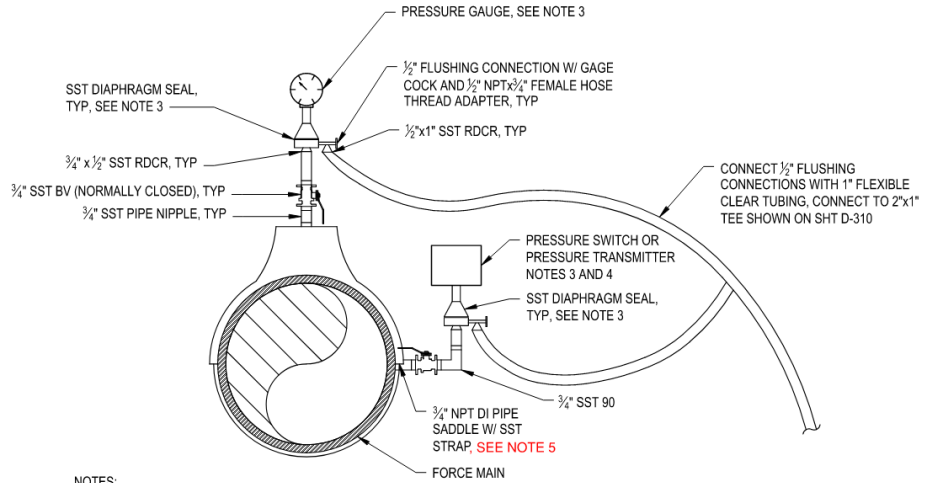


ii. **Add note 2:**

“2. AN ENGINEERED SHORING SYSTEM WILL BE REQUIRED FOR CONSTRUCTION OF DIVERSION STRUCTURE EXTENSION, REFER TO SPECIFICATION 31 50 00-EXCAVATION SUPPORT AND PROTECTION”

o. Sheet D-501:

i. **Revise detail 1 as shown:**



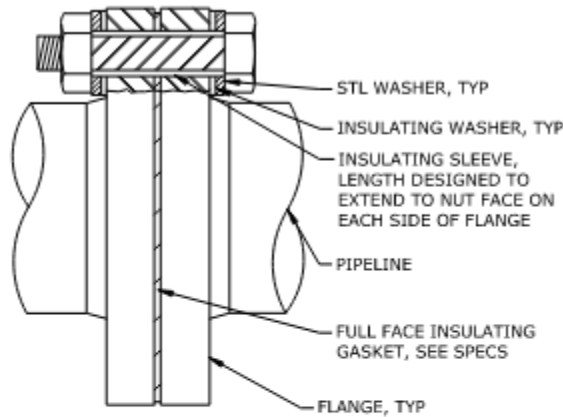
NOTES:

1. ALL PIPE AND FITTINGS SHALL BE SCHEDULE 80 STAINLESS STEEL WITH THREADED ENDS.
2. INSTALL PRESSURE GAUGE AND DIAPHRAGM SEAL PER MANUFACTURERS' REQUIREMENTS.
3. INSTALL BOOTH PRESSURE GAUGE AND PRESSURE SWITCH ASSEMBLY AT PUMP DISCHARGE PIPING. FOR ALL OTHER INSTALLATIONS, ONLY INSTALL PRESSURE GAUGE ASSEMBLY, DO NOT INSTALL PRESSURE SWITCH OR FLUSHING CONNECTION.
4. SEE CONTRACT DOCUMENT 40 91 00 INSTRUMENT LIST FOR MANUFACTURER INFORMATION.
5. FOR STEEL PIPE, PROVIDE THREAOLET INSTEAD OF SADDLE.

1 PRESSURE GAUGE ASSEMBLY
SCALE: NTS

p. Sheet D-502:

i. **Add** the following as detail 5:



NOTES:

1. ABOVE GRADE INSULATING FLANGE INSTALLATION SHOWN
2. FOR BURIED OR SUBMERGED INSULATING FLANGE INSTALLATION INSTALL INSULATING WASHER ON ONE SIDE OF INSULATING FLANGE (PROTECTED SIDE PREFERRED)
3. FOR BURIED OR SUBMERGED INSULATING FLANGES, COMPLETELY ENCASE WITH GEOMEMBRANE PER SPECS, AND THEN ENCASE WITH POLYETHYLENE WRAP, OVER LAPPING GEOMEMBRANE AT EACH END

INSULATED FLANGE
SCALE: NTS

q. Sheet I-001:

- i. **Replace** with the attached sheet.
- r. Sheet FM-C-130:
 - i. **Replace** KEY NOTE #1 (at STA G1+00) with the following (new text in red):

“STA G1+00
FURNISH & INSTALL:
1-30” DI 45° VERT DISCHARGE BEND, **FLG**, IN WET WELL
1-30” DI FLG X PE, SPL, LENGTH AS REQ’D
SEE NOTE 10””
 - ii. **Add** note #10 to the NOTES:

“10. PROVIDE STAINLESS STEEL HARDWARE AND ISOLATION KITS FOR FLANGE CONNECTION WITHIN EXISTING WET WELL PER GENERAL NOTE 17 ON SHEET G-005, AND COAT EXTERIOR OF 30” DI PIPE AND FITTING INSTALLED IN WET WELL PER COATING SYSTEM # 101 PER SECTION 09 90 00, PAINTING AND COATING.”
- s. Sheet FM-C-131:
 - i. **Replace** trench backfill and pavement restoration related text above profile view shown with the following (new text in red):

“SEE DET 1, SHT **C-502** FOR TRENCH B-FILL & AC RESTORATION REQUIREMENTS, SEE NOTE 3.”

End of Addendum #4

Addendum #4

Supplementary Information

I – SUMMARY OF PUMP TEST RESULTS AND REVIEW OF
DEWATERING REQUIREMENTS-PUMP STATION AND DIVERSION
STRUCTURE, (2010)



9725 SW Beaverton-Hillsdale Hwy, Suite 140
Beaverton, OR 97005-3364
p| 503-641-3478 f| 503-644-8034

MEMORANDUM

To: Nesh Mucibabic / HDR Engineering, Inc.
(*nesh.mucibabic@hdrinc.com*)

Date: September 3, 2010

GRI Project No.: 5000

From: Dwight Hardin, PE, GE; Gene Tupper, PE, GE; and Teresa Nowicki, RG

Re: Summary of Pump Test Results and Review of Dewatering Requirements
Pump Station and Diversion Structure
Clackamas Sanitary Sewer Intertie 2
Clackamas, Oregon

This memorandum summarizes the results of a pump test on the Intertie 2 pump station site. The purpose of the test was to assist with characterization of dewatering requirements for construction of the Intertie 2 pump station. As requested by HDR Engineering, Inc. (HDR), GRI collected groundwater samples for chemical analysis at the conclusion of the pumping test.

GRI conducted a geotechnical investigation to evaluate subsurface conditions along the alignment of the Clackamas Sewer Intertie 2 Diversion project. Subsurface conditions disclosed by the geotechnical investigation are summarized in our July 27, 2010, Geotechnical Data Report (GDR) to HDR entitled, "Geotechnical Data Report, Clackamas County Water Environment Services (WES), Clackamas Sewer Intertie 2 Diversion, Project A: Pump Station, Diversion Structure, and Diversion Pipeline, Project B: 20- and 30-in. Force Mains, Clackamas County, Oregon." GRI also prepared a Geotechnical Baseline Report (GBR), which discusses design and construction of the project with respect to the subsurface conditions disclosed by the geotechnical investigation. The July 27, 2010, GBR is entitled, Clackamas County Water Environment Services (WES), Clackamas Sewer Intertie 2 Diversion, Project A: Pump Station, Diversion Structure, and Diversion Pipeline, Project B: 20- and 30-in. Force Mains, Clackamas County, Oregon."

Background

As currently planned, the proposed Intertie 2 pump station will be located on the east half of the undeveloped lot located at the northwest corner of SE Johnson Road and an unnamed private road, approximately 1,000 ft north of the intersection of Highway 224 and SE Johnson Road. The general configuration of the pump station, diversion structure, and connecting pipeline, are provided on the Plan and Profile, Figure 1, and Site Plan, Figure 2.

As part of the geotechnical investigation, GRI completed two borings, designated borings B-03 and B-04, on the pump station site in August 2009. GRI completed boring B-1 near the diversion structure at the north end of the pipe alignment in October 2009.

In a November 5, 2010, memorandum to HDR entitled, "Dewatering Review and Pumping Test, Pump Station and Diversion Structure, Clackamas Sanitary Sewer Intertie 2, Clackamas, Oregon," we provided an estimate of the dewatering requirements for the pump station excavation based on our experience in

the vicinity of the site and with similar materials, the gradation of the soils disclosed by the borings, the groundwater table near the ground surface, and a 30-ft-deep excavation. The method of estimating groundwater flow was based on assumptions of the permeability of the soil and the radius of influence during dewatering. Permeability of the soil can vary within a soil unit and is difficult to estimate on the basis of standard classification tests, such as grain size analyses. In this regard, the presence of discrete, more-permeable lenses of materials, such as a layer of relatively clean sand, can significantly influence the overall permeability of a much larger unit. In addition, the radius of influence during pumping is greatly influenced by the permeability of the soil. For these reasons, the initial dewatering estimate was considered an order of magnitude estimate, and we recommended performing a pump test at the pump station site to further evaluate dewatering requirements.

Geology

The Mt. Scott Creek drainages are mantled with alluvium consisting of Quaternary lacustrine and fluvial sediments. These deposits primarily consist of unconsolidated to semi-consolidated silt, sand, gravel, cobbles, and boulders (Schlicker and Finlayson, 1979). The thickness of the sediments is variable and may extend to depths of 250 to 500 ft near the site.

Subsurface Conditions

Subsurface conditions at the pump station site were initially explored with two borings, designated borings B-03 and B-04, using a sonic drill rig, and at the diversion structure with boring B-1 using mud-rotary drilling methods. The borings were drilled in 2009. The locations of the borings are shown on Figures 1 and 2. Observation standpipes consisting of slotted 2-in.-OD PVC pipe were installed in borings B-03, B-04, and B-1. For the pump test, two additional borings, designated B-06 and B-07, were drilled on the pump station site between August 10 and 17, 2010, using an Ingersoll Rand Atlas Copco TH60 air rotary drill rig provided and operated by Skyles Well Drilling of Oregon City, Oregon. Boring B-06 was the pumping well, and boring B-07 was an observation well. Subsurface materials and conditions encountered in the borings are summarized on Figures 3 through 7.

In general, the borings indicate the area is mantled to a depth of a few feet with a variable thickness of medium stiff to stiff silt. The silt contains a variable clay content, ranging from a trace of clay to clayey, a trace of fine-grained sand, and occasional to frequent cobbles. The silt is underlain by very dense, rounded to subrounded gravel in a matrix of silt and sand. Although not encountered in the borings, it should be assumed that cobbles and boulders are present in the gravel. Locally, a layer of relatively clean sand was encountered in boring B-03 between a depth of 9 and 11 ft. As part of the geotechnical investigation, GRI completed grain size analyses of several samples from borings B-03 and B-04; the results are provided in the GDR. Samples of the gravel cuttings obtained during drilling of borings B-06 and B-07 were not suitable for gradation analysis. However, visual examination of the cuttings indicates the gravel materials are consistent with the materials disclosed by our previous explorations on the site. Borings B-03, B-04, and B-07, were terminated in the gravel at a depth of about 50 ft. Boring B-06 encountered a deeper layer of silt at a depth of 58 ft and was terminated in silt at a depth of 60 ft. The deeper silt is gray and contains some rounded to subrounded gravel and a trace of fine-grained sand.

Groundwater was encountered in the borings at the time of drilling. Standpipes installed in the borings permit the measurement of groundwater over time. The static groundwater levels measured in the standpipes are summarized in the table below.

Exploration:	<u>B-1</u>	<u>B-03</u>	<u>B-04</u>	<u>B-06</u>	<u>B-07</u>
Approximate Ground Surface Elevation, ft:	88	86	85	86	86
Date Exploration Completed:	10/1/09	8/20/09	8/21/09	8/11/10	8/16/10
<u>Depth to Static Groundwater, ft ⁽¹⁾</u>					
At Time of Drilling ⁽²⁾	See Note 3	6.5	7.0		
10/5/09		3.0	2.8		
10/6/09	4.1				
10/30/09	3.3	2.7	2.3		
12/15/09	1.8	1.4	1.4		
3/4/10	2.8	2.0	1.8		
8/19/10	4.23	3.07	2.71	3.14	2.86

- Notes: 1) Depth to groundwater below ground surface.
2) Based on appearance of sampler.
3) Boring drilled using mud-rotary techniques, which precludes measurement of groundwater level at time of drilling.

The near-surface groundwater aquifer at and near the pump station site is unconfined and assumed to be contained in the gravel at the site. We estimate the thickness of the aquifer to be 400 ft.

Pump Test

A pump test was conducted in the pumping well B-06 between August 17 and 19, 2010. The pump test was performed by Steve's Pump Service (SPS) of Boring, Oregon, using an AquaDUTY 25AV1S4 submersible pump fitted with an in-line flow meter. The pump was installed with the intake at a depth of 53 ft. SPS measured flow rates and drawdown in observation well B-06 throughout the pump test. Drawdown was measured using an electronic probe lowered into the casing of the pumping well. Prior to the steady-state pump test, SPS conducted a flow rate test, and determined the pumping rate of the pumping well B-06 to be 14.5 gpm. This pumping rate achieved a steady-state drawdown of approximately 48 ft below the top of the casing. The pump lost suction if the water level was lowered to 50 ft below the top of the casing, or 48 ft below the ground surface. Operating the pump at higher rates resulted in pumping the well dry. Upon completion of the flow rate test, the pumping and observation wells were allowed to recover to 90% of the static water level before starting the steady-rate pump test. The steady-state pump test was then conducted at about 14.5 gpm for 20 hours. During the steady-state pump test, SPS initially measured the water level in the pumping well every 2 min. After 30 min., the reading interval was increased to 15 min.; and after 5 hrs, the reading interval was increased to 30 to 60 min. Prior to the pump test, GRI installed vibrating-wire piezometers with in-place data loggers in observation wells B-03, B-04, and B-07, to monitor the groundwater levels during the pump test. GRI also obtained hand-measured water levels at intermittent intervals during the test in these three observation wells and in observation well B-1 located near the diversion structure and about 610 ft north of the pump station site.

During the steady-state pump test, GRI measured water levels in observation wells B-03, B-04, and B-07, on the pump station site and in observation well B-1 near the diversion structure. Following the steady-state pump test, water levels were measured in the wells as the water level recovered. The static, or initial, water levels and water levels at the end of the steady-state pump test are tabulated below. The water levels measured in the pumping and observation wells during pumping and recovery are summarized graphically on Figure 8. Tabulated water level drawdown and recovery data for the pumping well and observation wells is attached, with the flow-rate pump test data obtained from boring B-06.

SUMMARY OF INITIAL AND FINAL WATER LEVELS

<u>Well No.</u>	<u>Type of Well</u>	<u>Approximate Surface Elev., ft</u>	<u>Depth to Static Water Level, ft (8-19-10)</u>	<u>Depth to Water at End of Pump Test, ft (8-18-10)</u>
B-03	Observation	86	3.07	5.04
B-04	Observation	85	2.71	4.82
B-06	Pumping	86	3.14	45.6
B-07	Observation	86	2.86	14.43
B-1	Observation	88	4.23	4.24

Note: All depths to water level measured from the ground surface.

At your request, GRI collected groundwater samples from the pumping well and four observation wells immediately prior to termination of the steady-state pump test. The samples were sent to a laboratory for chemical analysis. The test results will be forwarded to HDR in a separate memorandum.

Conclusions and Recommendations

The pump test was performed at a discharge rate of 14.5 gpm; higher pumping rates resulted in pumping the well dry. Observation wells on the pump station site were located at radial distances of 25, 53, and 104 ft from the pumping well. An additional observation well is located near the diversion structure, about 600 ft north of the pumping well. Drawdown data shown on Figure 8 indicate equilibrium was approached in the pumping well B-06 and observation well B-07 after approximately 3 hours of pumping, and in observation wells B-03 and B-04 after approximately 4 hours of pumping. The water level at observation well B-1 was essentially unchanged during the pump test. Based on the drawdown measured in the observation wells, we estimate the radius of influence is about 150 ft. In addition, the response of the water levels in the observation wells during testing suggests the hydraulic conductivity of the gravel is largely controlled by the fines content of the gravel matrix and possibly discontinuous sand layers.

In our November 5, 2009, memorandum, we estimated the volume of water that could potentially enter the pump station excavation could be on the order of 500 gpm, assuming the groundwater table is near the ground surface and the depth of excavation is about 30 ft. The depth of excavation for the pump station is currently estimated to be 30 to 35 ft. The pump test data indicate the volume of water that could enter the pump station excavation will be of similar magnitude, although likely less, than was noted in our November 5, 2009, memorandum.

In addition to dewatering wells, dewatering of the pump station and other deep excavations can be facilitated by the placement of an 18- to 24-in.-thick drainage blanket over the bottom of the excavation and pumping from sumps. Clean crushed rock of 3/4- to 1 1/2-in. gradation and having less than 2% passing the No. 200 sieve (washed analysis) is suitable for this purpose.

The pump test wells in borings B-06 and B-07 are registered with the Oregon Water Resources Department (OWRD) as dewatering wells. OWRD requires that dewatering wells be re-registered annually or decommissioned. Current dewatering well registration expires in August 2011. Wells placed in borings B-1, B-03, and B-04, are registered with OWRD as monitoring wells. The pumping well B-06 and monitoring well B-07 are located outside of the anticipated excavation limits of the pump station and

have been completed so that they can be used as construction dewatering wells, it is also understood that the wells in borings B-06 and B-07 may be re-registered with OWRD as permanent irrigation wells.

Wells that will not be used during or after construction of the project should be decommissioned by a well driller licensed in Oregon and in accordance with OWRD regulations. Wells that will be used beyond the end of construction should be appropriately registered with OWRD.

Limitations

The recommendations provided in this memorandum should be considered an addendum to our July 27, 2010, Geotechnical Data Report (GDR) and Geotechnical Baseline Report (GBR) and subject to the limitations stated therein.

Please contact GRI if you have any questions or require any additional information.

Submitted for GRI,



Dwight J. Hardin, PE, GE
Principal

A handwritten signature in cursive script that reads "Gene M. Tupper".

Gene M. Tupper, PE, GE
Senior Engineer



Teresa A. Nowicki, RG
Staff Geologist

Reference

Schlicker, H.G., and Finlayson, C.T., 1979, Geology and Geologic Hazards of Northwestern Clackamas County, Oregon: Oregon Department of Geology and Mineral Industries, Bulletin 99.

This document has been submitted electronically.

SUMMARY OF PUMP TEST RESULTS

Pump Station and Diversion Structure
Clackamas Sanitary Sewer Intertie 2

B-06 (Pumping Well)

Flow Rate Test

<u>Elapsed Time, min.</u>	<u>Depth to Water, ft</u>	<u>Drawdown, ft</u>	<u>Pumping Rate, gpm</u>	<u>Comments</u>
0	5.5	0	5.4	
2	9.25	3.75	5.4	
4	11.33	5.83	5.4	
6	13	7.5	5.4	
8	14	8.5	5.4	
10	14.83	9.33	5.4	
15	16	10.5	5.4	
20	16.75	11.25	5.4	
25	17.25	11.75	5.4	
30	17.58	12.08	5.4	
45	27.17	21.67	10	
60	29	23.5	32	Wide open, broke suction at 50 ft (vortex)
75	47.5	42	15	
90	48	42.5	15	
105	48.42	42.92	14.5	
120	48.33	42.83	14.5	Stop test and let recover

Depth to water measured from top of casing

Pump Test Results Pumping Well B-06

<u>Elapsed Time, min.</u>	<u>Depth to Water, ft</u>	<u>Drawdown, ft</u>	<u>Pumping Rate, gpm</u>	<u>Elapsed Time, min.</u>	<u>Depth to Water, ft</u>	<u>Drawdown, ft</u>	<u>Pumping Rate, gpm</u>
0	7.83	0.00	16.3	900	47.83	40.00	14.4
2	16.50	8.67	14.4	930	47.58	39.75	14.4
4	21.83	14.00	14.4	960	47.33	39.50	14.4
6	25.75	17.92	14.4	990	46.67	38.84	14.4
8	28.92	21.08	14.4	1020	46.33	38.50	14.4
10	30.00	22.17	14.4	1050	45.50	37.67	14.2
15	32.50	24.67	14.6	1080	47.00	39.17	14.6
20	33.50	25.67	14.5	1110	47.17	39.34	14.4
25	36.58	28.75	14.5	1140	47.00	39.17	14.4
30	37.67	29.83	14.5	1170	47.00	39.17	14.4
45	40.00	32.17	14.5	1200	47.67	39.84	14.25
60	42.33	34.50	14.3	1202	40.75	32.92	
75	42.42	34.58	14.3	1204	37.58	29.75	
90	42.92	35.08	14.3	1206	32.83	25.00	
105	44.17	36.33	14.3	1208	30.00	22.17	
120	44.25	36.42	14.3	1210	26.00	18.17	
135	45.79	37.96	14.4	1215	16.83	9.00	
150	45.25	37.42	14.4	1220	12.67	4.83	
165	45.50	37.67	14.3	1225	10.58	2.75	
180	45.25	37.42	14.2	1230	9.33	1.50	
195	46.00	38.17	14.5	1245	7.75	-0.08	
210	46.17	38.33	14.5	1260	7.00	-0.83	
225	46.00	38.17	14.3	2409	5.21	-2.62	
240	46.42	38.59	14.4				
255	46.29	38.46	14.4				
270	45.92	38.09	14.3				
300	44.83	37.00	14.2				
330	45.08	37.25	14.4				
360	44.67	36.83	14.4				
390	45.50	37.67	14.4				
420	45.25	37.42	14.2				
450	45.00	37.17	14.4				
480	45.83	38.00	14.4				
510	45.17	37.34	14.4				
570	45.83	38.00	14.4				
630	45.00	37.17	14.3				
690	46.00	38.17	14.7				
720	46.00	38.17	14.6				
780	45.25	37.42	14.3				
810	46.58	38.75	14.6				
840	45.00	37.17	14				
870	47.17	39.34	14.8				

Depth to water measured from top of casing

**Pump Test Results
Observation Well B-03**

<u>Elapsed Time, min.</u>	<u>Depth to Water, ft</u>	<u>Drawdown, ft</u>	<u>Elapsed Time, min.</u>	<u>Depth to Water, ft</u>	<u>Drawdown, ft</u>
0	3.24	0	1240	3.72	0.48
13	3.66	0.42	1245	3.64	0.4
16	3.77	0.53	1250	3.57	0.33
18	3.84	0.6	1255	3.52	0.28
21	3.9	0.66	1261	3.47	0.23
24	3.95	0.71	1271	3.43	0.19
26	4	0.76	1282	3.38	0.14
29	4.07	0.83	1290	3.33	0.09
32	4.1	0.86	1317	3.23	-0.01
34	4.14	0.9	1397	3.1	-0.14
39	4.2	0.96	2416	2.87	-0.37
44	4.27	1.03			
49	4.3	1.06			
55	4.35	1.11			
59	4.37	1.13			
75	4.46	1.22			
92	4.52	1.28			
102	4.54	1.3			
111	4.56	1.32			
122	4.58	1.34			
143	4.59	1.35			
153	4.59	1.35			
170	4.59	1.35			
183	4.62	1.38			
212	4.63	1.39			
242	4.71	1.47			
487	4.76	1.52			
884	4.86	1.62			
903	4.88	1.64			
963	4.91	1.67			
1024	4.84	1.6			
1082	4.85	1.61			
1136	4.83	1.59			
1191	4.84	1.6			
1199	4.84	1.6			
1216	4.44	1.2			
1218	4.39	1.15			
1221	4.23	0.99			
1223	4.19	0.95			
1226	4.08	0.84			
1231	3.91	0.67			
1235	3.81	0.57			

Depth to water measured from top of casing

**Pump Test Results
Observation Well B-04**

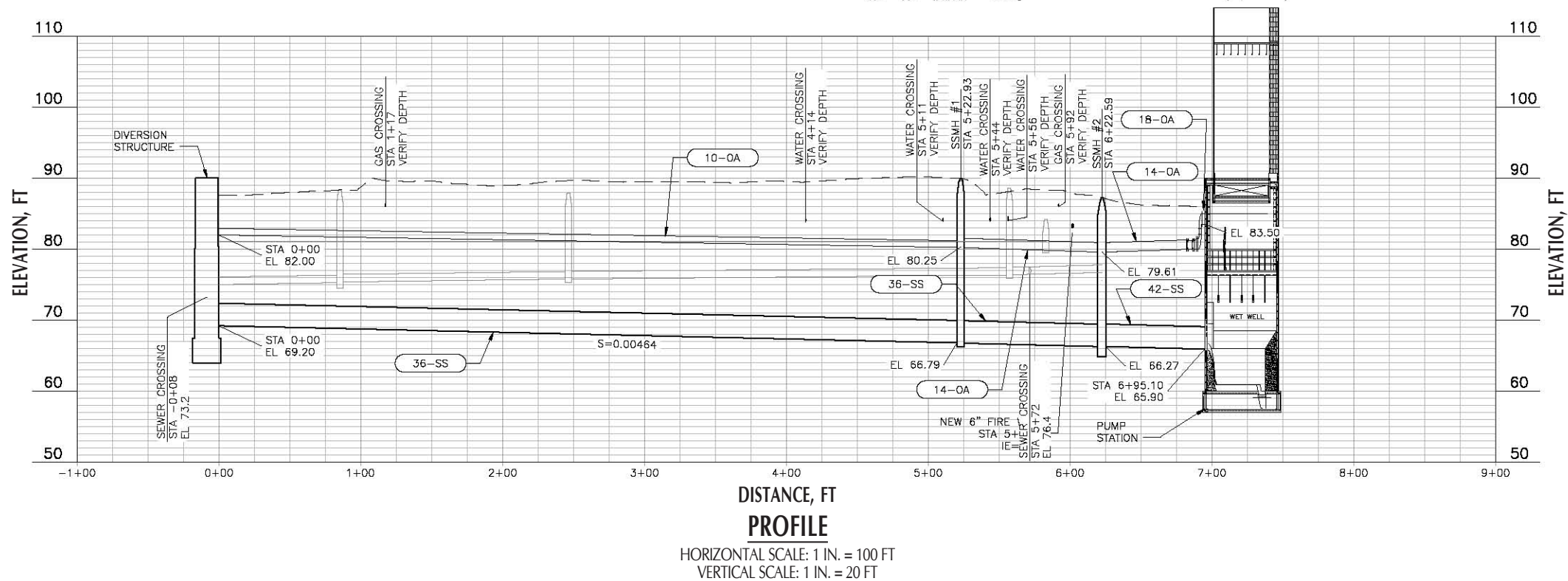
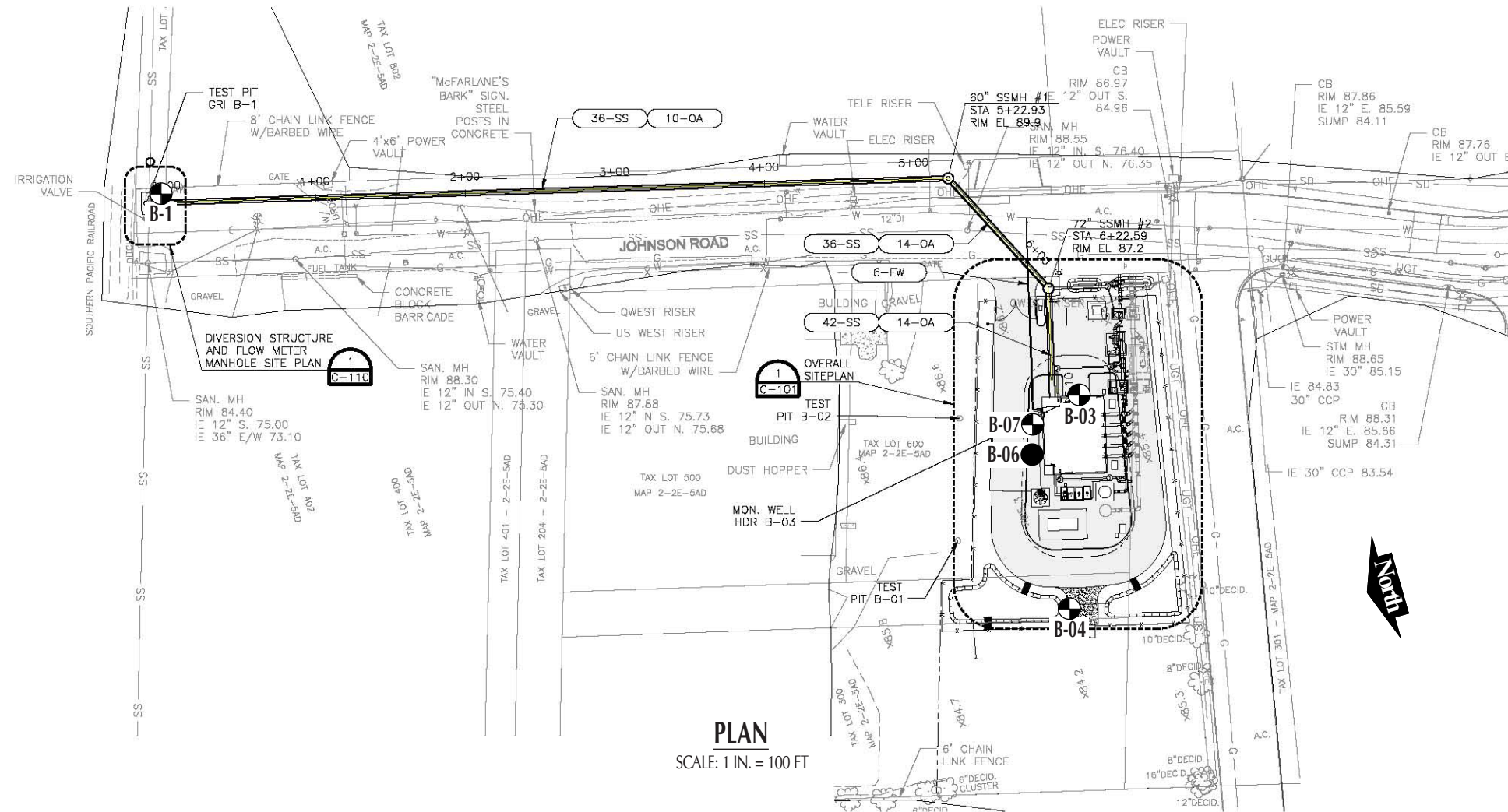
<u>Elapsed Time, min.</u>	<u>Depth to Water, ft</u>	<u>Drawdown, ft</u>
0	4	0
36	4.51	0.51
41	4.57	0.57
46	4.62	0.62
51	4.7	0.7
56	4.76	0.76
61	4.78	0.78
77	4.88	0.88
94	4.92	0.92
104	4.93	0.93
113	4.99	0.99
124	5.01	1.01
145	5.03	1.03
155	5.04	1.04
171	5.06	1.06
185	5.07	1.07
214	5.08	1.08
237	5.11	1.11
490	5.16	1.16
880	5.18	1.18
898	5.19	1.19
958	5.21	1.21
1026	5.22	1.22
1084	5.29	1.29
1138	5.2	1.2
1189	5.17	1.17
1199	5.17	1.17
1233	3.99	-0.01
1237	3.94	-0.06
1242	3.83	-0.17
1246	3.78	-0.22
1252	3.67	-0.33
1258	3.63	-0.37
1262	3.6	-0.4
1273	3.53	-0.47
1284	3.5	-0.5
1292	3.45	-0.55
1321	3.35	-0.65
1378	3.31	-0.69
2403	3.06	-0.94

Depth to water measured from top of casing

**Pump Test Results
Observation Well B-07**

<u>Elapsed Time, min.</u>	<u>Depth to Water, ft</u>	<u>Drawdown, ft</u>	<u>Elapsed Time, min.</u>	<u>Depth to Water, ft</u>	<u>Drawdown, ft</u>
0	6.11	0	1134	16.45	10.34
1	6.72	0.61	1193	16.66	10.55
2	6.88	0.77	1199	16.6	10.49
3	7.15	1.04	1201	16.68	10.57
4	7.6	1.49	1202	16.6	10.49
5	8.09	1.98	1203	16.78	10.67
6	8.52	2.41	1204	16.67	10.56
7	9.12	3.01	1205	16.1	9.99
8	9.39	3.28	1206	15.94	9.83
9	9.88	3.77	1207	15.89	9.78
12	10.79	4.68	1208	15.83	9.72
14	11.47	5.36	1209	15.6	9.49
17	11.98	5.87	1210	15.35	9.24
19	12.5	6.39	1211	15	8.89
22	12.93	6.82	1212	14.62	8.51
25	13.26	7.15	1213	14.14	8.03
28	13.63	7.52	1214	13.67	7.56
31	13.93	7.82	1217	12.78	6.67
33	14.13	8.02	1219	11.86	5.75
38	14.54	8.43	1222	10.93	4.82
43	14.83	8.72	1224	10.23	4.12
48	15.14	9.03	1227	9.49	3.38
53	15.28	9.17	1229	9.17	3.06
58	15.45	9.34	1234	8.37	2.26
74	15.74	9.63	1238	7.87	1.76
83	15.85	9.74	1244	7.45	1.34
90	15.92	9.81	1249	7.06	0.95
100	16.01	9.9			
110	16.07	9.96			
120	16.15	10.04			
142	16.22	10.11			
152	16.23	10.12			
167	16.25	10.14			
182	16.27	10.16			
210	16.32	10.21			
240	16.31	10.2			
484	16.31	10.2			
885	16.43	10.32			
900	16.38	10.27			
961	16.67	10.56			
1023	16.41	10.3			
1080	16.39	10.28			

Depth to water measured from top of casing

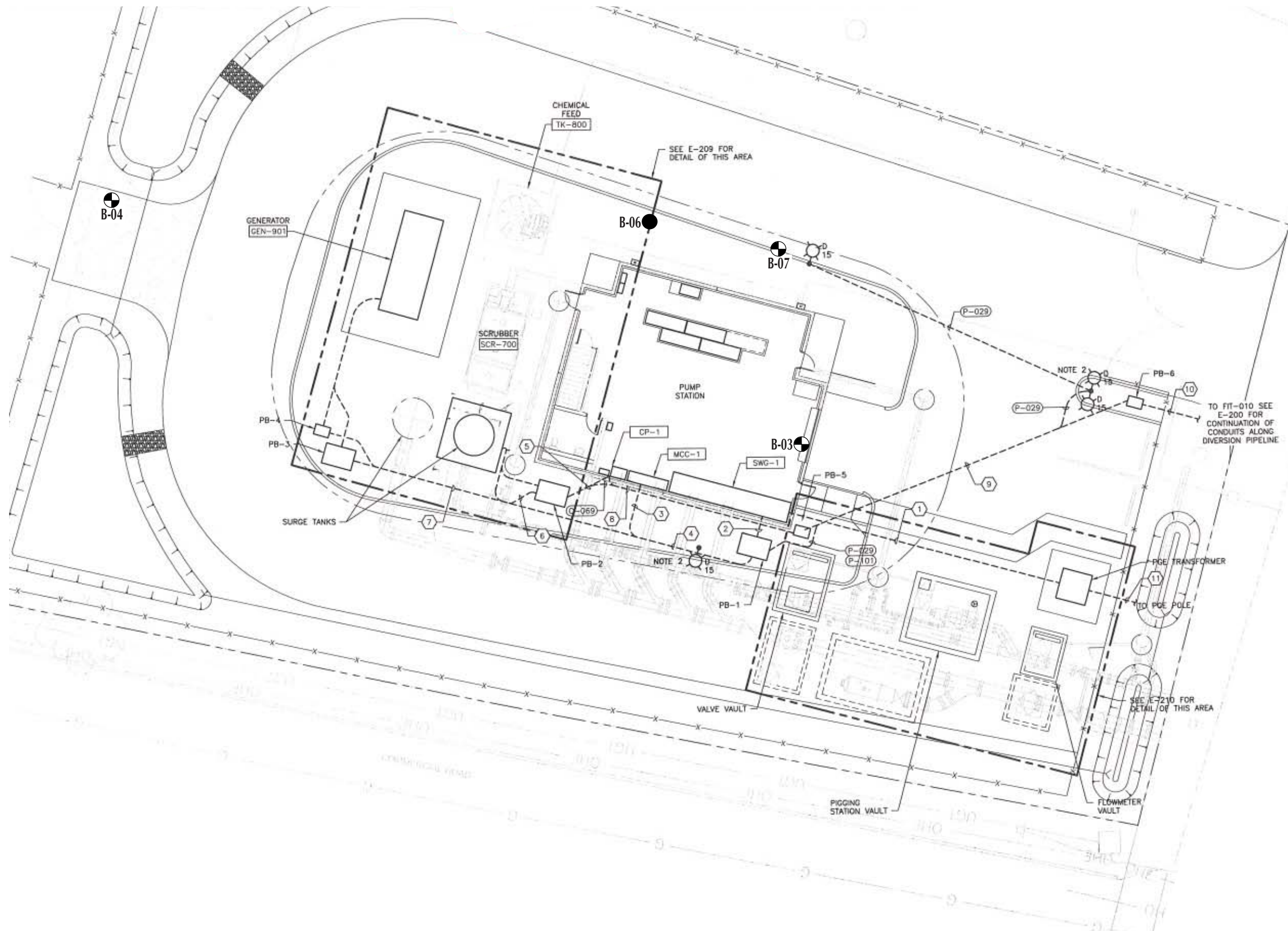


- PUMPING WELL
- ◐ OBSERVATION WELL

PLAN AND PROFILE FROM FILE OF 90% DESIGN DOCUMENTS BY HDR ENGINEERING, INC., DATED JULY 2010

GRI HDR ENGINEERING, INC.
CLACKAMAS COUNTY SANITARY SEWER

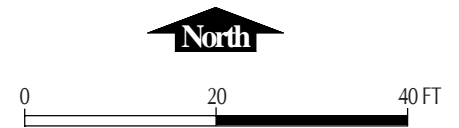
PLAN AND PROFILE



- PUMPING WELL
- ⊕ OBSERVATION WELL

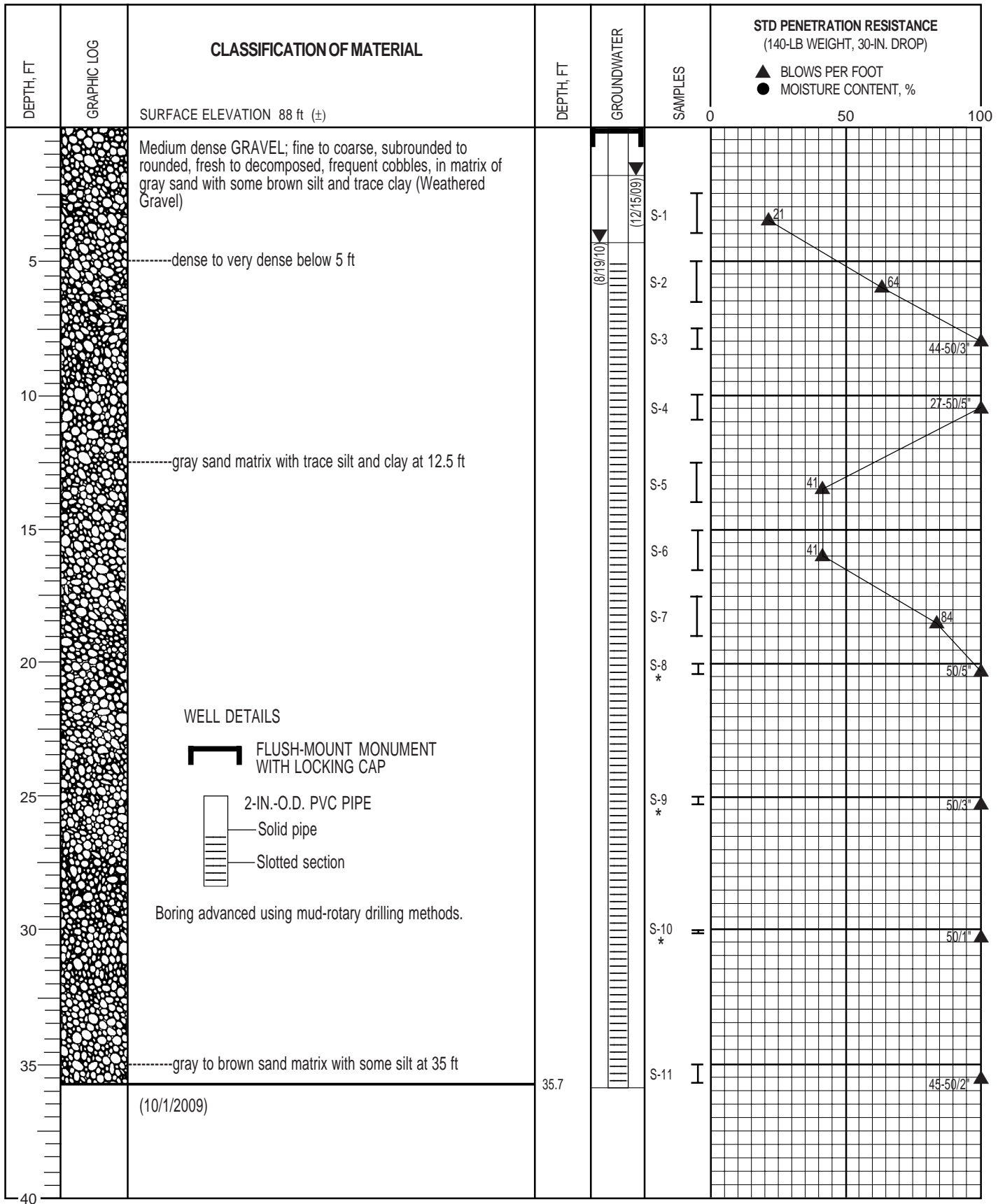
NOTE: BORING B-1 NOT SHOWN

SITE PLAN FROM FILE BY HDR ENGINEERING, INC., DATED JULY 30, 2010



GRI HDR ENGINEERING, INC.
CLACKAMAS COUNTY SANITARY SEWER

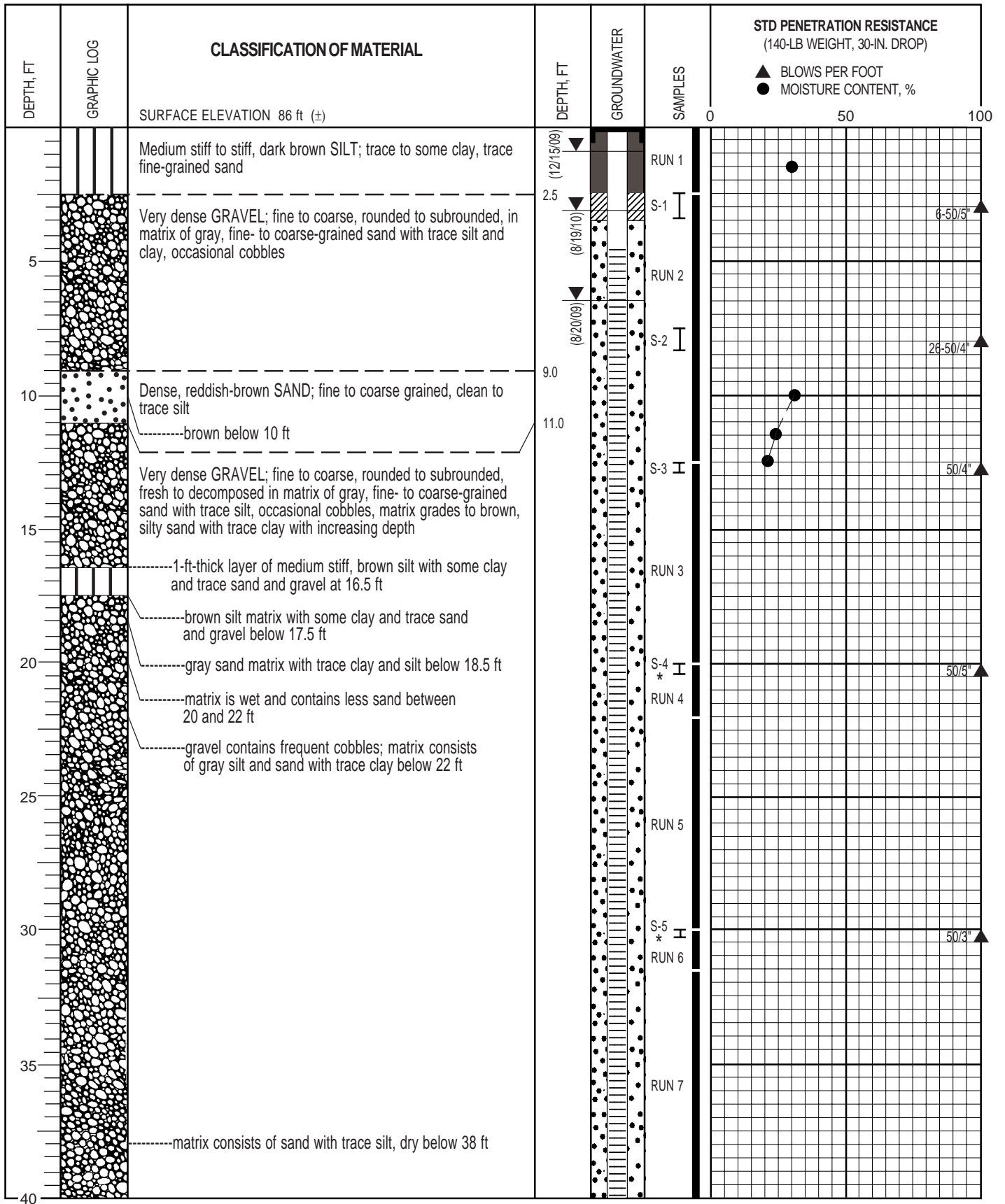
SITE PLAN
(PUMP STATION)



- I 2-IN.-OD SPLIT-SPOON SAMPLER
- II 3-IN.-OD THIN-WALLED SAMPLER
- III 3-IN.-OD SPLIT-SPOON SAMPLER
- G GRAB SAMPLE OF DRILL CUTTINGS
- SLOTTED PVC PIPE
- ▼ Water Level (date)
- ◆ TORVANE SHEAR STRENGTH, TSF
- UNDRAINED SHEAR STRENGTH, TSF
- * NO RECOVERY
- Liquid Limit
- Moisture Content
- Plastic Limit



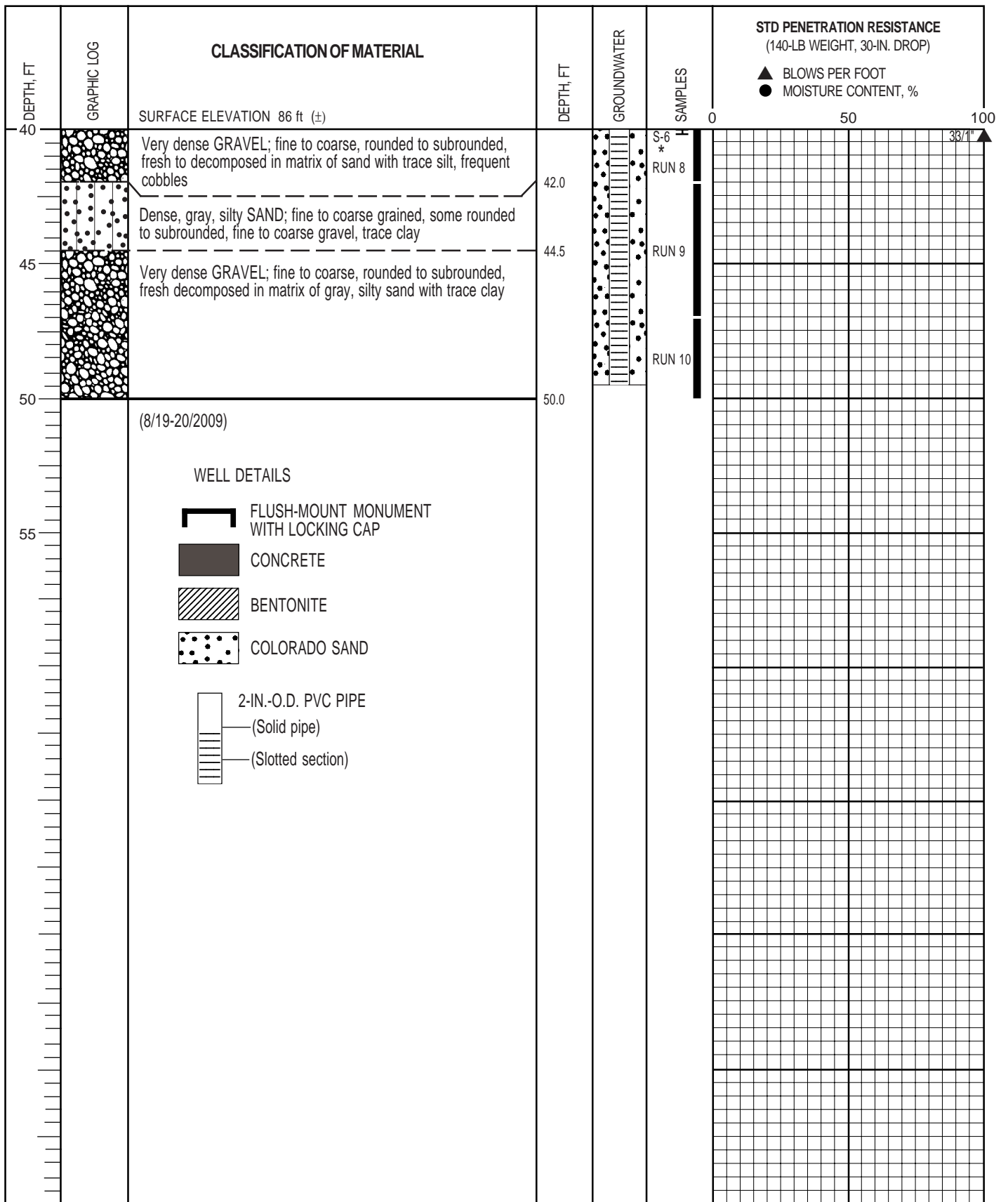
BORING B-1
(OBSERVATION WELL)

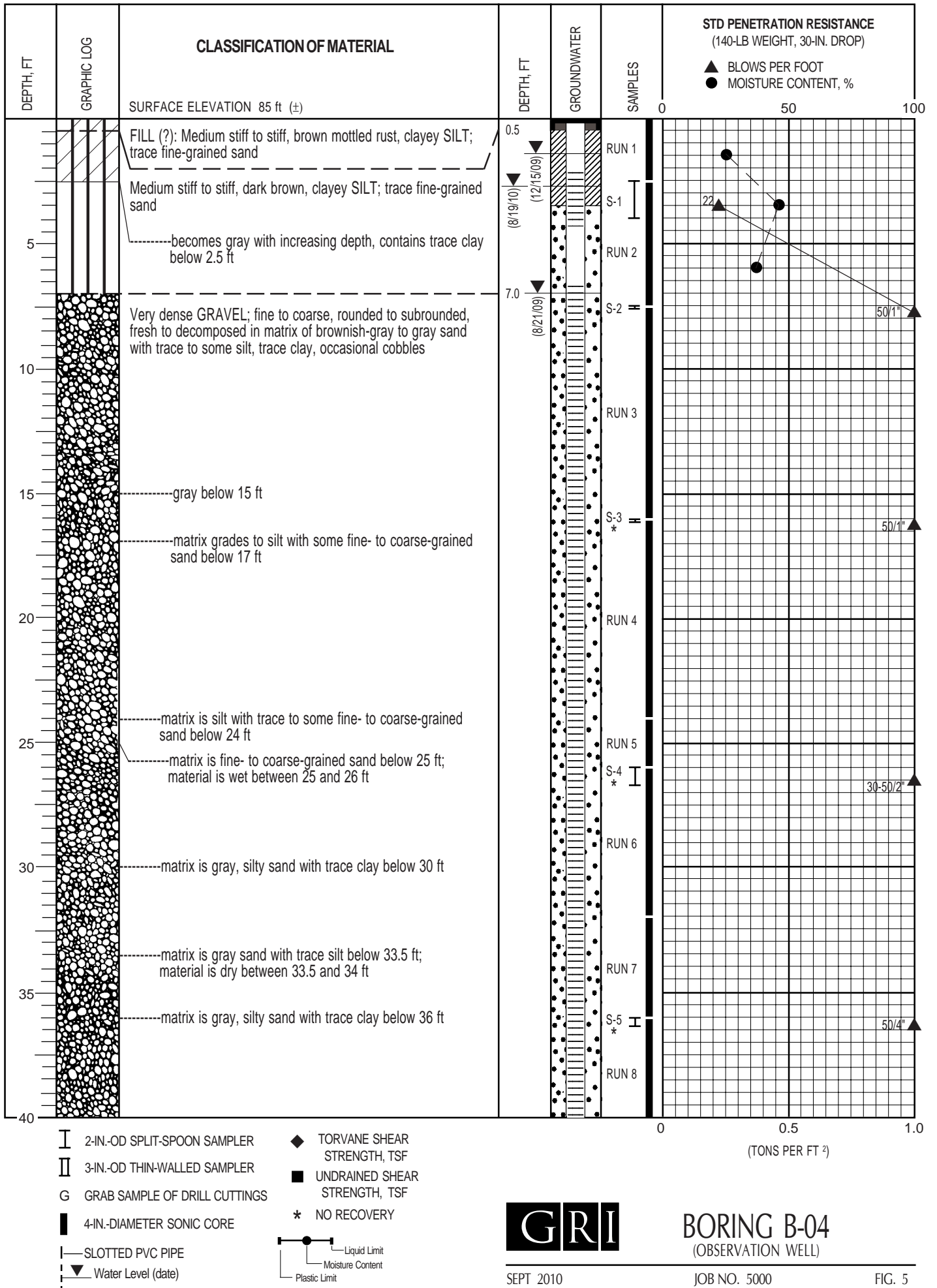


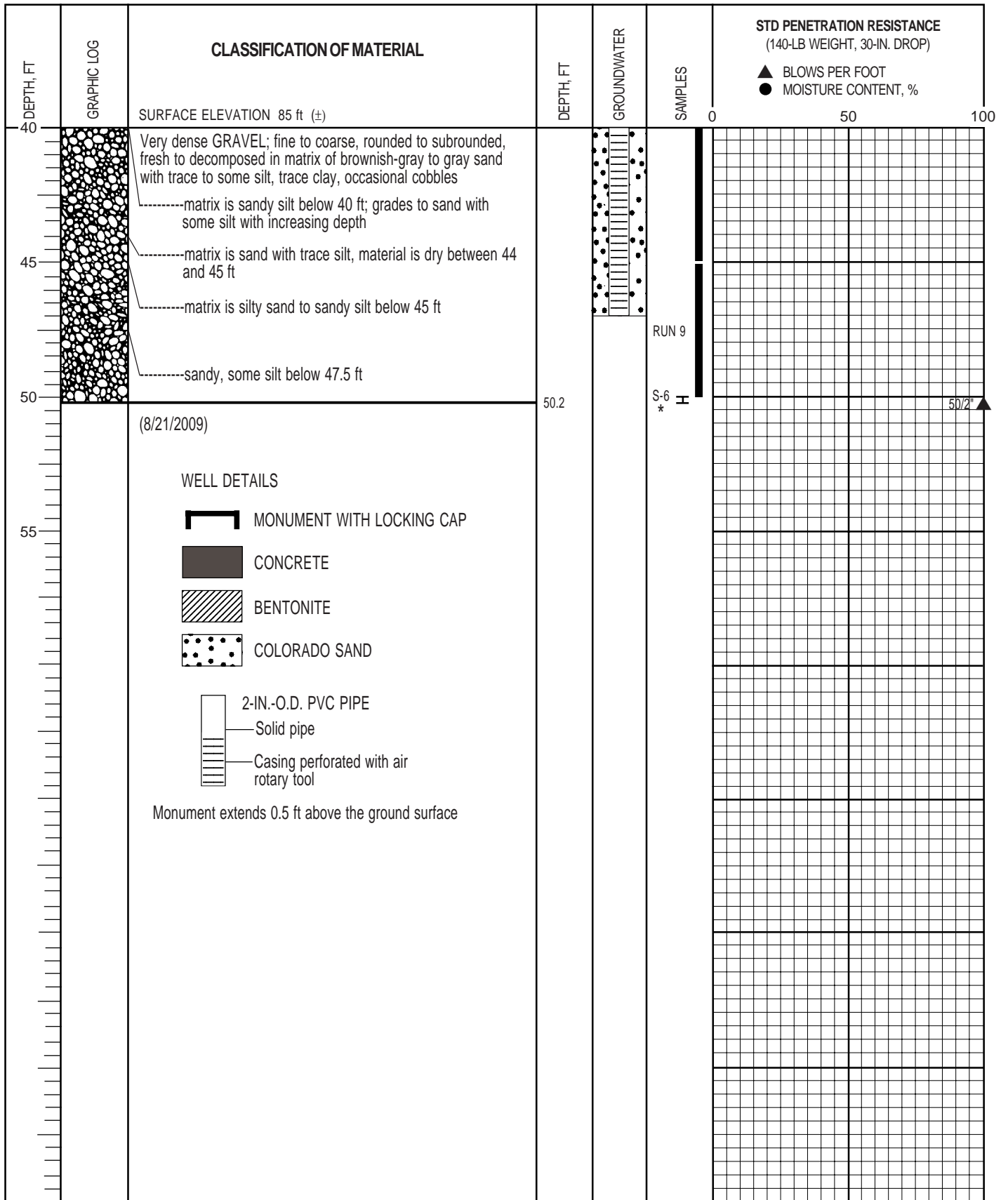
- I 2-IN.-OD SPLIT-SPOON SAMPLER
- II 3-IN.-OD THIN-WALLED SAMPLER
- G GRAB SAMPLE OF DRILL CUTTINGS
- 4-IN.-DIAMETER SONIC CORE
- SLOTTED PVC PIPE
- ▼ Water Level (date)
- ◆ TORVANE SHEAR STRENGTH, TSF
- UNDRAINED SHEAR STRENGTH, TSF
- * NO RECOVERY
- Liquid Limit
- Moisture Content
- Plastic Limit



BORING B-03
(OBSERVATION WELL)



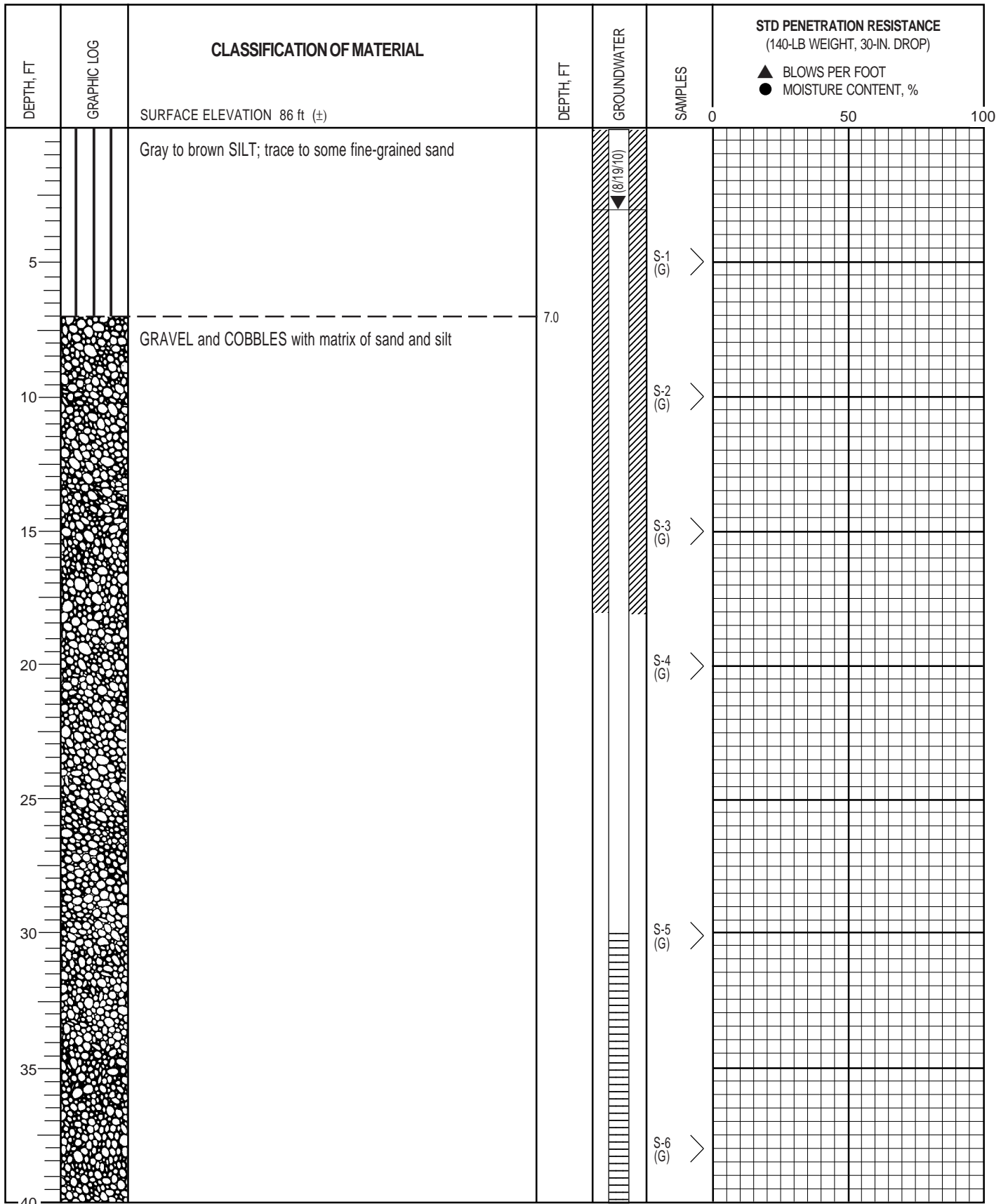




- I 2-IN.-OD SPLIT-SPOON SAMPLER
- II 3-IN.-OD THIN-WALLED SAMPLER
- G GRAB SAMPLE OF DRILL CUTTINGS
- 4-IN.-DIAMETER SONIC CORE
- SLOTTED PVC PIPE
- ▼ Water Level (date)
- ◆ TORVANE SHEAR STRENGTH, TSF
- UNDRAINED SHEAR STRENGTH, TSF
- * NO RECOVERY
- Liquid Limit
- Moisture Content
- Plastic Limit



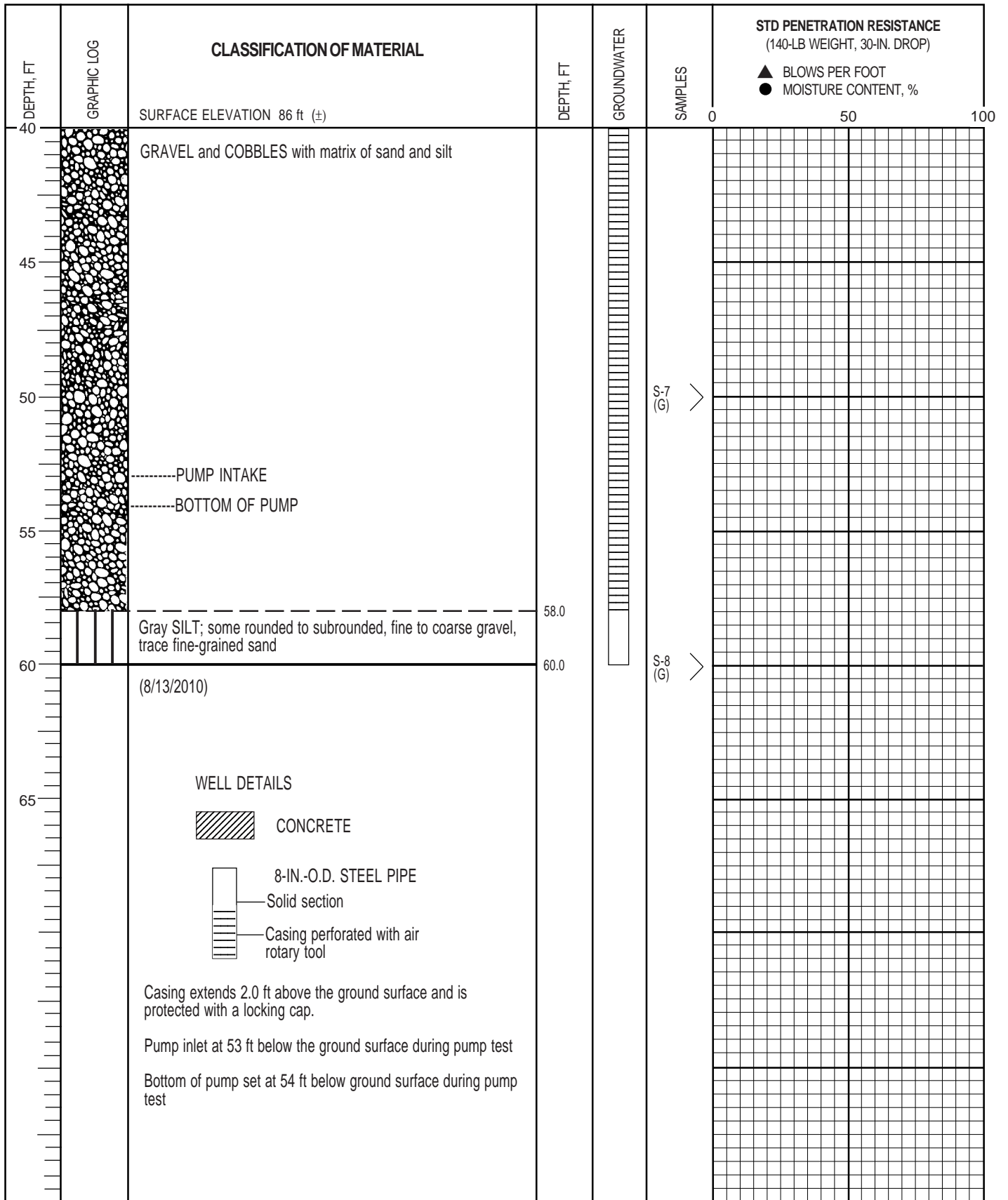
BORING B-04 (cont.)
(OBSERVATION WELL)



- ┃ 2-IN.-OD SPLIT-SPOON SAMPLER
- ┃ 3-IN.-OD THIN-WALLED SAMPLER
- G GRAB SAMPLE OF DRILL CUTTINGS
- █ NX CORE RUN
- ┃ SLOTTED PVC PIPE
- ┃ ▼ Water Level (date)
- ◆ TORVANE SHEAR STRENGTH, TSF
- UNDRAINED SHEAR STRENGTH, TSF
- * NO RECOVERY
- Liquid Limit
- Moisture Content
- ┃ Plastic Limit



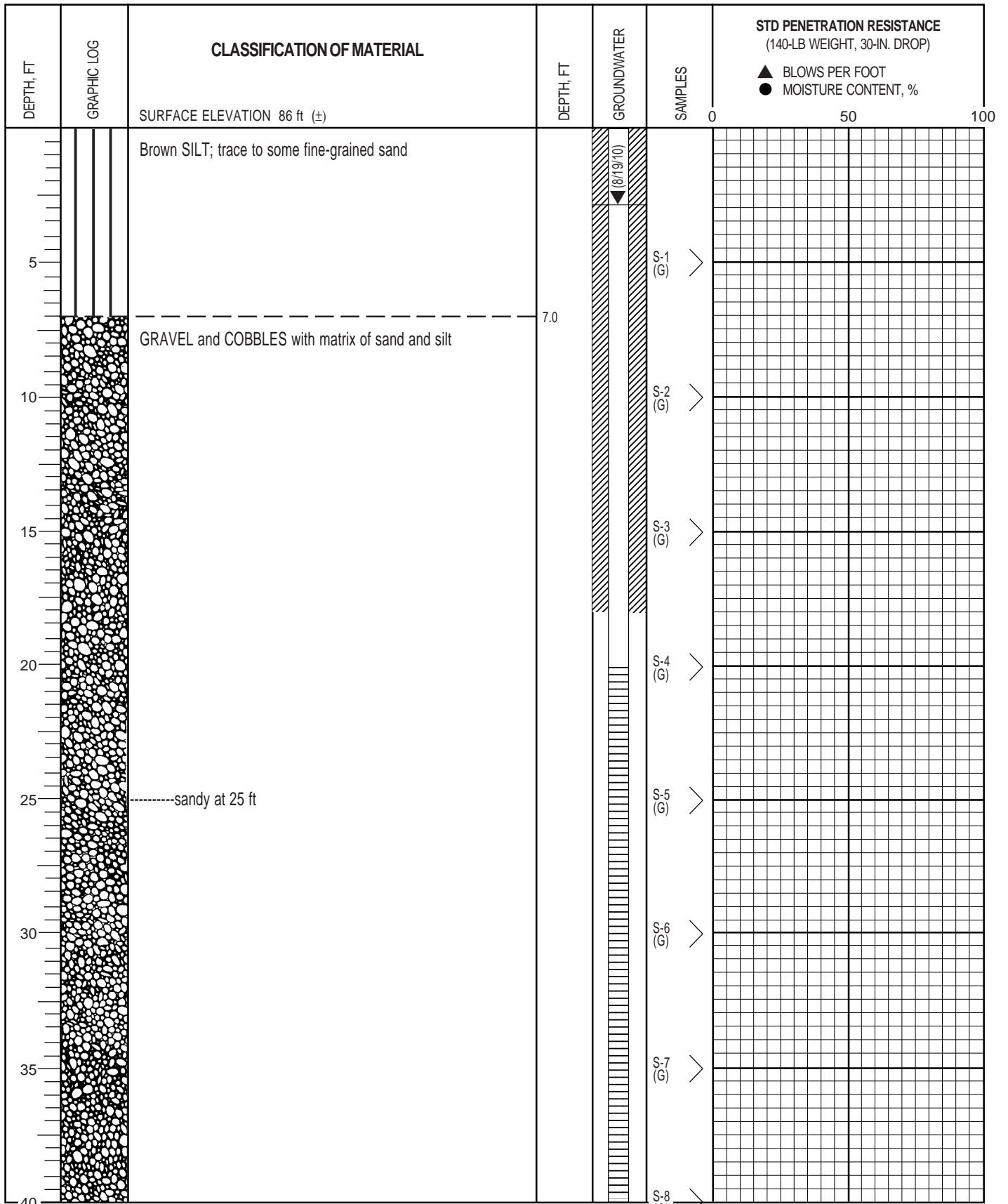
BORING B-06
(PUMPING WELL)



- I 2-IN.-OD SPLIT-SPOON SAMPLER
- II 3-IN.-OD THIN-WALLED SAMPLER
- G GRAB SAMPLE OF DRILL CUTTINGS
- NX CORE RUN
- SLOTTED PVC PIPE
- ▼ Water Level (date)
- ◆ TORVANE SHEAR STRENGTH, TSF
- UNDRAINED SHEAR STRENGTH, TSF
- * NO RECOVERY
- Liquid Limit
- Moisture Content
- Plastic Limit



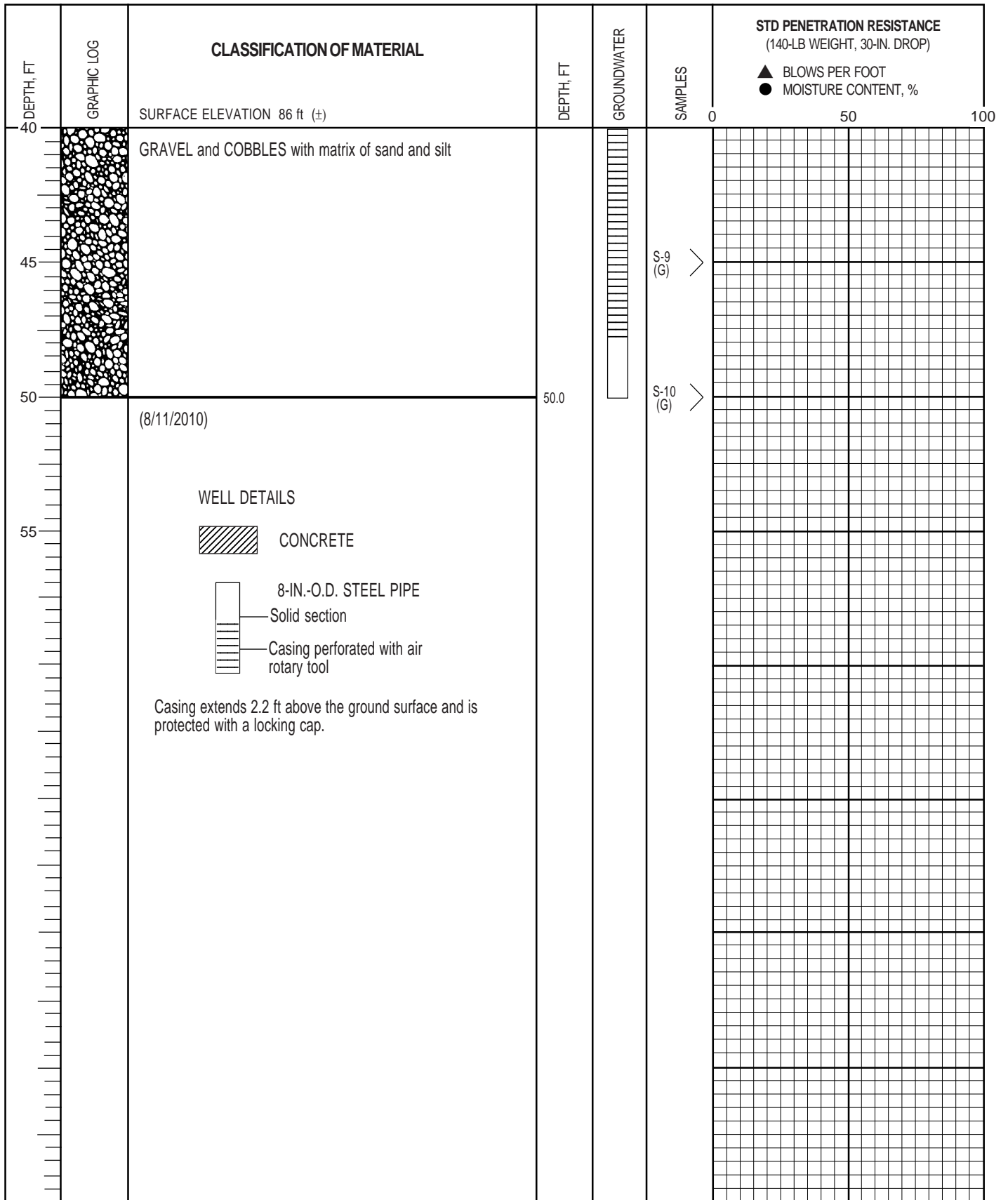
BORING B-06 (cont.)
(PUMPING WELL)



- 2-IN.-OD SPLIT-SPOON SAMPLER
- 3-IN.-OD THIN-WALLED SAMPLER
- GRAB SAMPLE OF DRILL CUTTINGS
- NX CORE RUN
- SLOTTED PVC PIPE
- Water Level (date)
- TORVANE SHEAR STRENGTH, TSF
- UNDRAINED SHEAR STRENGTH, TSF
- NO RECOVERY
- Liquid Limit
Moisture Content
Plastic Limit



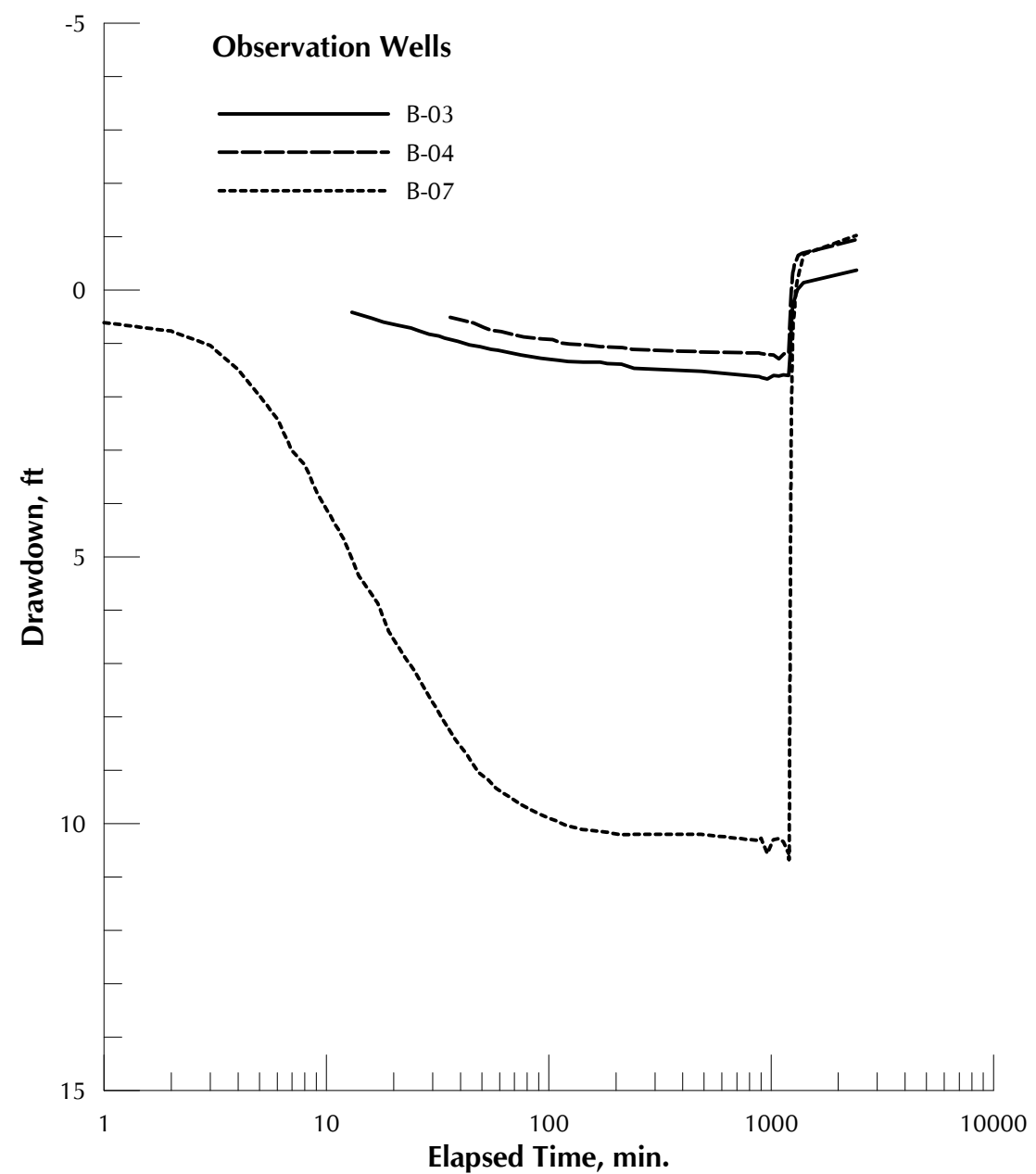
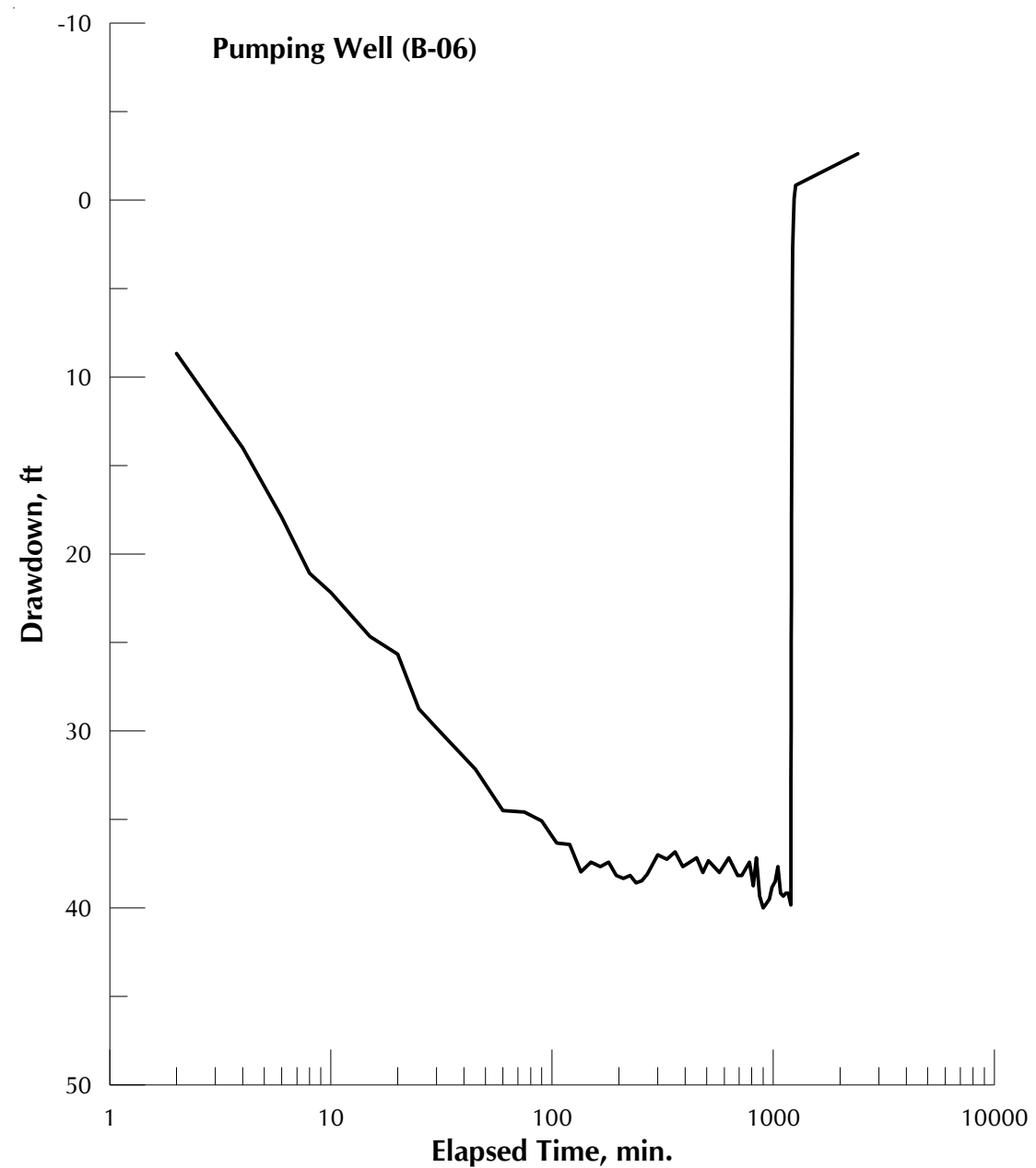
BORING B-07
(OBSERVATION WELL)



- I 2-IN.-OD SPLIT-SPOON SAMPLER
- II 3-IN.-OD THIN-WALLED SAMPLER
- G GRAB SAMPLE OF DRILL CUTTINGS
- NX CORE RUN
- SLOTTED PVC PIPE
- ▼ Water Level (date)
- ◆ TORVANE SHEAR STRENGTH, TSF
- UNDRAINED SHEAR STRENGTH, TSF
- * NO RECOVERY
- Liquid Limit
- Moisture Content
- Plastic Limit



BORING B-07 (cont.)
(OBSERVATION WELL)



	<u>B-06</u>
DEPTH TO GROUNDWATER AT START OF TEST, FT:	5.8
DEPTH TO GROUNDWATER AFTER RECOVERY, FT:	3.1
DISCHARGE RATE FROM PUMPING WELL DURING PUMP TEST, GPM	14.5
<i>(DEPTH MEASURED FROM GROUND SURFACE)</i>	

	<u>B-03</u>	<u>B-04</u>	<u>B-07</u>
DEPTH TO GROUNDWATER AT START OF TEST, FT:	3.4	3.6	3.9
DEPTH TO GROUNDWATER AFTER RECOVERY, FT:	3.1	2.7	2.9
DISTANCE FROM PUMPING WELL, FT:	53	104	25
<i>(DEPTH MEASURED FROM GROUND SURFACE)</i>			

NOTE: DRAWDOWN IS DEFINED AS THE DEPTH TO WATER AT THE BEGINNING OF PUMP TEST MINUS DEPTH TO WATER AT AN ELAPSED TIME

K – SWITCHGEAR SUBMITTAL AND O&M, CATERPILAR PROJECT
#36368



**Electric
Power**



Operations & Maintenance Switchgear

CCSD #1 INTERTIE

2 PUMP STATION

MILWAUKIE, OREGON

PROJECT # 36368

VOLUME 2

PETERSON
POWER SYSTEMS





Operations & Maintenance Manual

CCSD #1 Intertie 2 Pump Station
Project 36368
Milwaukie, Oregon
(Volume 2)



Operations & Maintenance Manual

CCSD #1 Intertie 2 Pump Station
Project 36368
Milwaukie, Oregon
(Volume 2)



Operations & Maintenance Manual

CCSD #1 Intertie 2 Pump Station
Project 36368
Milwaukie, Oregon
(Volume 2)



CCSD #1 INTERTIE 2 PUMP STATION O&M TABLE OF CONTENTS VOLUME 2

TAB 5 – As Built Drawings

- Information Drawing Set
 - G01-G13 General Drawings
 - G14-G15 Sequence of Operations
 - F01-F03 Field Interconnects
- As Built Drawing Set
 - S01-S06 System Drawings
 - M01-M04 Master Controls Drawings
 - E01-E08 Generator Drawings
 - D01-D03 Distribution Drawings
 - N01-N04 Utility Drawings
 - A01-A15 Assembly Drawings

TAB 6 – Safety Procedures

- 24-Hour Safety Information
- Caterpillar Safety Statement
- Eaton Safety Statement

TAB 7 – Documentation

- ISO Standard Manufacturer Warranty
- Startup Test Procedure

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AS BUILT
Drawings

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INFORMATION DRAWING SET

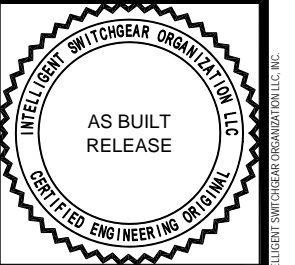
WES CCSD #1 INTERTIE 2 DIVERSION

CLACKAMAS, OR

480/277V UTILITY / GENERATOR PARALLELING SWITCHGEAR

PETERSON POWER SYSTEM
ISO PROJECT No. 36368

TABLE OF CONTENTS			
DESCRIPTION	SHEET	DESCRIPTION	SHEET
DRAWING LEGEND	G01	FIELD INTERCONNECTS - SYSTEM	F01
CIRCUIT BREAKER SCHEDULE	G02	FIELD INTERCONNECTS - GEN 1	F02
FRONT ELEVATION AND ONE-LINE PLAN AND SIDE VIEW	G03	FIELD INTERCONNECTS - GEN 2	F03
FLOOR PLAN	G04		
ANCHOR PLAN	G05		
THREE - LINE DIAGRAM	G06		
THREE - LINE DIAGRAM	G07		
THREE - LINE DIAGRAM	G08		
THREE - LINE DIAGRAM	G09		
THREE - LINE DIAGRAM	G10		
AUTOMATION COMMUNICATIONS PLAN	G11		
CONTROL CONDUIT SCHEDULE	G12		
CONTROL CONDUIT SCHEDULE - ELEVATION	G13		
SEQUENCE OF OPERATIONS	G14		
SEQUENCE OF OPERATIONS	G15		



TITLE: WES CCSD #1 INTERTIE 2 DIVERSION		DRAWN BY: AJ		MODIFIED BY: HC	
TITLE SHEET		DATE CREATED: 01-05-11		DATE MODIFIED: 09-19-11	
480V UTILITY / GENERATOR PARALLELING SWITCHGEAR		REV. 3.1		SHEET NUMBER of 15	
APPROVED BY: C. Waggaman		SCALE: N.T.S.		TS	
DATE APPROVED: 05-14-13		REV. 3.1		SHEET NUMBER of 15	
FILE NAME: 36368-TS		REV. 3.1		SHEET NUMBER of 15	

NO.	REVISION	DATE
0.0	ISSUED FOR SUBMITTAL	02-24-11
0.1	RE-ISSUED FOR SUBMITTAL	03-01-11
0.2	RE-ISSUED FOR SUBMITTAL	07-15-11
1.0	ISSUED FOR PRODUCTION	10-10-11
2.0	ISSUED FOR FIELD STARTUP	12-21-11
3.0	ISSUED FOR AS BUILT	10-18-12
3.1	RE-ISSUED FOR AS BUILT	05-14-13

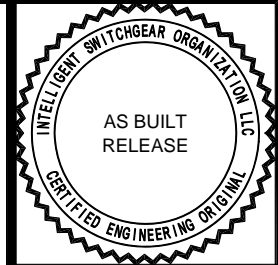
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ABBREVIATION LEGEND

ABBREVIATION	DESCRIPTION
15/25	SYNCHRONIZER with SYNC CHECK
2	TIMER
25/25D	SYNC CHECK RELAY/DEAD BUS ONLY
27/59	UNDER/OVER VOLTAGE RELAY
32	REVERSE POWER RELAY
32/62	REVERSE POWER RELAY WITH TIMER
3P	3 POLE
3S	PROGRAMMABLE CONTROLLER
3S OK	GEN CONTROLLER AVAILABLE
3w	3 WIRE SYSTEM
40	LOSS OF EXCITATION RELAY
40/62	LOSS OF EXCITATION RELAY WITH TIMER
46	NEGATIVE SEQUENCE OVERCURRENT RELAY
47	UNDERVOLTAGE PHASE SEQUENCE RELAY
4w	4 WIRE SYSTEM
50	INSTANTANEOUS OVERCURRENT RELAY
50/51	INSTANTANEOUS TIME OVERCURRENT
51	TIME OVERCURRENT RELAY
52	CIRCUIT BREAKER
59	OVERVOLTAGE RELAY
62	TIME DELAY RELAY
65	GOVERNOR
67	DIRECTIONAL OVERCURRENT
79	RECONNECT TIME DELAY
810/U	OVER/UNDER FREQUENCY RELAY
86	LOCKOUT RELAY
87	DIFFERENTIAL RELAY
90	REGULATING DEVICE
A	AMPERE
AC	ALTERNATING CURRENT
AF	AMPERAGE FRAME RATING
AI	ANALOG INPUT
AL	ALUMINUM
AM	AMPERE METER
AN	ANNUNCIATOR
AO	ANALOG OUTPUT
AS	AMMETER SELECTOR
AT	AMPERAGE TRIP RATING
ATS	AUTOMATIC TRANSFER SWITCH
ATSR	ATS RUN REQUEST
ATSR	ATS RUN REQUEST RELAY
AUX	AUXILIARY
AVR	AUTOMATIC VOLTAGE REGULATOR
AWG	AMERICAN WIRE GAUGE
BATT	BATTERY
BMS	BUILDING MANAGEMENT SYSTEM
S.C.	SURGE CAPACITOR
CB	CIRCUIT BREAKER
CBCL	CIRCUIT BREAKER CLOSE
CBOP	CIRCUIT BREAKER OPEN
CBCS	CIRCUIT BREAKER CONTROL SWITCH
CCM	CATERPILLAR COMMUNICATIONS MODULE
CCW	COUNTER CLOCKWISE
CH	CHANNEL
CI	CUSTOMER INTERFACE
CIM	CUSTOMER INTERFACE MODULE
CLO	CLOSE LOCKOUT
CL	CLOSED
COMMS	COMMUNICATIONS
CP	CONTROL POWER
CPT	CONTROL POWER TRANSFORMER
CR	CONTROL RELAY
CS	CELL SWITCH
CT	CURRENT TRANSFORMER
CTL	CONTROL
CTS	CURRENT TEST SWITCH
CTSB	CT SHORTING BLOCK
CU	COPPER
CW	CLOCKWISE
DIO	DIODE
DC	DIRECT CURRENT
df/dt	RATE OF CHANGE OF FREQUENCY
DI	DIGITAL INPUT
DIST	DISTRIBUTION BLOCK
D.O.	DRAWOUT
DO	DIGITAL OUTPUT
DRP	DROOP
DTI	DATA TABLE INTERFACE

ABBREVIATION	DESCRIPTION
E	ELECTRONIC
E.I.	ELECTRICAL INTERLOCK
E.O.	ELECTRICALLY OPERATED
EC	ENGINE CONTROL
ECP	ENGINE CRANKING PANEL
ECS	ENGINE CONTROL SWITCH
EI	ENGINE INTERFACE
ENG	ENGINE
EPB	EMERGENCY PANELBOARD
ERR	ENGINE RUN REQUEST
ES	ETHERNET SWITCH
FBP	FRONT BASE PLATE
FBO	FURNISHED BY OTHERS
FLA	FULL LOAD AMPS
FLD	FIELD
FLT	FAULT
FO	FIBER OPTIC
FOR	FIBER OPTIC REPEATER
FM	FREQUENCY METER
F.M.	FIXED MOUNTED
FU	FUSE
G-EMCP	GENERATOR CONTROLLER
GB	GENERATOR BYPASS
GEN	GENERATOR
GF	GROUND FAULT
GND	GROUND
GPS	GENERATOR PARALLELING SWITCHBOARD
H.A.	HIGH ACCURACY CT'S
HBR	HOT BUS RELAY
HRN	HORN
Hz	FREQUENCY (HERTZ)
I	INSTANTANEOUS TRIP
IA	ISOLATOR AMPLIFIER
ILS	LOAD SHARING MODULE
INV	INVERTER
I/O	I/O PLC
k	1000 (KILO)
kW	KILOWATT
kWh	KILOWATT HOUR
L	LONG TIME TRIP
LA	LIGHTNING ARRESTOR
LFL	LOW FUEL LEVEL
LOP	LOW OIL PRESSURE
LOR	LOCKOUT RELAY
LI	LONG AND INSTANTANEOUS TRIP
LIG	LI WITH GROUND FAULT TRIP
LS	LOAD SHED RELAY
LSI	LONG, SHORT AND INSTANTANEOUS TRIP
LSIA	LSI WITH GROUND FAULT ALARM
LSIG	LSI WITH GROUND FAULT TRIP
LT	LIGHT (for colors)
LWL	LOW WATER LEVEL
LYNX	ISO POWERLYNX MODULE
M	MOTOR
M1A-3S	UTILITY/TIE A CONTROLLER
M1A-3S-OK	UTILITY/TIE A CONTROLLER AVAILABLE
M1B-3S	UTILITY/TIE B CONTROLLER
MAG	MAGNETIC
MALF	MALFUNCTION
M.O.	MANUALLY OPERATED
MCCB	MOLDED CASE CIRCUIT BREAKER
MCM	1000 CIRCULAR MILS
M.I.	MECHANICAL INTERLOCK
MFR	MULTI FUNCTION RELAY
MISC	MISCELLANEOUS
MOC	MECHANISM OPERATED CELL SWITCH
MR	MULTI RATIO
MTR	METER (DEVICE)
MUF	MULTIPLE UTILITY FAILURE
MW	MEGAWATT
N6	#2-600MCM MECHANICAL LUG
N/A	NOT APPLICABLE
N/R	NOT REQUIRED
N.C.	NORMALLY CLOSED
NIA	NOT IN AUTOMATIC
NEU	NEUTRAL
NES	NON-ESSENTIAL LOAD SHED RELAY
NGR	NEUTRAL GROUND RESISTOR
N.O.	NORMALLY OPEN
OC	OVER CRANK
OIP	OPERATOR INTERFACE PANEL

ABBREVIATION	DESCRIPTION
OP	OPEN
OP CTR	OPERATION COUNTER
OS	OVER SPEED
PB	PUSHBUTTON
PC	PERSONAL COMPUTER
PF	POWER FACTOR
PHET	PRE HIGH ENGINE TEMP
PL	BREAKER POSITION LIGHT
PLC	PROGRAMMABLE LOGIC CONTROLLER
PLOP	PRE LOW OIL PRESSURE
POS	POSITION
POD	UPS CONTROL SWITCHBOARDS
POT	POTENTIOMETER
PRG	PROGRAMMING PORT
PS	PHOENIX POWER SUPPLY
PT	POTENTIAL TRANSFORMER
REC	RECEPTACLE
REF	REFERENCE
RTD	RESISTANCE TEMPERATURE DETECTOR
RP	RATING PLUG
S	SHORT TIME TRIP
SA	SURGE ARRESTOR
SAR	SAFETIES ARMING RELAY
SB	STATION BATTERY
SC	SHUNT COIL
SCADA	SUPERVISORY CONTROL AND DATA ACQUISITION
SCT	SUMMING CURRENT TRANSFORMER
SECT	SECTION
SEL	SCHWEITZER DEVICE
SFM	SOURCE FREQUENCY METER
SHLD	SHIELD/SHIELDED
SMP	SYNCH MODE PERMISSIVE
SMR	SYNCH MODE RUN
SMS	SYNCHRONIZING MODE SELECTOR
SPD	SPEED CONTROL
SR	SPRING RELEASE
SW	SELECTOR SWITCH
SW-A	ETHERNET SWITCH FOR CHANNEL A
SW-B	ETHERNET SWITCH FOR CHANNEL B
SS	SHIPPING SPLIT
SUF	SINGLE UTILITY FAILURE
T1	#6-350MCM MECHANICAL LUG
TB	TERMINAL BLOCK
TBD	TO BE DETERMINED
TC	TRIP COIL
TIO	TERMINAL I/O MODULE
TM	THERMAL MAGNETIC
TMR	TIMING RELAY
TOC	TRUCK OPERATED CELL SWITCH
TS	TOUCHSCREEN
TSP	TOUCHSCREEN PROCESSOR
TSW	TEST SWITCH
TVSS	TRANSIENT VOLTAGE SURGE SUPPRESSOR
TWL	TEST WITH LOAD
UCLOS	UTILITY CLOSE LOCKOUT SWITCH
UPS	UNINTERRUPTABLE POWER SUPPLY
UFT	UTILITY FAIL TEST
UVR	UNDER VOLTAGE RELEASE
VA	VOLT AMPERES
VAR	VOLT AMPERES REACTIVE
VLT	VOLTAGE CONTROL
VM	VOLTMETER
VR	VOLTAGE REGULATOR
VT	VOLTAGE TRANSFORMER
W	WATT
WV	WATT/VAR
Y	ANTI-PUMP FEATURE
XDR	TRANSDUCER
a	AUX BREAKER CONTACT (NORMALLY OPEN)
b	AUX BREAKER CONTACT (NORMALLY CLOSED)
c	a AND b with COMMON
ba	NORMALLY OPEN BELL ALARM
mA	MILLIAMPERE
mV	MILLIVOLT
∅A	A-PHASE
∅B	B-PHASE
∅C	C-PHASE
BMV	BUS VOLTAGE METER
BFM	BUS FREQUENCY METER
UVTD	UNDERVOLTAGE TIME DELAY



WES CCSD #1 INTERTIE 2 DIVERSION	
DRAWING LEGEND	
480V UTILITY / GENERATOR PARALLELING SWITCHGEAR	REV. 3.1
APPROVED BY: C. Waggaman	SCALE: N.T.S.
DATE APPROVED: 05-14-13	REVISED BY: AJ
FILE NAME: 36368-G01	DATE CREATED: 12-30-10
DATE: 05-14-13	DATE MODIFIED:
SHEET NUMBER: 1	SHEET NUMBER: 15

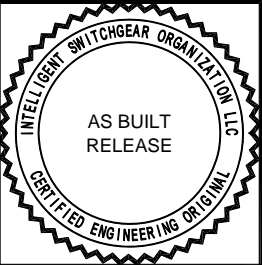
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1.0	ISSUED FOR PRODUCTION	10-10-11
2.0	ISSUED FOR FIELD STARTUP	12-21-11
3.0	ISSUED FOR AS BUILT	10-18-12
3.1	RE-ISSUED FOR AS BUILT	05-14-13

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LV CIRCUIT BREAKER, LUGGING AND CONDUIT ENTRY SCHEDULE

DEVICE	LOCATION	MANUFACTURE TYPE / TRIP UNIT	FRAME (A)	TRIP SETTING (A)	RATING PLUG (A)	INTERRUPT CAPACITY (KA)	TRIP FUNCTIONS	OPERATION	MOUNTING	CHARGE	SHUNT CLOSE	SHUNT TRIP	ACCESSORIES							MECHANICAL LUGS*			NAMEPLATE DESCRIPTION	CONDUIT ENTRY	
													AB CONTACTS	BELL ALARM	CELL SWITCH	CLOSE COVER	KIRK KEY	OP CTR	SHUTTERS	LUGS PER PHASE	NEUTRAL LUGS	GROUND LUGS		TOP	BOTTOM
INCOMING LINE	1																	TBD *	TBD *	TBD *	INCOMING LINE		X		
52N	2C	CUTLER-HAMMER MDS-620 / DT-520M	2000	2000	2000	65	LSIG	E.O.	D.O.	120VAC	120VAC	24VDC	2	X	X	X			X	N/A	N/A	N/A	UTILITY MAIN BREAKER 52N		
52D1	3A	CUTLER-HAMMER MDS-608 / DT-520M	800	600	600	65	LSIA	M.O.	D.O.	N/A	N/A	N/A	2	X	X			X	N/A	N/A	N/A	SEWAGE PUMP 1 PMP-101			
INCOMING LINE	4																	2-600	N/A	2-#2	INCOMING LINE		X		
52D2	3D	CUTLER-HAMMER MDS-608 / DT-520M	800	600	600	65	LSIA	M.O.	D.O.	N/A	N/A	N/A	2	X	X			X	N/A	N/A	N/A	SEWAGE PUMP 2 PMP-102			
INCOMING LINE	4																	2-600	N/A	2-#2	INCOMING LINE		X		
52D3 (PROV)	5A	CUTLER-HAMMER MDS-608 / DT-520M	800	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A						X	N/A	N/A	N/A	FUTURE SEWAGE PUMP 3 PMP-103			
INCOMING LINE	6																	N/A	N/A	N/A	INCOMING LINE		X		
52D4	5B	CUTLER-HAMMER MDS-608 / DT-520M	800	300	300	65	LSIA	M.O.	D.O.	N/A	N/A	N/A	2	X	X			X	N/A	N/A	N/A	SEWAGE PUMP 4 PMP-104			
INCOMING LINE	6																	1-600	N/A	1-#2	INCOMING LINE		X		
52D5	5C	CUTLER-HAMMER MDS-608 / DT-520M	800	300	300	65	LSIA	M.O.	D.O.	N/A	N/A	N/A	2	X	X			X	N/A	N/A	N/A	SEWAGE PUMP 5 PMP-105			
INCOMING LINE	6																	1-600	N/A	1-#2	INCOMING LINE		X		
52D6	5D	CUTLER-HAMMER MDS-608 / DT-520M	800	600	600	65	LSIA	M.O.	D.O.	N/A	N/A	N/A	2	X	X			X	N/A	N/A	N/A	MCC-1			
INCOMING LINE	6																	2-600	N/A	2-#2	INCOMING LINE		X		
52G1	9B	CUTLER-HAMMER MDS-616 / DT-520M	1600	1000	1000	65	LSIA	E.O.	D.O.	120VAC	120VAC	24VDC	2	X	X	X		X	3-600	3-750	3-#2	GENERATOR BREAKER 52G1		X	
52G2 (PROV)	10B	CUTLER-HAMMER MDS-616 / DT-520M	1600	NOTE 2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A						X	TBD	TBD	TBD	GENERATOR BREAKER 52G2(PROVISION)		X	

NOTE 1) CABLE SIZES AND QUANTITIES REQUIRED AT TIME OF RELEASE, OR ONLY STANDARD NEMA 2 HOLE PATTERN WILL BE SUPPLIED.
 2) MAXIMUM TRIP ALLOWED 1000A.



WES CCSD #1 INTERTIE 2 DIVERSION
CIRCUIT BREAKER SCHEDULE
 480V UTILITY / GENERATOR PARALLELING SWITCHGEAR

APPROVED BY: *C. Waggaman*
 DATE APPROVED: 05-14-13

SCALE: N.T.S.

REV. 3.1
 DRAWN BY: AJ
 DATE CREATED: 12-30-10
 MODIFIED BY: RBG
 DATE MODIFIED: 12-21-11

SHEET NUMBER: 2 of 15

G02

FILE NAME: 36368-G02

NO.	REVISION	DATE
0.0	ISSUED FOR SUBMITTAL	02-24-11
0.1	RE-ISSUED FOR SUBMITTAL	03-01-11
0.2	RE-ISSUED FOR SUBMITTAL	07-15-11
1.0	ISSUED FOR PRODUCTION	10-10-11
2.0	ISSUED FOR FIELD STARTUP	12-21-11
3.0	ISSUED FOR AS BUILT	10-18-12
3.1	RE-ISSUED FOR AS BUILT	05-14-13

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GENERAL NOTES
 POWER ENVELOPE: CUTLER HAMMER
 SYSTEM VOLTAGE: 480/277V, 60Hz, 3 ϕ , 4-WIRE
 SYSTEM INTERRUPT RATING: 65kAIC
 SYSTEM AMPERAGE: 2000A
 TEMPERATURE RISE: 65°C RISE OVER 40°
 PHASE ROTATION A-B-C
 BUS MATERIAL: SILVER PLATED COPPER
 BUS INSULATION: PHASE ONLY
 ENCLOSURE TYPE: EEMAC/NEMA1A INDOOR
 FRONT ACCESS CABLE SECTIONS
 LABEL: UL1558, DEADFRONT, SERVICE ENTRANCE LABEL W/BARRIERS
 SEGREGATION BARRIERS BETWEEN CABLE/BUS COMPARTMENT
 SEGREGATION BARRIERS BETWEEN VERTICAL STRUCTURES
 PRIMARY DISCONNECT SHUTTERS
 REMOVABLE BOOTS FOR THE BUS JOINTS
 IBC/CBC SEISMIC QUALIFIED
 HANDLING: FORK LIFT, CRANE
 COLOR: ANSI 61
 NAMEPLATES: BLACK PHENOLIC WITH WHITE LETTERING
 NAMEPLATES: ATTACHED WITH SCREWS
 MIMIC BUS: RED PLASTIC
 MIMIC BUS: ATTACHED WITH ADHESIVE

BATTERIES SHIPPED LOOSE FOR EXTERNAL MOUNTING.
 PROVIDED BATTERY RACK IS APPROXIMATELY 15 3/4" X 24".
 TYPICAL BATTERY SIZE IS TWO 12V 40AH BATTERIES.

DIMENSIONS - INCHES
 [mm]

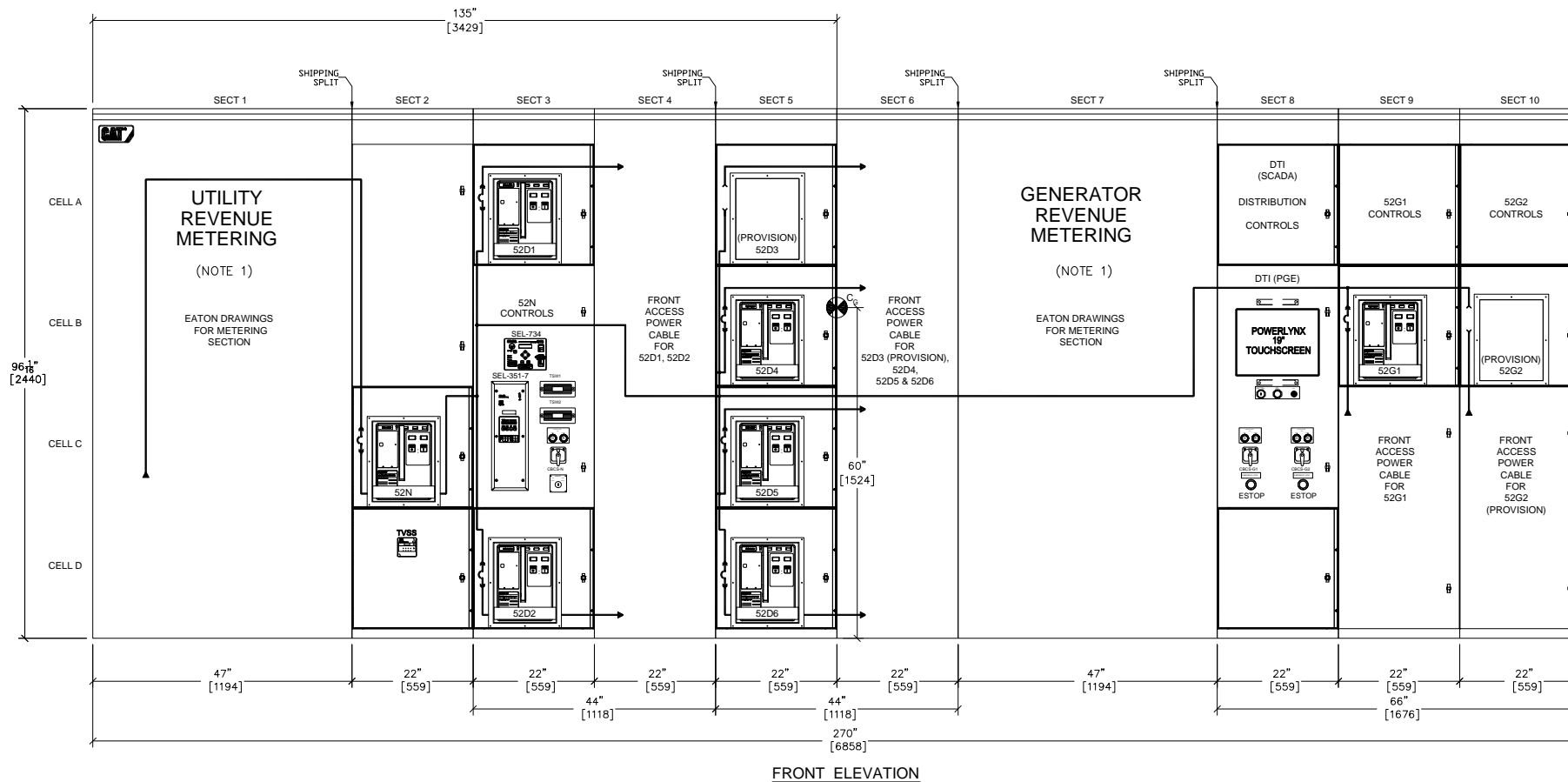
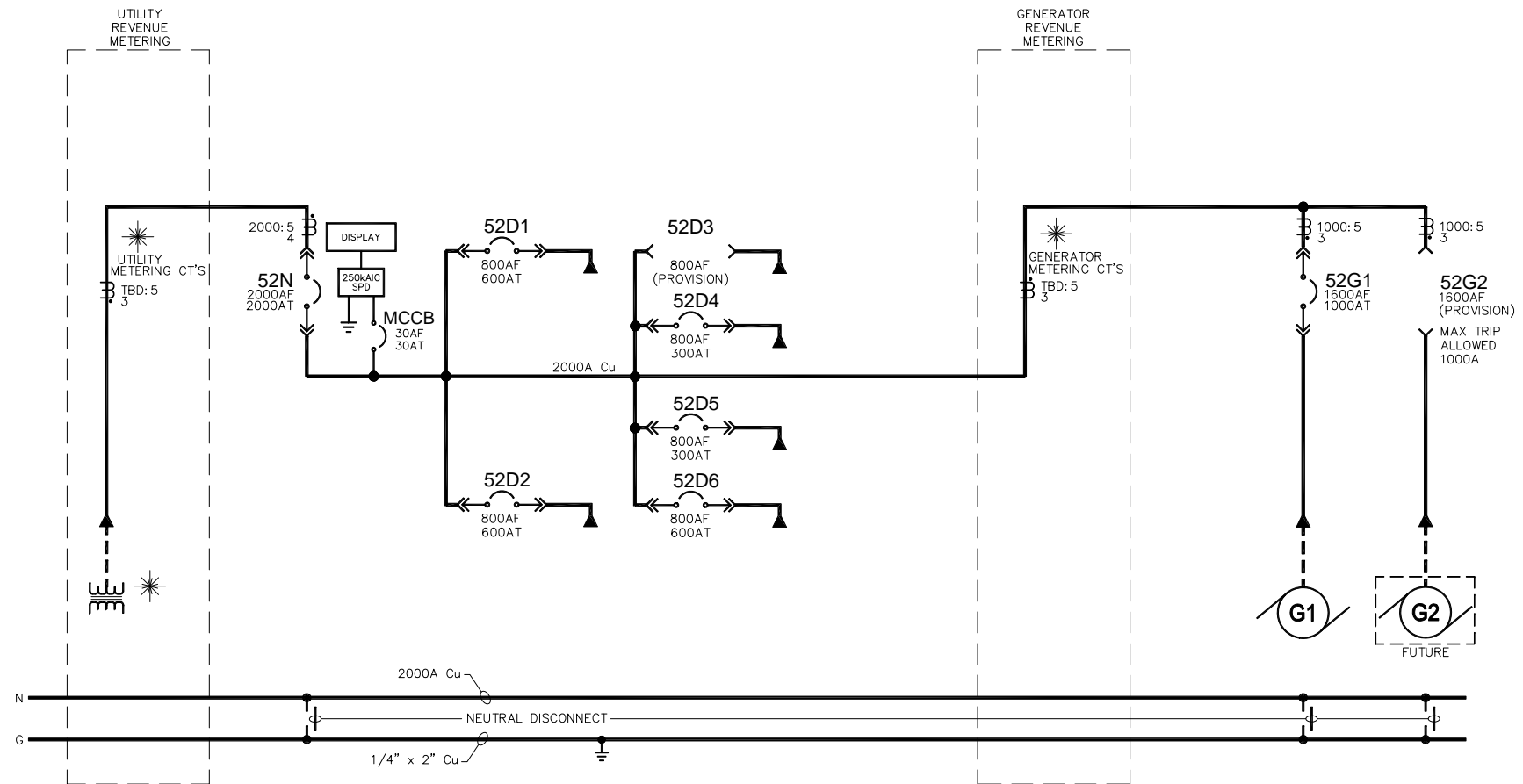
ESTIMATED SHIPPING WEIGHTS:

- SECT 1 - 2,000 LBS.
- SECT 2 - 2,145 LBS.
- SECT 3 - 2,250 LBS.
- SECT 4 - 2,000 LBS.
- SECT 5 - 2,520 LBS.
- SECT 6 - 2,000 LBS.
- SECT 7 - 2,000 LBS.
- SECT 8 - 2,000 LBS.
- SECT 9 - 2,130 LBS.
- SECT 10 - 2,130 LBS.

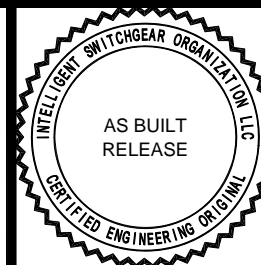
ESTIMATED SHIPPING SPLIT WEIGHTS:

- SS SECT 1 - 2,000 LBS.
- SS SECT'S 2-4 - 6,395 LBS.
- SS SECT'S 5-6 - 4,520 LBS.
- SS SECT'S 7-8 - 2,000 LBS.
- SS SECT'S 8-10 - 6,260 LBS.

SUPPLIED BY OTHERS



NOTES:
 1. PGE APPROVAL IS REQUIRED FOR SECTIONS 1 AND 7.



WES CCSD #1 INTERTIE 2 DIVERSION FRONT ELEVATION AND ONE - LINE		REV. 3.1	DATE APPROVED 05-14-13	FILE NAME 36368-G03
480V UTILITY / GENERATOR PARALLELING SWITCHGEAR		SCALE N.T.S.	DATE APPROVED 05-14-13	FILE NAME 36368-G03
APPROVED BY C. Waggaman	DRAWN BY AJ	REV. 3.1	DATE APPROVED 05-14-13	FILE NAME 36368-G03
DATE CREATED 12-30-10	DATE MODIFIED 09-19-11	SHEET NUMBER 3	of 15	

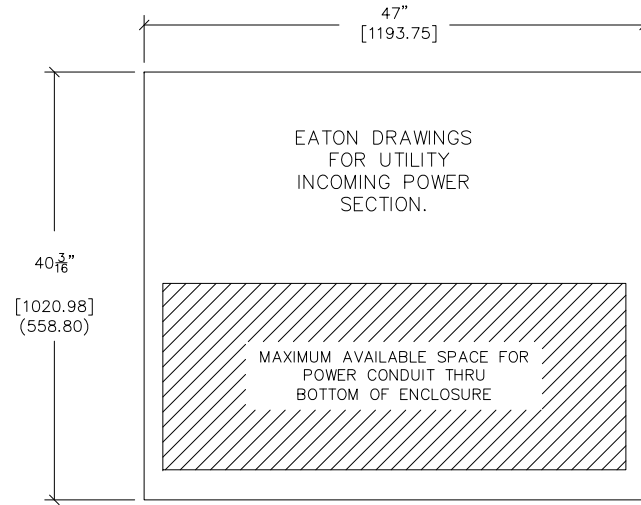
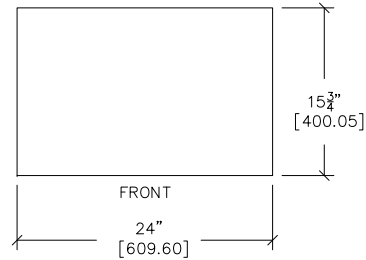
NO.	REVISION	DATE
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0.1	RE-ISSUED FOR SUBMITTAL	03-01-11
0.2	RE-ISSUED FOR SUBMITTAL	07-15-11
1.0	ISSUED FOR PRODUCTION	10-10-11
2.0	ISSUED FOR FIELD STARTUP	12-21-11
3.0	ISSUED FOR AS BUILT	10-18-12
3.1	RE-ISSUED FOR AS BUILT	05-14-13

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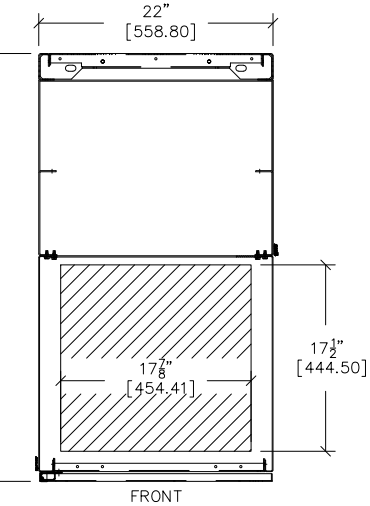
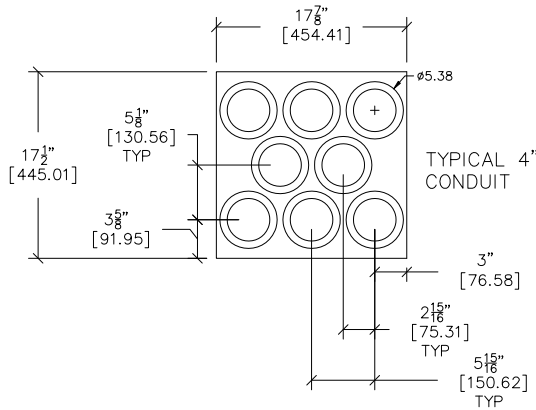
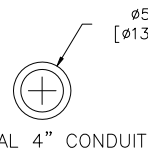
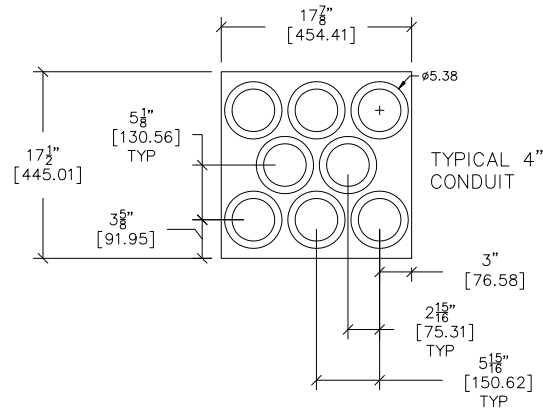
DIMENSIONS - INCHES
[mm]

36.00 INCHES (914.4 mm) IS THE RECOMMENDED FRONT CLEARANCE FOR BREAKER REMOVAL WITH TOP-OF-SWITCHGEAR-MOUNTED BREAKER LIFTER. IF A PORTABLE BREAKER LIFTER IS TO BE USED, ALLOW AT LEAST 84.00 INCHES (2133.6 mm) OF AISLE SPACE.

24V DC SEISMIC BATTERY RACK
APPROXIMATE DIMENSIONS
HEIGHT: 16"



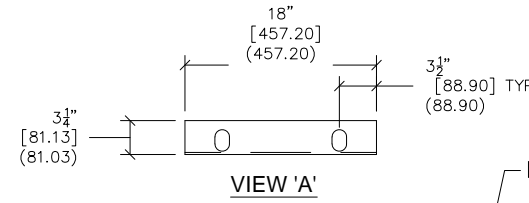
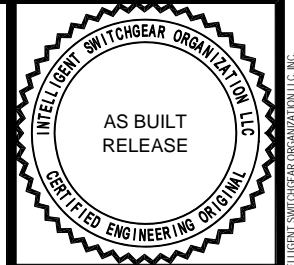
TYPICAL FOR:
SECT 1
PLAN VIEW
BOTTOM CONDUIT ENTRY



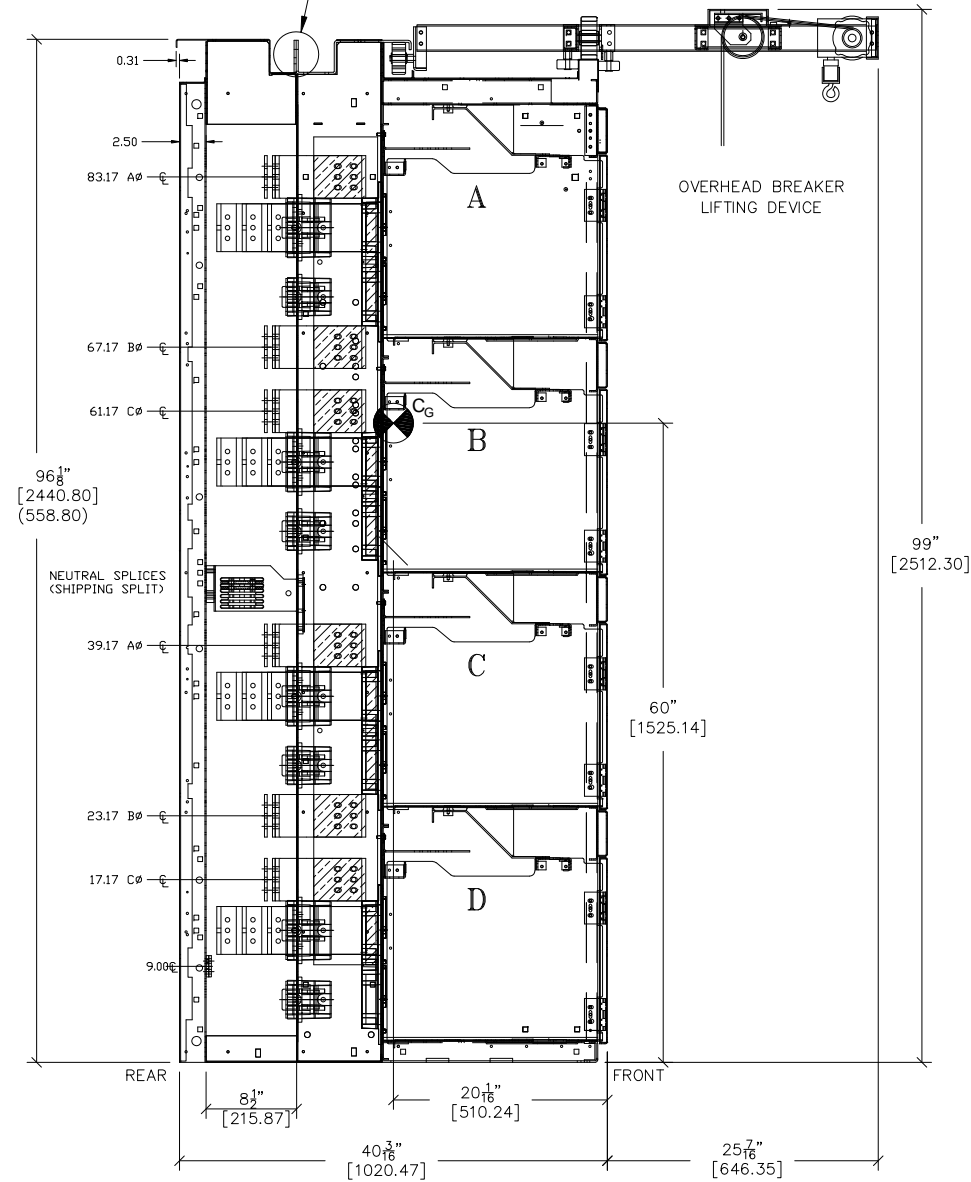
TYPICAL FOR:
SECTS 9 & 10
PLAN VIEW
BOTTOM CONDUIT ENTRY

BREAKER FRAME	NUMBER OF LUGS
800 AMP FRAME	3 PER PHASE
1600 AMP FRAME	5 PER PHASE
2000 AMP FRAME	6 PER PHASE

NOTE: TYPE OF LUGS - CABLES RATED #2-600MCM



LIFTING ANGLE (VIEW 'A')



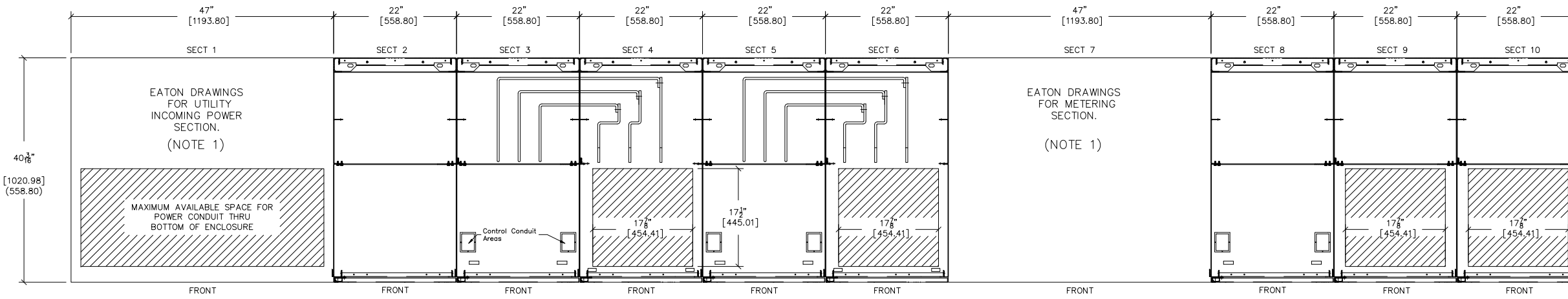
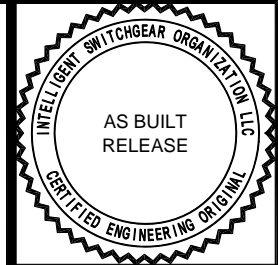
TYPICAL FOR:
SECTS 2-6 & 8-10
SIDE VIEW

TITLE: WES CCSD #1 INTERTIE 2 DIVERSION PLAN AND SIDE VIEW		REV. 3.1	DATE APPROVED 05-14-13	DATE MODIFIED 12-30-10	SHEET NUMBER 4	of 15
APPROVED BY <i>C. Waggaman</i>		SCALE N.T.S.	REV. 3.1	DATE APPROVED 05-14-13	DATE MODIFIED 12-30-10	SHEET NUMBER 4
DRAWN BY AJ		REV. 3.1	DATE APPROVED 05-14-13	DATE MODIFIED 12-30-10	SHEET NUMBER 4	of 15
FILE NAME 36368-G04		REV. 3.1	DATE APPROVED 05-14-13	DATE MODIFIED 12-30-10	SHEET NUMBER 4	of 15

NO.	REVISION	DATE
0.0	ISSUED FOR SUBMITTAL	02-24-11
0.1	RE-ISSUED FOR SUBMITTAL	03-01-11
0.2	RE-ISSUED FOR SUBMITTAL	07-15-11
1.0	ISSUED FOR PRODUCTION	10-10-11
2.0	ISSUED FOR FIELD STARTUP	12-21-11
3.0	ISSUED FOR AS BUILT	10-18-12
3.1	RE-ISSUED FOR AS BUILT	05-14-13

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DIMENSIONS - INCHES
[mm]



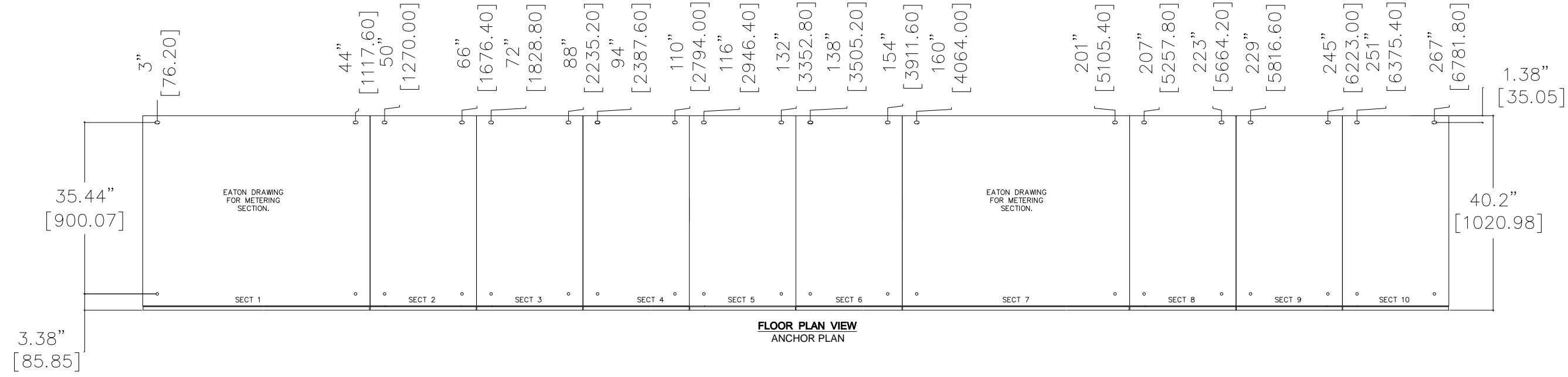
FLOOR PLAN VIEW
BOTTOM CONDUIT ENTRY

NOTES:
1. PGE APPROVAL IS REQUIRED FOR SECTIONS 1 AND 7.

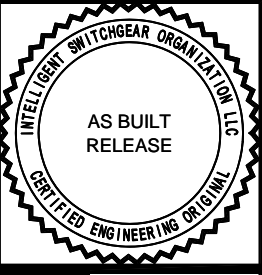
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SCALE:		N.T.S.	
APPROVED BY:	DATE APPROVED:	REV.:	REV.:
<i>C. Waggaman</i>	05-14-13	3.1	3.1
FILE NAME:	36368-G05	DRAWN BY:	MODIFIED BY:
		AJ	IK
		DATE CREATED:	DATE MODIFIED:
		12-30-10	05-12-11
		SHEET NUMBER:	SHEET NUMBER:
		5	15

NO.	REVISION	DATE
0.0	ISSUED FOR SUBMITTAL	02-24-11
0.1	RE-ISSUED FOR SUBMITTAL	03-01-11
0.2	RE-ISSUED FOR SUBMITTAL	07-15-11
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3.0	ISSUED FOR AS BUILT	10-18-12
3.1	RE-ISSUED FOR AS BUILT	05-14-13

DIMENSIONS - INCHES
[mm]



FLOOR PLAN VIEW
ANCHOR PLAN



TITLE: **WES CCSD #1 INTERTIE 2 DIVERSION**

ANCHOR PLAN

480V UTILITY / GENERATOR PARALLELING SWITCHGEAR

APPROVED BY
C. Waggaman

SCALE
N.T.S.

REV. 3.1

DATE APPROVED
05-14-13

REV. 3.1

DATE CREATED
01-18-11

REV. 3.1

DATE MODIFIED
05-12-11

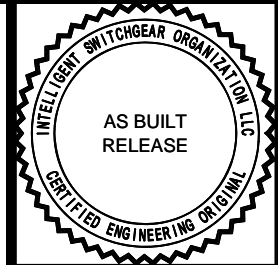
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36368-G06

G06

SHEET NUMBER
6

of 15

NO.	REVISION	DATE
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0.1	RE-ISSUED FOR SUBMITTAL	03-01-11
0.2	RE-ISSUED FOR SUBMITTAL	07-15-11
1.0	ISSUED FOR PRODUCTION	10-10-11
2.0	ISSUED FOR FIELD STARTUP	12-21-11
3.0	ISSUED FOR AS BUILT	10-18-12
3.1	RE-ISSUED FOR AS BUILT	05-14-13



CATERPILLAR

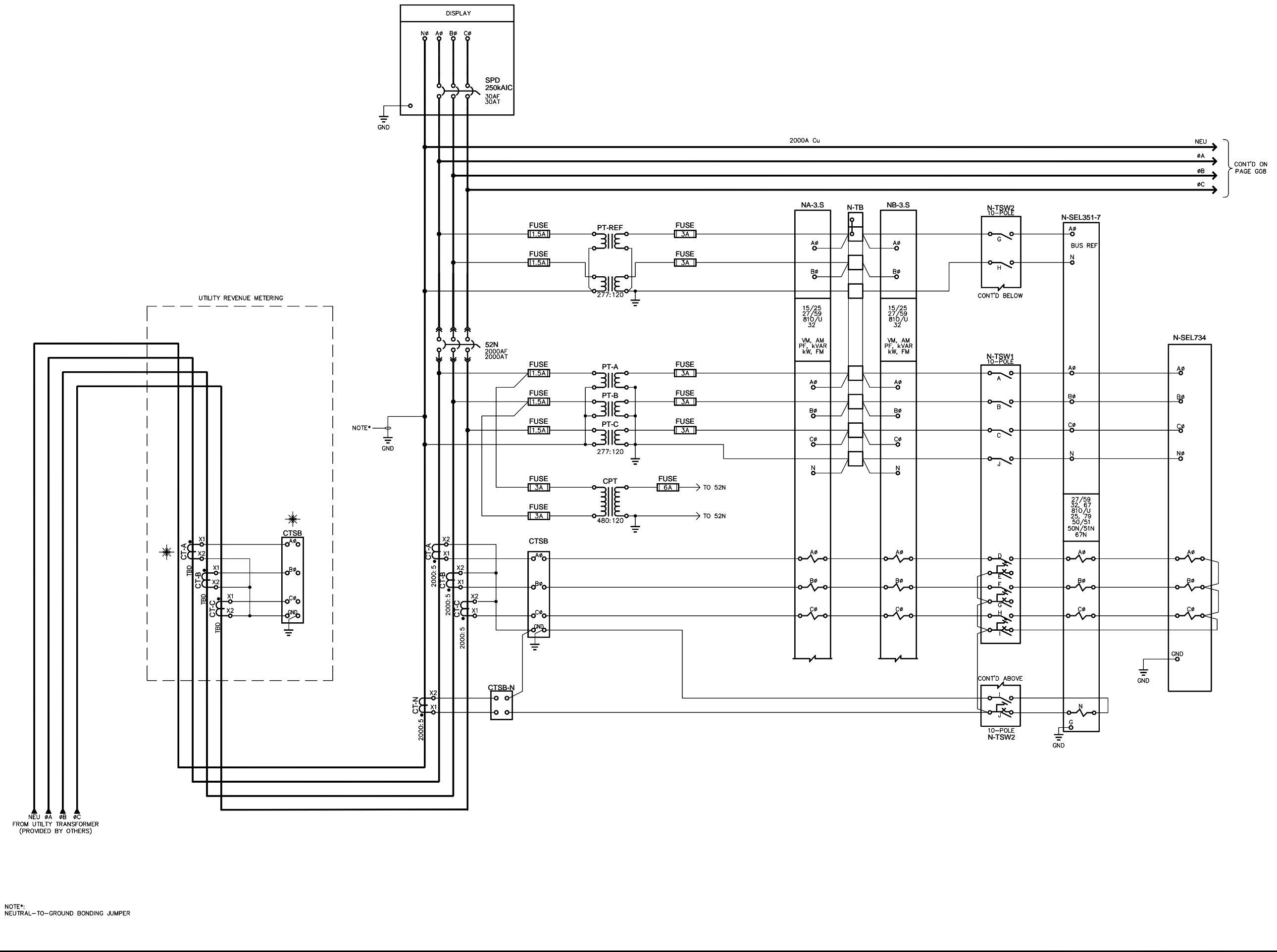
**WES CCSD #1 INTERTIE 2 DIVERSION
THREE - LINE DIAGRAM**

480V UTILITY / GENERATOR PARALLELING SWITCHGEAR

APPROVED BY	SCALE	REV.	REV.	MODIFIED BY
<i>C. Waggaman</i>	N.T.S.	3.1	AJ	AM
DATE APPROVED			DATE CREATED	DATE MODIFIED
05-14-13			01-05-11	10-10-11
FILE NAME			SHEET NUMBER	of
36368-G07			7	15

NO.	REVISION	DATE
0.0	ISSUED FOR SUBMITTAL	02-24-11
0.1	RE-ISSUED FOR SUBMITTAL	03-01-11
0.2	RE-ISSUED FOR SUBMITTAL	07-15-11
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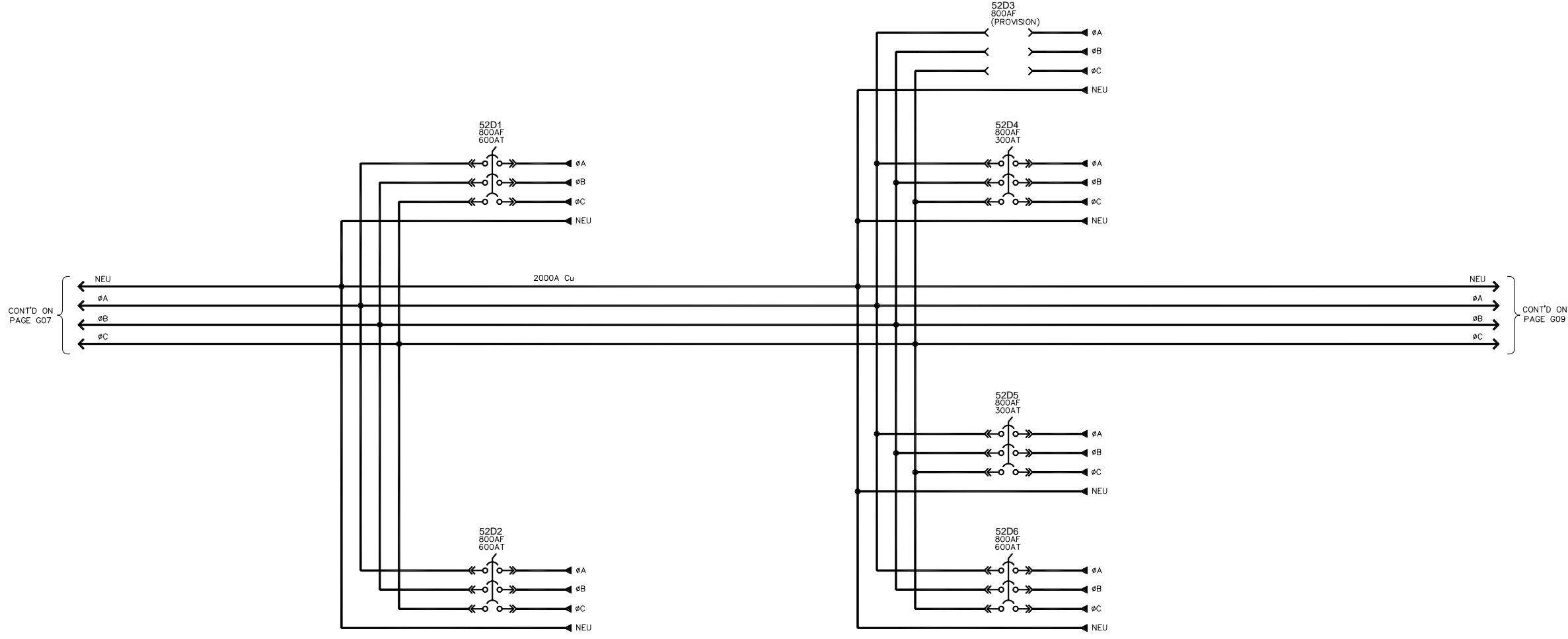


NOTE*:
NEUTRAL-TO-GROUND BONDING JUMPER

CONT'D ON
PAGE G08

CONT'D ABOVE

CONT'D BELOW



CONT'D ON PAGE G07

CONT'D ON PAGE G09



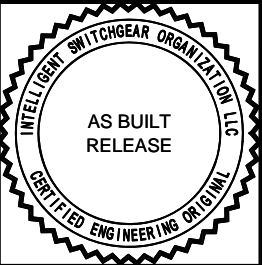
CATERPILLAR

**WES CCSD #1 INTERTIE 2 DIVERSION
THREE - LINE DIAGRAM**

480V UTILITY / GENERATOR PARALLELING SWITCHGEAR

APPROVED BY <i>C. Waggaman</i>	SCALE N.T.S.	REV. 3.1	DRAWN BY AJ	MODIFIED BY
DATE APPROVED 05-14-13			DATE CREATED 01-05-11	DATE MODIFIED
FILE NAME 36368-G08			SHEET NUMBER 8	of 15

NO.	REVISION	DATE
0.0	ISSUED FOR SUBMITTAL	02-24-11
0.1	RE-ISSUED FOR SUBMITTAL	03-01-11
0.2	RE-ISSUED FOR SUBMITTAL	07-15-11
1.0	ISSUED FOR PRODUCTION	10-10-11
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3.0	ISSUED FOR AS BUILT	10-18-12
3.1	RE-ISSUED FOR AS BUILT	05-14-13



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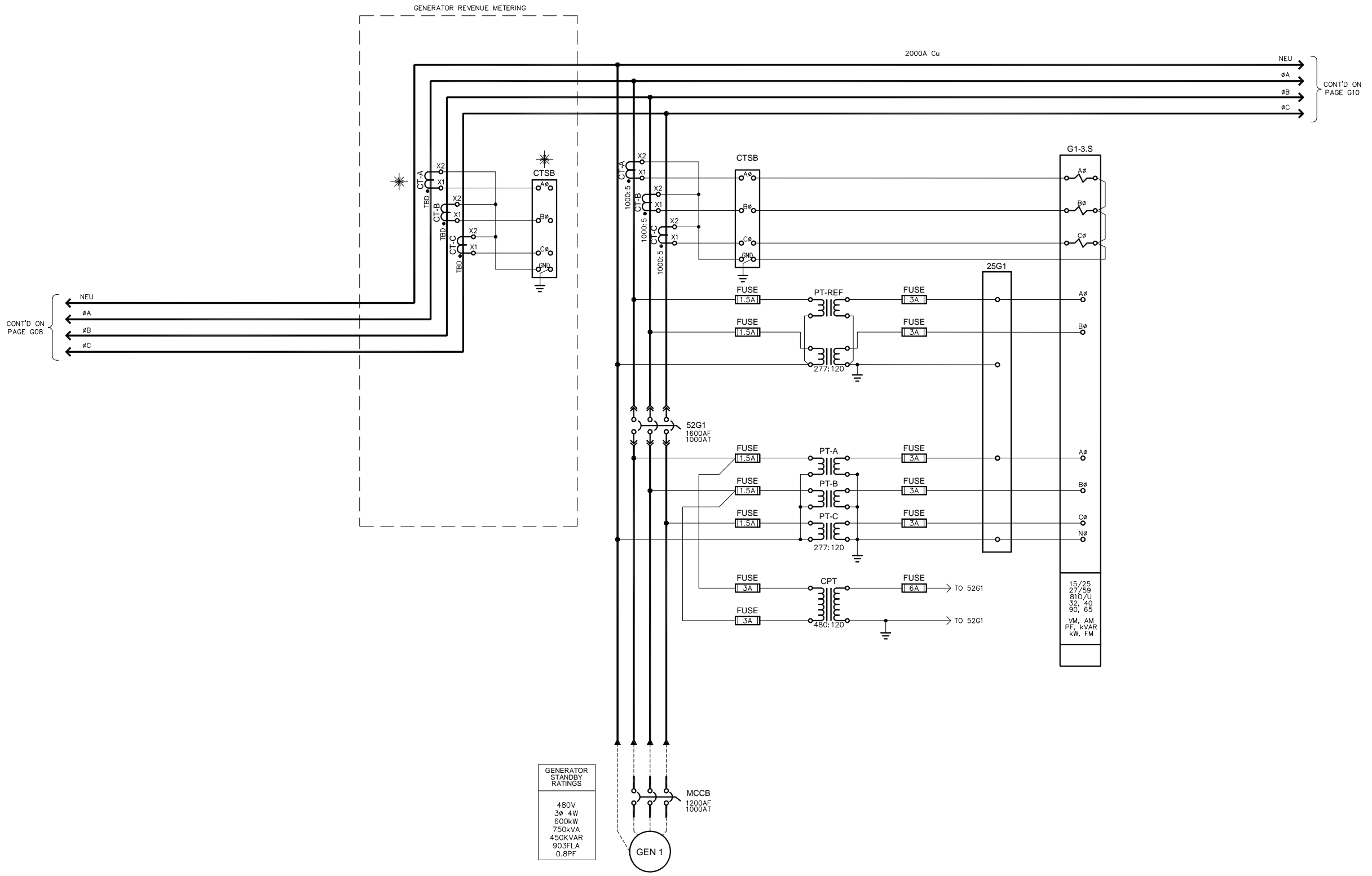
**WES CCSD #1 INTERTIE 2 DIVERSION
THREE - LINE DIAGRAM**

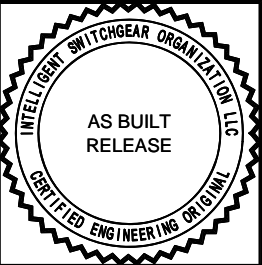
480V UTILITY / GENERATOR PARALLELING SWITCHGEAR

APPROVED BY <i>C. Waggaman</i>	SCALE N.T.S.	REV. 3.1	DRAWN BY AJ	MODIFIED BY HC
DATE APPROVED 05-14-13			DATE CREATED 01-05-11	DATE MODIFIED 02-23-11
FILE NAME 36368-G09			SHEET NUMBER 9	of 15

NO.	REVISION	DATE
0.0	ISSUED FOR SUBMITTAL	02-24-11
0.1	RE-ISSUED FOR SUBMITTAL	03-01-11
0.2	RE-ISSUED FOR SUBMITTAL	07-15-11
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3.0	ISSUED FOR AS BUILT	10-18-12
3.1	RE-ISSUED FOR AS BUILT	05-14-13

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CATERPILLAR

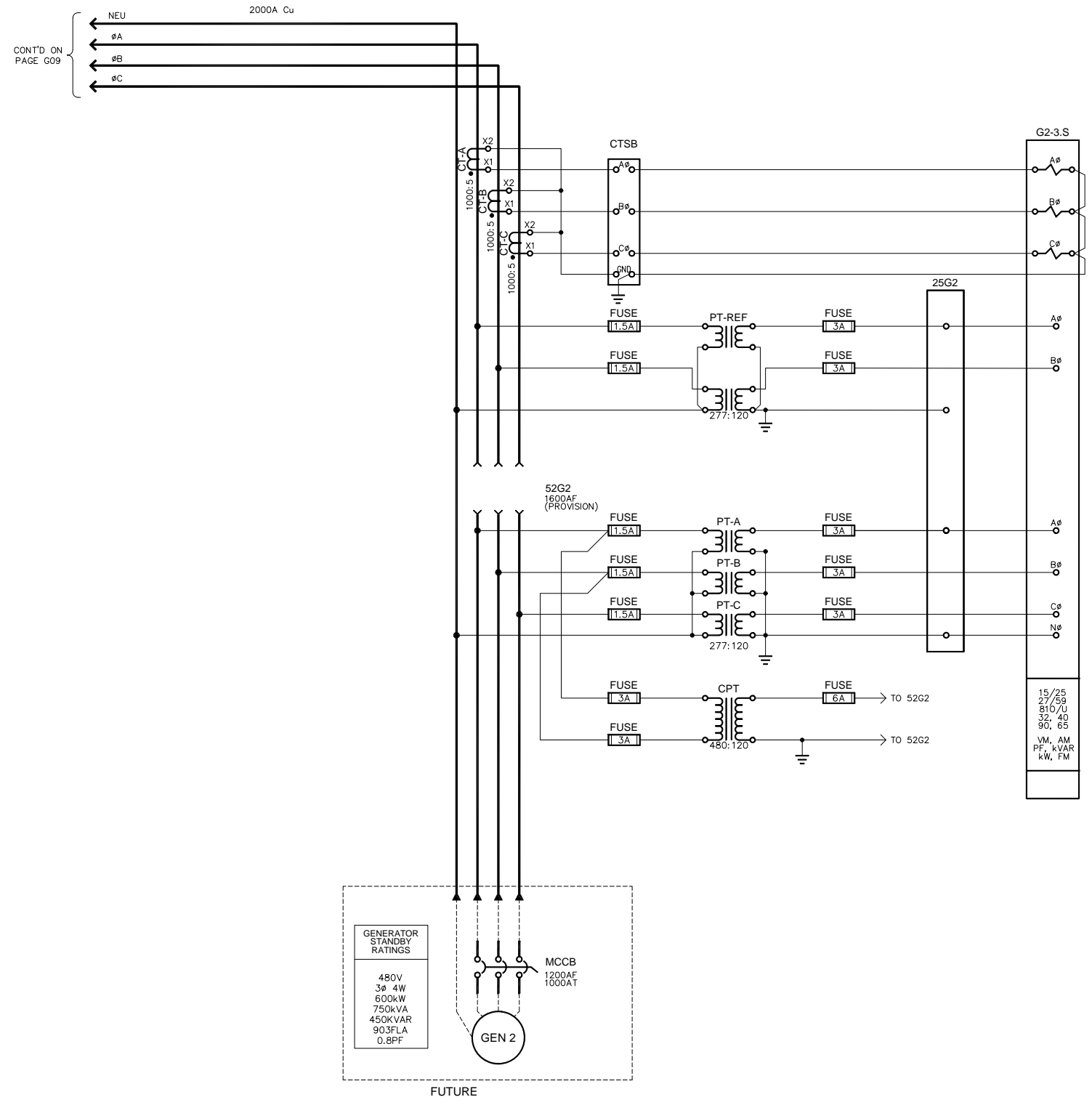
**WES CCSD #1 INTERTIE 2 DIVERSION
THREE - LINE DIAGRAM**

480V UTILITY / GENERATOR PARALLELING SWITCHGEAR

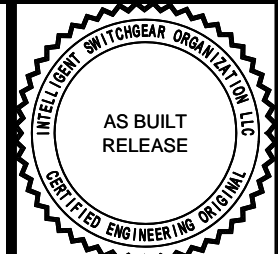
APPROVED BY <i>C. Waggaman</i>	SCALE N.T.S.	REV. 3.1	DRAWN BY AJ	MODIFIED BY HC
DATE APPROVED 05-14-13			DATE CREATED 01-05-11	DATE MODIFIED 02-23-11
FILE NAME 36368-G10			SHEET NUMBER 10	of 15

NO.	REVISION	DATE
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0.1	RE-ISSUED FOR SUBMITTAL	03-01-11
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3.1	RE-ISSUED FOR AS BUILT	05-14-13

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NOTE: DETAILED WIRING AND TERMINATION POINTS ARE PROVIDED IN THE WIRING DRAWINGS.

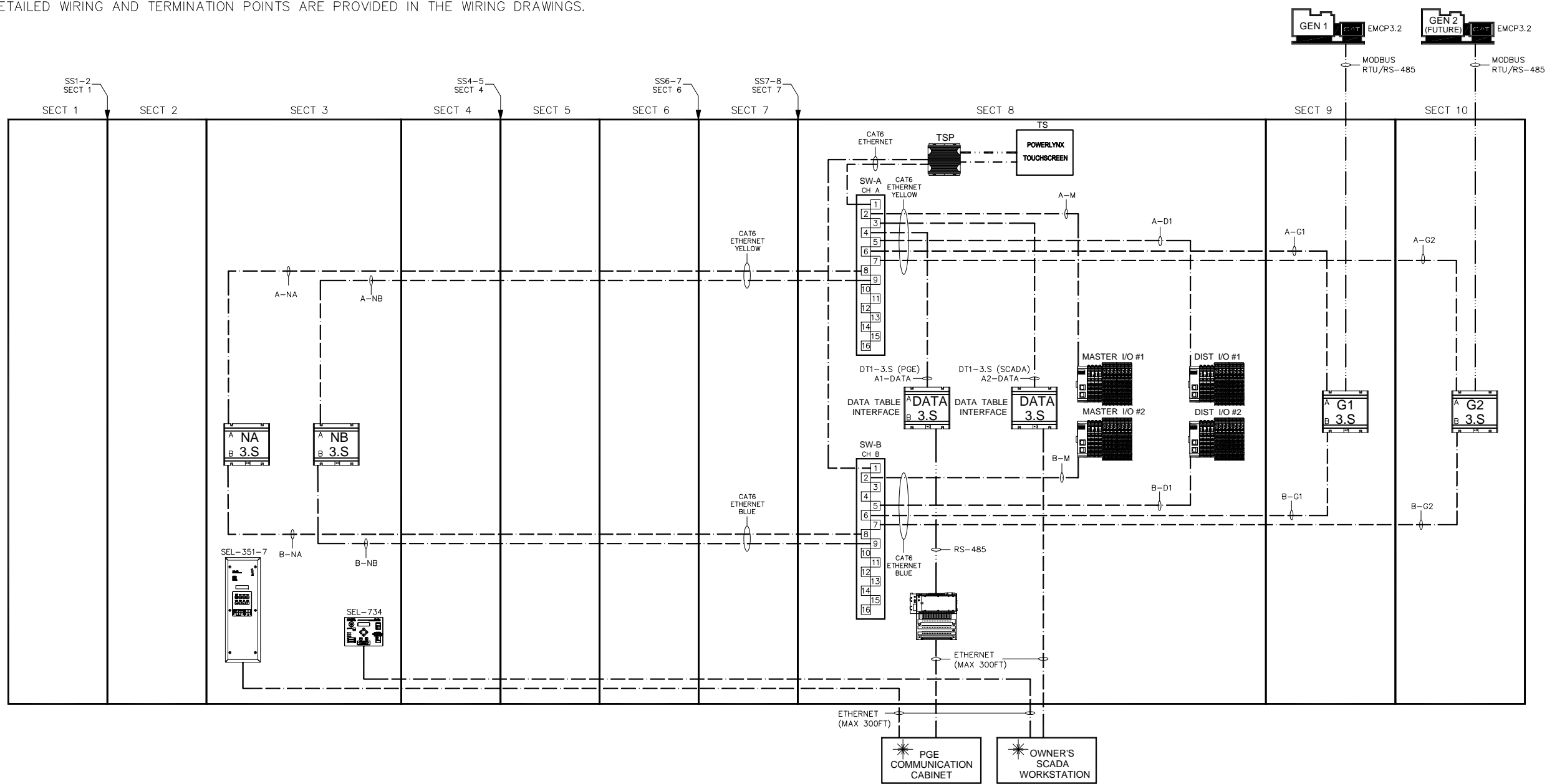


CATERPILLAR

**WES CCSD #1 INTERTIE 2 DIVERSION
AUTOMATION COMMUNICATIONS PLAN**

480V UTILITY / GENERATOR PARALLELING SWITCHGEAR

APPROVED BY <i>C. Waggaman</i>	SCALE N.T.S.	REV. 3.1	DRAWN BY AJ	MODIFIED BY LBM
DATE APPROVED 05-14-13			DATE CREATED 01-05-11	DATE MODIFIED 10-16-12
FILE NAME 36368-G11			SHEET NUMBER 11	of 15



SUPPLIED BY OTHERS

WIRE LEGEND

- RS-232
- VIDEO CABLE
- CHANNEL "A" CAT6 ETHERNET (YELLOW)
- CHANNEL "B" CAT6 ETHERNET (BLUE)
- MODBUS RTU/RS-485
- ETHERNET

DEVICE LEGEND

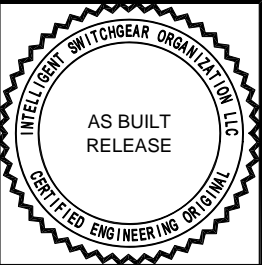
DATA TABLE INTERFACE 	19 INCH TOUCHSCREEN 	PROGRAMMABLE CONTROL
PHOENIX ETHERNET SWITCH 	DIRECTIONAL OVERCURRENT RECLOSING RELAY SEL-351-7 	PHOENIX ETHERNET BUS COUPLER
MODICON PLC 	REVENUE METERING SYSTEM SEL-734 	TOUCH SCREEN PROCESSOR XYCOM

NO.	REVISION	DATE
0.0	ISSUED FOR SUBMITTAL	02-24-11
0.1	RE-ISSUED FOR SUBMITTAL	03-01-11
0.2	RE-ISSUED FOR SUBMITTAL	07-15-11
1.0	ISSUED FOR PRODUCTION	10-10-11
2.0	ISSUED FOR FIELD STARTUP	12-21-11
3.0	ISSUED FOR AS BUILT	10-18-12
3.1	RE-ISSUED FOR AS BUILT	05-14-13

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CONTROL CIRCUIT CONDUIT SCHEDULE (SEE NOTE 1)

CONDUIT			CONDUCTOR		CONDUIT SIZE	CONDUIT TABLE
NO.	FROM	TO	QTY-SIZE	FUNCTION		
1	GEN 1	SECT 9	1 - 2 COND. #18 SHIELDED TWISTED PAIR, BELDEN 3073F OR EQUIVALENT	GEN 1 EMCP3.2 (DATA LINK)	NOTE 4 & 5	TYPE D NOTE 6
			1 - 3 COND. #16 SHIELDED TWISTED TRIPLET, BELDEN 8618 OR EQUIVALENT	GEN 1 ADEM 4 (SPEED BRICK)		
			1 - 2 COND. #16 SHIELDED TWISTED PAIR, BELDEN 8719 OR EQUIVALENT	GEN 1 CDVR (ANALOG VOLTAGE CONTROL)		
			3 - #14 AWG	GEN 1 CDVR (MANUAL VOLTAGE CONTROL)		
			4 - #10 AWG	24VDC POWER		
1A	GEN 1	SECT 8	16 - #14 AWG	GEN 1 DISCRETE	NOTE 4 & 5	TYPE A
			3 - #14 AWG	PGE PRE-START WARNING ALARM		
2	GEN 2 (FUTURE)	SECT 10	1 - 2 COND. #18 SHIELDED TWISTED PAIR, BELDEN 3073F OR EQUIVALENT	GEN 2 EMCP3.2 (DATA LINK)	NOTE 4 & 5	TYPE D NOTE 6
			1 - 3 COND. #16 SHIELDED TWISTED, BELDEN 8618 OR EQUIVALENT	GEN 2 ADEM 4 (SPEED BRICK)		
			1 - 2 COND. #16 SHIELDED TWISTED PAIR, BELDEN 8719 OR EQUIVALENT	GEN 2 CDVR (ANALOG VOLTAGE CONTROL)		
			3 - #14 AWG	GEN 2 CDVR (MANUAL VOLTAGE CONTROL)		
			4 - #10 AWG	24VDC POWER		
2A	GEN 2 (FUTURE)	SECT 8	16 - #14 AWG	GEN 2 DISCRETE	NOTE 4 & 5	TYPE A
			3 - #14 AWG	PGE PRE-START WARNING ALARM		
3	EMERGENCY POWER PANEL	SECT 8	3 - #10 AWG	120VAC FOR 24V DC BATTERY CHARGER (1Ø, 20A)	NOTE 5	TYPE C
4	24VDC STATION BATTERIES	SECT 8	4 - #10 AWG	24VDC POWER	NOTE 5	TYPE A
5	OWNER'S SCADA WORKSTATION	SECT 8	1 - CAT6 CABLE	DATA TABLE INTERFACE	NOTE 5	TYPE D
			1 - CAT6 CABLE	POWER METER COMMUNICATIONS		
6	PGE COMMUNICATION CABINET	SECT 8	1 - CAT6 CABLE	PGE COMMUNICATIONS	NOTE 5	TYPE D
			1 - CAT6 CABLE	SEL-351-7 COMMUNICATIONS		
7	SECT 8	PUMP STATION PLC	16 - #14 AWG	GEN 1 RUN/GEN 1 TROUBLE/GEN 1 FAIL/SWGR COMMON ALARM/SYSTEM OPERATING IN DSG MODE/GEN 2 RUN/GEN 2 TROUBLE/GEN 2 FAIL	NOTE 5	TYPE A



WES CCSD #1 INTERTIE 2 DIVERSION CONTROL CONDUIT SCHEDULE 480V UTILITY / GENERATOR PARALLELING SWITCHGEAR			
APPROVED BY <i>C. Waggaman</i>	SCALE N.T.S.	REV. 3.1	MODIFIED BY HC
DATE APPROVED 05-14-13	DATE CREATED 01-07-11	DATE MODIFIED 09-19-11	SHEET NUMBER 12 of 15
FILE NAME 36368-G12	G12		

CONDUIT TABLE	
A	DC CONTROL <= 30V
B	DC CONTROL > 30V
C	AC CONTROL
D	SIGNAL LEVEL
E	FIBER OPTIC

- NOTES:**
- 1) ELECTRICAL CONTRACTOR RESPONSIBLE FOR ADHERENCE TO ALL APPLICABLE STANDARDS AND CODES.
 - 2) ELECTRICAL CONTRACTOR MAY MODIFY ROUTING AND COMBINE CONDUITS OF THE SAME TYPE.
 - 3) ELECTRICAL CONTRACTOR TO TERMINATE FIELD WIRING AT BOTH ENDS.
 - 4) CONDUIT TYPES A AND D MAY BE COMBINED.
 - 5) CONDUIT TO BE SIZED BY INSTALLER.
 - 6) SEPARATE METALLIC CONDUIT MUST BE USED FOR EACH WIRE TYPE (A, B, C, & D). WIRE TYPES A & D MAY BE COMBINED IN THE SAME METALLIC CONDUIT.
 - 7) SPARES TO BE LEFT 10' LONG, COILED AND TAPED IN BOTTOM OF ENCLOSURE.
 - 8) ELECTRICAL CONTRACTOR TO PROVIDE 20% SPARES.
 - 9) ALL CONTROL WIRING TO BE STRANDED COPPER UNLESS SPECIFIED OTHERWISE.
- NOTE: DETAILED FIELD INTERCONNECT POINTS ARE PROVIDED IN THE FIELD INTERCONNECT (F) DRAWINGS.

NO.	REVISION	DATE
0.0	ISSUED FOR SUBMITTAL	02-24-11
0.1	RE-ISSUED FOR SUBMITTAL	03-01-11
0.2	RE-ISSUED FOR SUBMITTAL	07-15-11
1.0	ISSUED FOR PRODUCTION	10-10-11
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3.0	ISSUED FOR AS BUILT	10-18-12
3.1	RE-ISSUED FOR AS BUILT	05-14-13

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Functional Sequence of Operations

A. Automatic/Standby Mode

1. The utility main breaker is closed serving utility power to the generator/load bus.
2. The generator breaker is open.
3. The automation is standing by to act in response to a utility failure.

B. Emergency Mode

1. Utility Failure
 - a. Utility protective relaying senses utility voltage or frequency out of tolerance.
 - b. The utility main breaker is opened.
 - c. A run request is sent to the generator.
 - d. When the generator is up to voltage and frequency it is closed to the bus.
 - e. The system is now in Emergency Mode.
2. Utility Restoration and Exit from Emergency Mode
 - a. Utility protective relaying senses utility voltage and frequency within tolerance.
 - b. Following an adjustable time delay (which can be abbreviated by the operator) to assure that the utility power source is stable, the generator is passively synchronized and paralleled to the utility source by closing the utility main breaker.
 - c. The generator is soft ramp unloaded until the utility source is nominally serving the entire system load.
 - d. The generator breaker is opened.
 - e. The generator is allowed to run for its programmed cool down period.
 - f. The system is now back in Automatic/Standby Mode.

C. Storm Avoidance Mode (Closed Transfer to Emergency Mode)

1. Entry
 - a. The operator selects Storm Avoidance Mode ON position on the OVERVIEW SCREEN or places the System Mode Selector Switch into the Closed Xfer to Emergency position.
 - b. A run request is sent to the generator, after the adjustable (0-30 second) pre-start signal.
 - c. After generator is up to rated voltage and frequency, and after completion of the warm-up time, the generator is synchronized and paralleled to the utility source by closing the generator main breaker.
 - d. The generator is soft ramp loaded until the generator is serving nominally the entire load on the bus and the utility main breaker is opened.
 - e. The system is now running in Emergency Mode.
2. Exit from Storm Avoidance Mode (Closed Transfer to Emergency Mode)
 - a. The operator selects the OFF position Storm Avoidance Mode or removes the System Mode Selector Switch from Transfer to Emergency position and returns it to the Auto position.
 - b. Following an adjustable time delay (which can be abbreviated by the operator), the generator is passively synchronized and paralleled to the utility source by closing the utility main breaker.
 - c. The generator is soft ramp unloaded until the utility source is nominally serving the entire system load.
 - d. The generator breaker is opened.
 - e. The generator is allowed to run for their programmed cool down period.
 - f. The system is now back in Automatic/Standby Mode.

D. DSG Mode (Load Management BaseLoad)

1. Entry
 - a. Select one of the modes of operation: (DSG mode corresponds to Item 4. Toggle switch should remain in BaseLoad / Export position. Since DSG mode can also be accessed remotely via PGE communications, the Remote DSG Mode Switch should always be enabled, unless Owner wants it to be blocked.)
 - 1) Import Limit - The user places the Import/Export toggle switch in the Import position and places the Base Load/Utility Tracking toggle switch in the Utility Tracking position. The user sets the Utility Import Set point to the desired amount of kW that they want to import through the Utility Circuit Breaker during Load Management Mode.
 - 2) Export Limit - The user places the Import/Export toggle switch in the Export position and places the Base Load/Utility Tracking toggle switch in the Utility Tracking position. The user sets the Utility Export Set point to the desired amount of kW that they want to export through the Utility Circuit Breaker during Load Management Mode.
 - 3) Base Load Import - The user places the Import/Export toggle switch in the Import position and places the Base Load/Utility Tracking toggle switch in the Base Load position. The user sets the Base Load Set point to the desired amount of kW that they want the generator to assume during Load Management Mode. The controls will not allow the generator plant to export kW through the Utility Circuit Breaker and will always maintain a nominal amount of Utility kW imported through the Utility Circuit Breaker.
 - 4) DSG Mode (Base Load Export) - The user places the Import/Export toggle switch in the Export position and places the Base Load/Utility Tracking toggle switch in the Base Load position. The user or PGE communications sets the Base Load Set point to the desired amount of kW that they want the generator to assume during DSG (Load Management Mode). The controls will allow the generator to export kW through the Utility Circuit Breaker.
 - b. Alarm horn/strobe is activated (0-30 seconds adjustable) and then the generator is commanded to start via remote DSG signal through PGE communications or Facility Operator's manual selection.
 - c. The generator is synchronized and paralleled to the bus at no load after completion of the warm-up time.
 - d. When the generator is on the bus it is soft ramp loaded until the generator is serving nominally the required amount of the load on the bus to meet the mode of operation selected.
 - e. The generator output is dynamically adjusted to maintain the set point to meet the mode of operation selected. If at any time the

- system is unable to maintain the setpoint then a "Set point Exceeded" alarm shall be sounded.
 - f. Should the utility fail at any time during Load Management operation, the utility protective relays shall cause the utility main to open (which is a single step "hard exit" out of DSG mode) thus placing the system in Emergency Mode until the Utility is restored (as described in Emergency Mode exit)
 - g. Should a "Block DSG" signal occur from the SEL 351-7 (out 103) system will go directly and automatically into "Exit DSG" as described in the paragraph following, accompanied by an alarm.
2. Exit
 - a. User returns Master Mode Selector Switch to the Auto position, or PGE sends a signal to terminate DSG mode.
 - b. The generator is soft ramp unloaded until the utility source is nominally serving the entire system load and the generator main breaker is opened.
 - c. The generator is allowed to run for its programmed cool down period. If a utility outage occurs during this period, the system will enter Emergency Mode.
 - d. The system is now back in Automatic/Standby Mode.

E. No Load Test Mode

1. Entrance into No Load Test Mode
 - a. The No Load Test Switch is placed in the ON position.
 - b. The generator is started.
 - c. The generator comes up to voltage and frequency and remain running disconnected from the bus.
 - d. The system is now in No Load Test Mode.
2. Exit from No Load Test Mode.
 - a. The No Load Test Switch is placed in the OFF position.
 - b. The generator is allowed to run for their programmed cool down period.
 - c. The system is now back in Automatic/Standby Mode.

Load Shed Control (Embedded But Not Used Per One Genset System)

The System Controls shall include a Load Shed Control function to control the loads served by the generator plant. The Load Shed Control shall have one Essential Load Shed Priority Level for each generator in the system plus one Non-Essential Load Shed Priority Level (which is always shed in the Emergency Mode of operation). The Load Shed Control shall control each of the distribution circuit breakers that are shown on the drawings. Distribution circuit breakers to be controlled shall be electrically operated. Each electrically operated distribution circuit breaker shall be field selectable to be assigned to any of the available Load Shed Priority Levels.

Provide the following controls for each Essential Load Shed Priority Level:

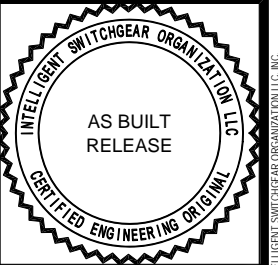
1. Shed Delay Timer, adjustable from 0 to 1024 seconds
 2. Add Delay Timer, adjustable from 0 to 1024 seconds
 3. Load Shed Override Selector (shed/auto//add)
 4. Status indicators to show whether the Priority Level is Added or Shed
 5. Provide the following controls for each Non-Essential Load Shed Priority
 6. Load Shed Override Selector (shed/auto//add)
 7. Status indicators to show whether the Priority Level is Added or Shed
- Additionally, the Load Shed Controls shall have:

1. Load Shed Control Switch (On/Off)
2. User-settable Load Shed % (as a function of on-line generator capacity)
3. User-settable Load Shed Time Delay
4. User-settable Load Add % (as a function of on-line generator capacity)
5. User-settable Load Add Time Delay
6. User-settable Bus Under frequency Set point
7. User-settable Bus Under frequency time delay
8. Bus Under frequency Reset Pushbutton
9. Bus Under frequency indicator

Conditional Load Shed: Upon entrance into Emergency Mode of operation, the Load Shed Control shall shed all Essential and Non-Essential loads. As generators come to the bus, Essential Priority Level loads shall be added conditionally based on the number of generators on line. When the first generator comes to the bus, Priority Level 1 loads shall be added; Second generator, priority 2, etc. After a time delay that allows all operational generators to come to the bus, Load Shed Mode shall shift to Load Sensitive Mode.

Load Sensitive Load Shed - After all generators have been given sufficient time to come to the bus, load shed shall shift to "Load Sensitive" mode. The system shall compare current generator on-line capacity (in kW) to current load requirements. If surplus capacity is greater than the calculated Load Add setpoint, after the Load Add Time Delay the next Load Shed Priority will be added. This calculation will continue until all Sheddable Loads are added, or until surplus capacity is less than the calculated Load Add setpoint. If surplus capacity is less than the calculated Load Shed setpoint, after the Load Shed Time Delay the next Load Shed Priority will be shed. This calculation will continue until all Sheddable Loads are shed, or until surplus capacity is greater than the calculated Load Shed setpoint. The Load Shed Control, in its automatic shedding and adding of loads, shall not override any manual load shed/add operation.

Should the load bus frequency fall below the user selected bus underfrequency setpoint for a period longer than the bus underfrequency time delay, then all Priority Level loads shall be shed and load addition shall not resume until the operator has depressed the Bus Underfrequency Reset button. The bus underfrequency protection shall override any manual load add operation.



TITLE: WES CCSD #1 INTERTIE 2 DIVERSION		DRAWN BY: AJ		MODIFIED BY: HC	
SEQUENCE OF OPERATIONS		REV: 3.1		DATE CREATED: 01-07-11	
480V UTILITY / GENERATOR PARALLELING SWITCHGEAR		SCALE: N.T.S.		DATE MODIFIED: 08-29-11	
APPROVED BY: C. Waggaman		REV: 3.1		SHEET NUMBER: 14 of 15	
DATE APPROVED: 05-14-13		G14			
FILE NAME: 36368-G14					

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0.0	ISSUED FOR SUBMITTAL	02-24-11
0.1	RE-ISSUED FOR SUBMITTAL	03-01-11
0.2	RE-ISSUED FOR SUBMITTAL	07-15-11
1.0	ISSUED FOR PRODUCTION	10-10-11
2.0	ISSUED FOR FIELD STARTUP	12-21-11
3.0	ISSUED FOR AS BUILT	10-18-12
3.1	RE-ISSUED FOR AS BUILT	05-14-13

HMI Manual Operation

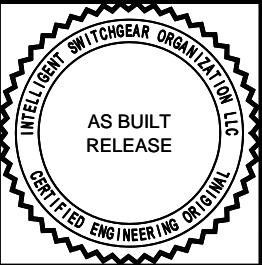
In this mode the generator will start if a power failure occurs, but the operator must manually close the generator breaker to a dead bus.

Transfer to Emergency Mode; loss of Utility:

1. The Master Mode Selector Switch in System Control screen must be placed into "Manual" position.
2. With Utility source not available, the protective relay will open utility breaker.
3. The operator places the Engine Control Switch in "Manual".
4. The operator manually closes the generator breaker to the dead bus from the control switch.
5. System is now in Emergency mode.

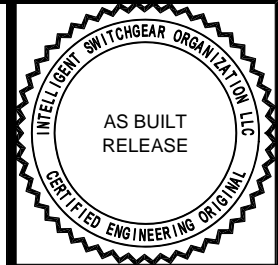
Re-Transfer to Automatic/ Standby Mode:

1. With Utility source available, operator will manually open generator breaker from the control switch.
2. The operator places the Engine Control switches in "Off" position.
3. The operator will then manually close utility breaker from the control switch.
4. The Master Mode Selector Switch in System Control screen will be placed into "Auto" position.
5. System is now in Automatic/Standby Mode.



TITLE:		WES CCSD #1 INTERTIE 2 DIVERSION	
		SEQUENCE OF OPERATIONS	
		480V UTILITY / GENERATOR PARALLELING SWITCHGEAR	
APPROVED BY	SCALE	REV.	MODIFIED BY
<i>C. Waggaman</i>	N.T.S.	3.1	HC
DATE APPROVED			DATE MODIFIED
05-14-13			01-07-11
FILE NAME	SHEET NUMBER		of
36368-G15	G15		15

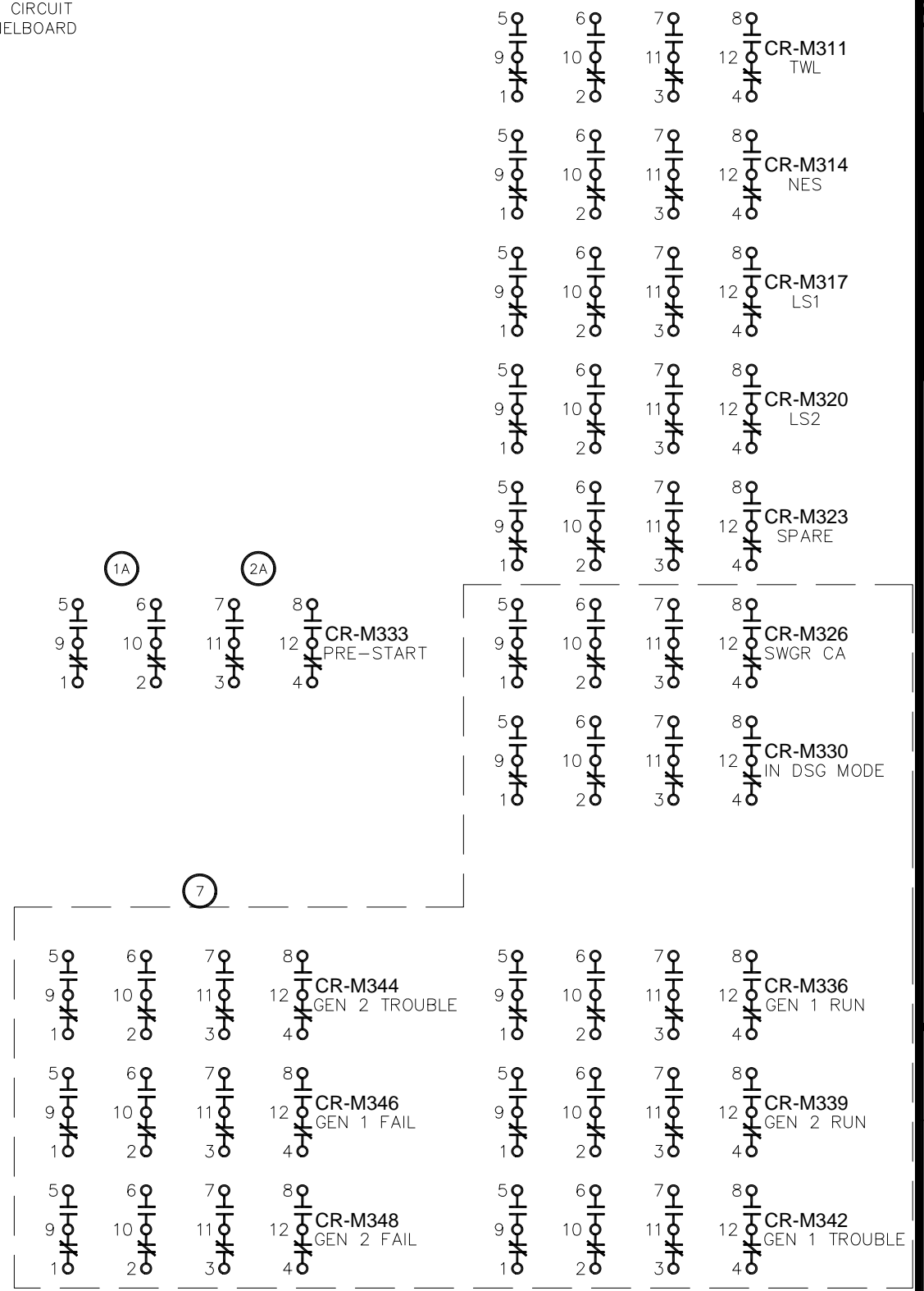
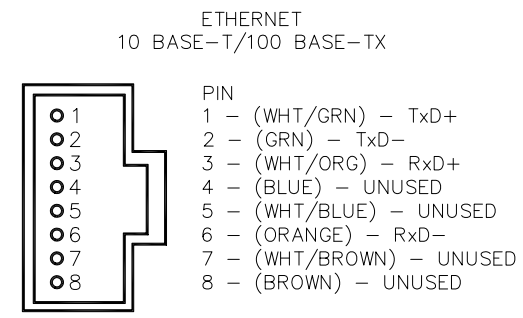
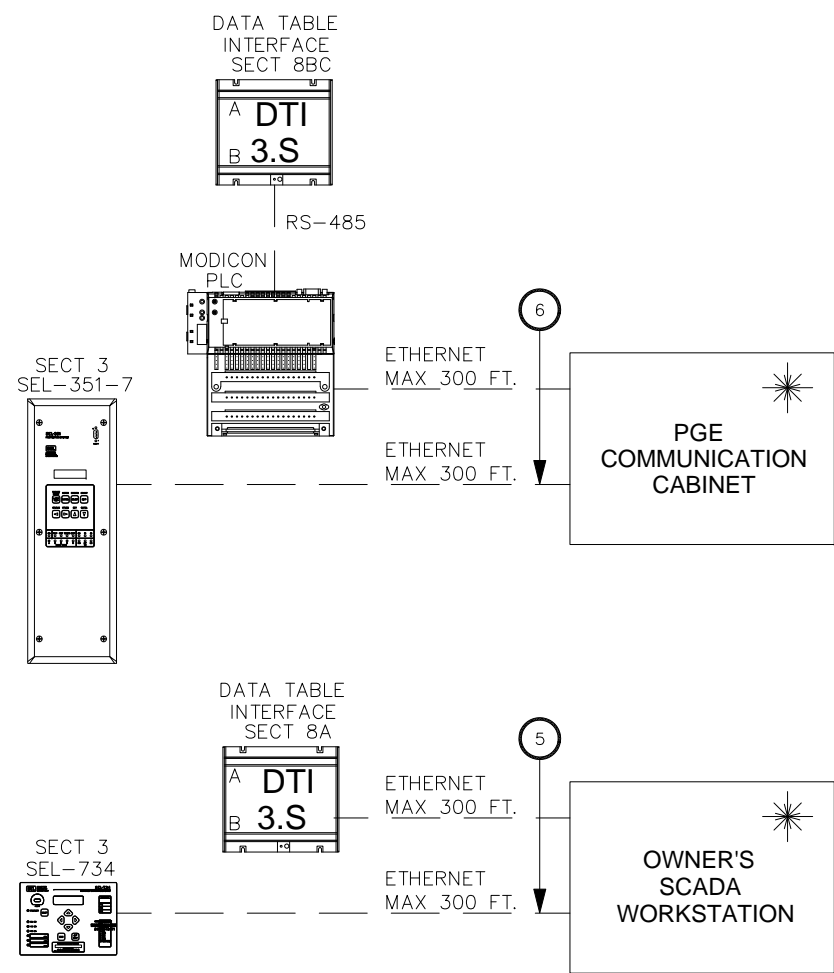
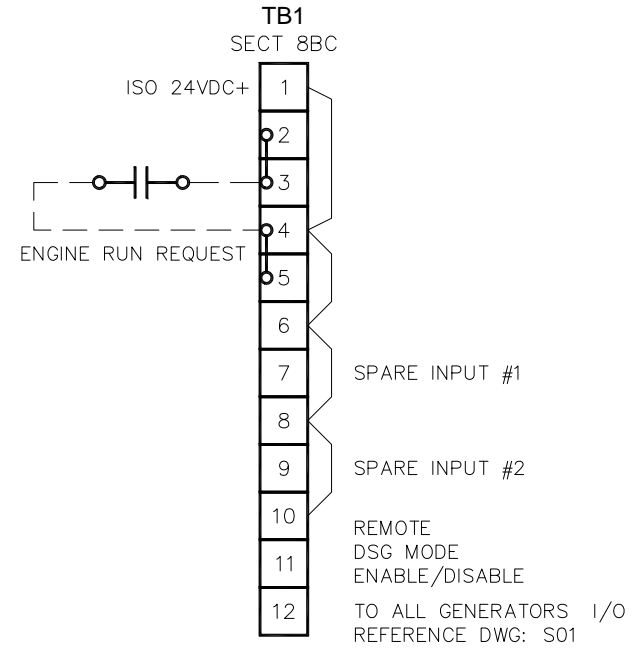
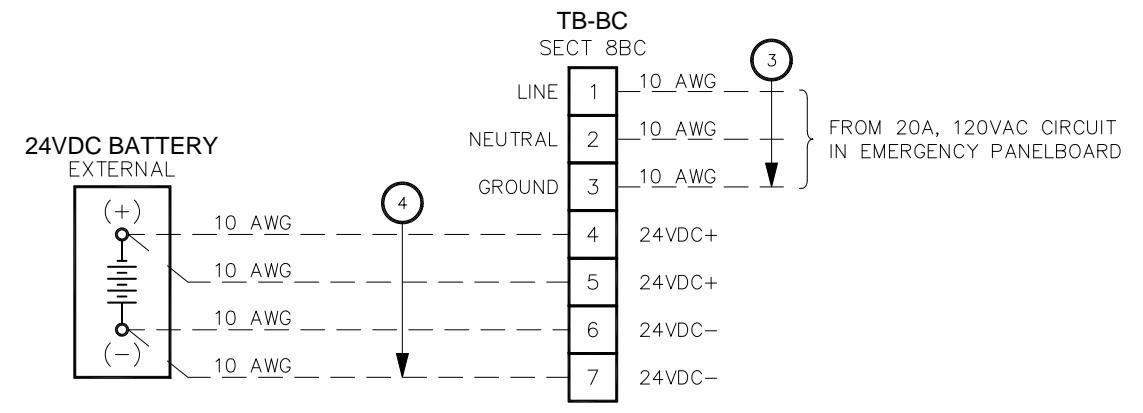
NO.	REVISION	DATE
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2.0	ISSUED FOR FIELD STARTUP	12-21-11
3.0	ISSUED FOR AS BUILT	10-18-12
3.1	RE-ISSUED FOR AS BUILT	05-14-13



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WES CCSD #1 INTERTIE DIVERSION
FIELD INTERCONNECTS - SYSTEM
480V UTILITY / GENERATOR PARALLELING SWITCHGEAR

APPROVED BY	SCALE	REV.	DRAWN BY	MODIFIED BY
<i>C. Waggaman</i>	N.T.S.	3.1	HC	LBM
DATE APPROVED			DATE CREATED	DATE MODIFIED
05-14-13			02-23-11	10-16-12
FILE NAME			SHEET NUMBER	of
36368-F01			1	3



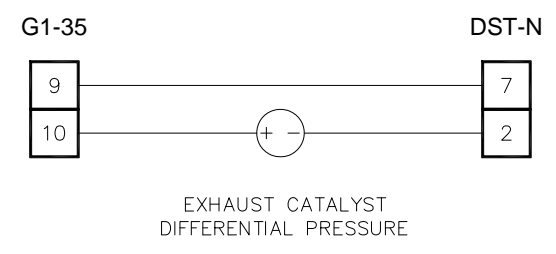
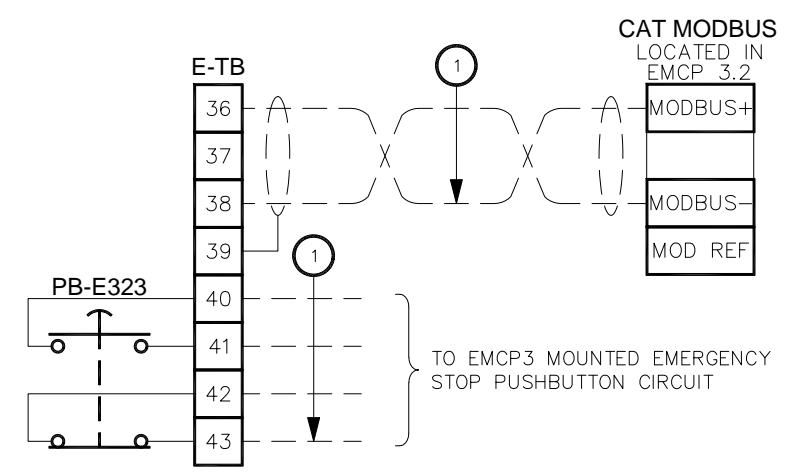
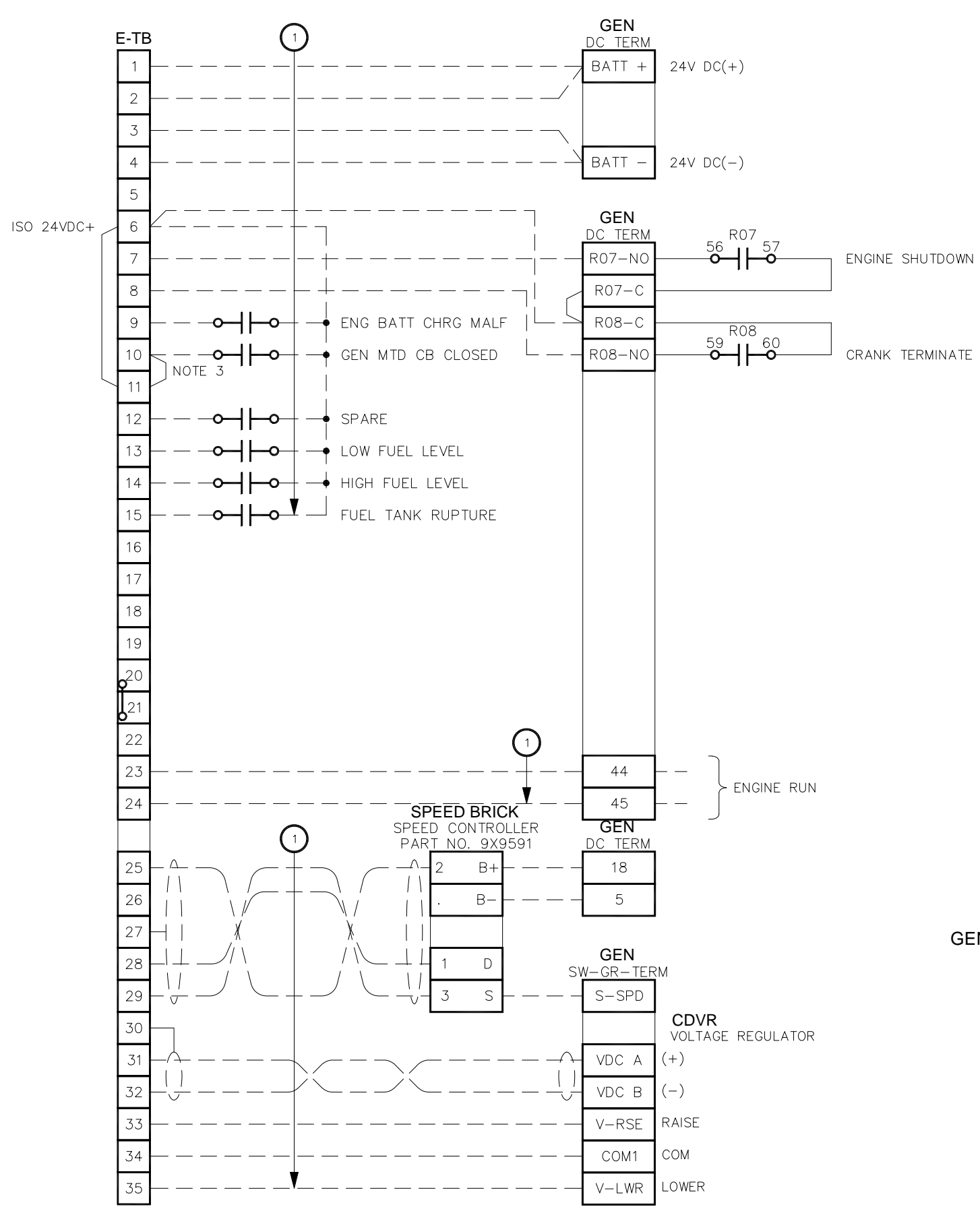
☼ SUPPLIED BY OTHERS

(X) CONDUIT NUMBER

NOTES:
1) SEE SHEET G12 & G13 FOR WIRING TYPES AND SIZING.
2) ALL CONTROL WIRING TO BE STRANDED COPPER WIRING UNLESS NOTED.

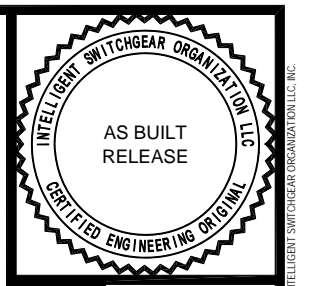
NO.	REVISION	DATE
1.0	ISSUED FOR PRODUCTION	10-10-11
2.0	ISSUED FOR FIELD STARTUP	12-21-11
3.0	ISSUED FOR AS BUILT	10-18-12
3.1	RE-ISSUED FOR AS BUILT	05-14-13

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GEN 1 CONTROLS LOCATED IN SECT 9A

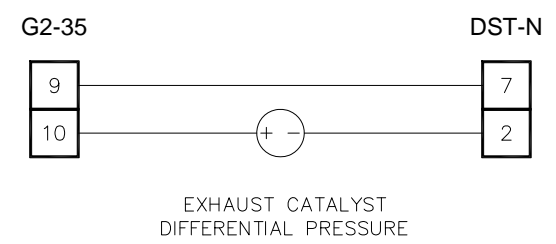
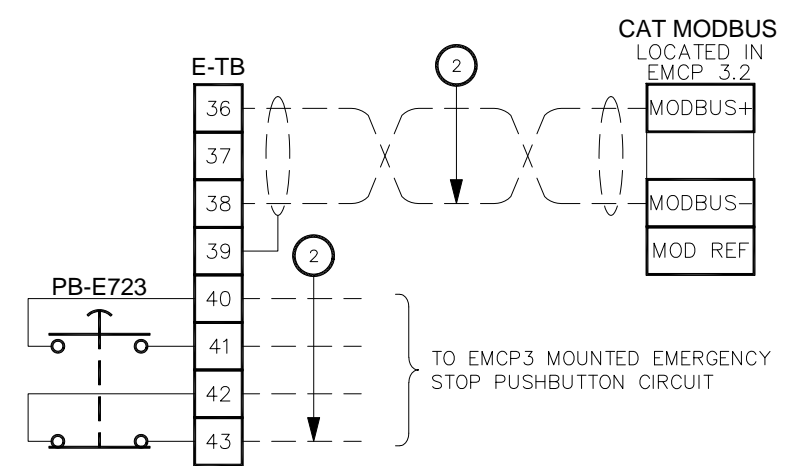
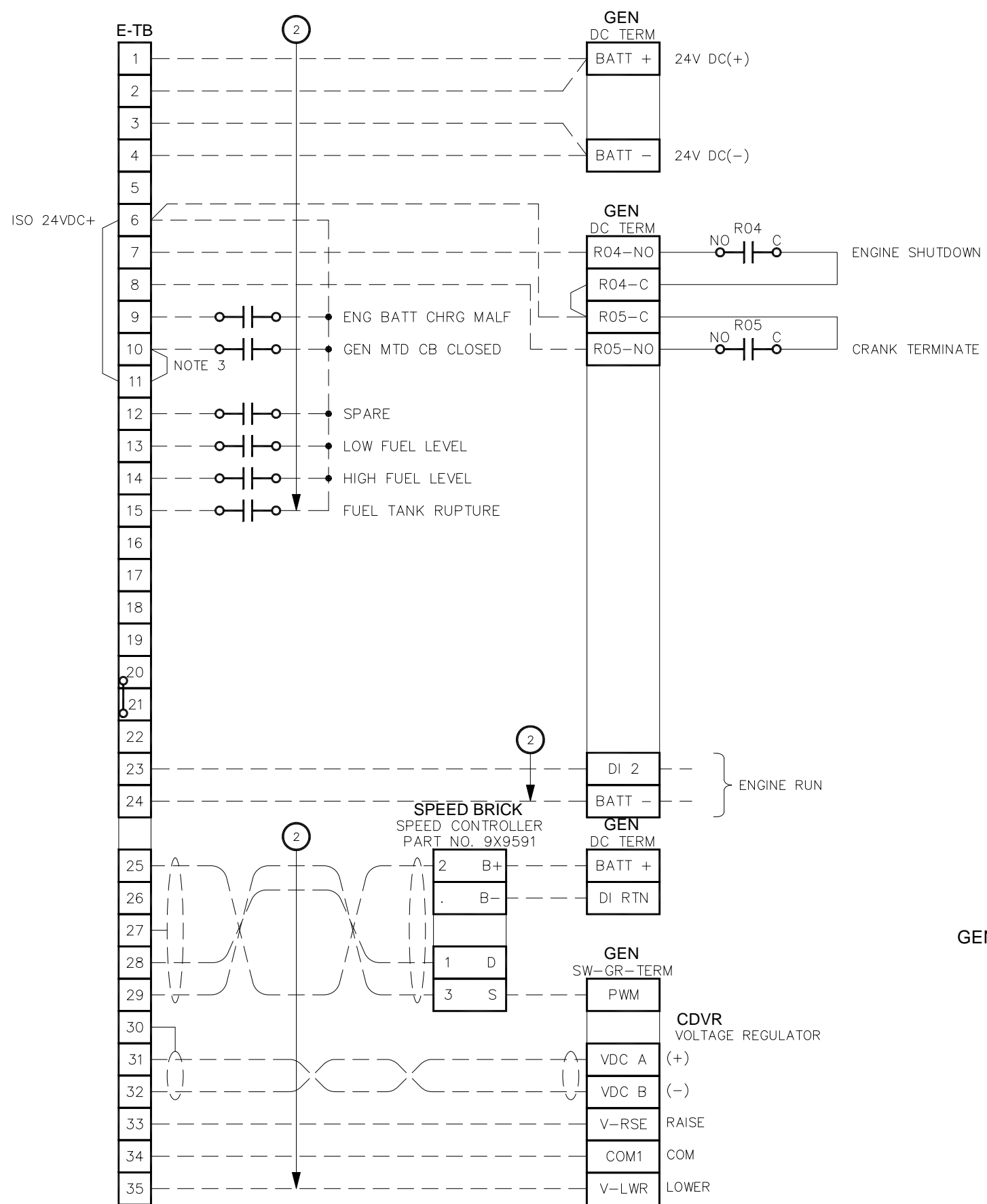
- (X) CONDUIT NUMBER
- NOTES:
 1) SEE SHEET G12 & G13 FOR WIRING TYPES AND SIZING.
 2) ALL CONTROL WIRING TO BE STRANDED COPPER WIRING UNLESS NOTED.
 3) REMOVE JUMPER IF GEN MTD CB IS PRESENT.



WES CCSD #1 INTERTIE DIVERSION		REV. 3.1	MODIFIED BY LBM
FIELD INTERCONNECTS - GEN 1		DATE CREATED 01-23-11	DATE MODIFIED 10-16-12
480V UTILITY / GENERATOR PARALLELING SWITCHGEAR		SCALE N.T.S.	SHEET NUMBER 2 of 3
APPROVED BY <i>C. Waggaman</i>	DATE APPROVED 05-14-13	FILE NAME 36368-F02	

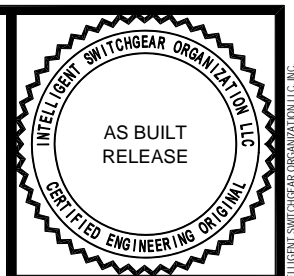
NO.	REVISION	DATE
1.0	ISSUED FOR PRODUCTION	10-10-11
2.0	ISSUED FOR FIELD STARTUP	12-21-11
3.0	ISSUED FOR AS BUILT	10-18-12
3.1	RE-ISSUED FOR AS BUILT	05-14-13

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GEN 1 CONTROLS LOCATED IN SECT 10A

- (X) CONDUIT NUMBER
- NOTES:
 1) SEE SHEET G12 & G13 FOR WIRING TYPES AND SIZING.
 2) ALL CONTROL WIRING TO BE STRANDED COPPER WIRING UNLESS NOTED.
 3) REMOVE JUMPER IF GEN MTD CB IS PRESENT.



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WES CCSD #1 INTERTIE DIVERSION		REV. 3.1	MODIFIED BY LBM
FIELD INTERCONNECTS - GEN 2		DATE CREATED 01-23-11	DATE MODIFIED 10-16-12
480V UTILITY / GENERATOR PARALLELING SWITCHGEAR		SCALE N.T.S.	SHEET NUMBER 3 of 3
APPROVED BY <i>C. Waggaman</i>	DATE APPROVED 05-14-13	FILE NAME 36368-F03	

NO.	REVISION	DATE
1.0	ISSUED FOR PRODUCTION	10-10-11
2.0	ISSUED FOR FIELD STARTUP	12-21-11
3.0	ISSUED FOR AS BUILT	10-18-12
3.1	RE-ISSUED FOR AS BUILT	05-14-13

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AS BUILT DRAWING SET

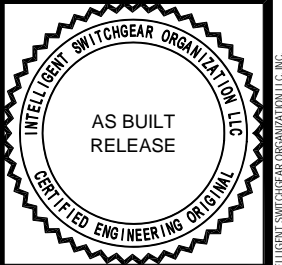
WES CCSD #1 INTERTIE 2 DIVERSION

CLACKAMAS, OR

480/277V UTILITY / GENERATOR PARALLELING SWITCHGEAR

PETERSON POWER SYSTEM
ISO PROJECT No. 36368

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DISTRIBUTION CONTROLS - 2	D02				
DISTRIBUTION CONTROLS - 3	D03				



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TITLE: WES CCSD #1 INTERTIE DIVERSION

TITLE SHEET 1

480V UTILITY / GENERATOR PARALLELING SWITCHGEAR

APPROVED BY
C. Waggaman

DATE APPROVED 05-14-13

SCALE N.T.S.

REV. 3.1

DRAWN BY HC

DATE CREATED 01-22-11

MODIFIED BY

DATE MODIFIED

SHEET NUMBER

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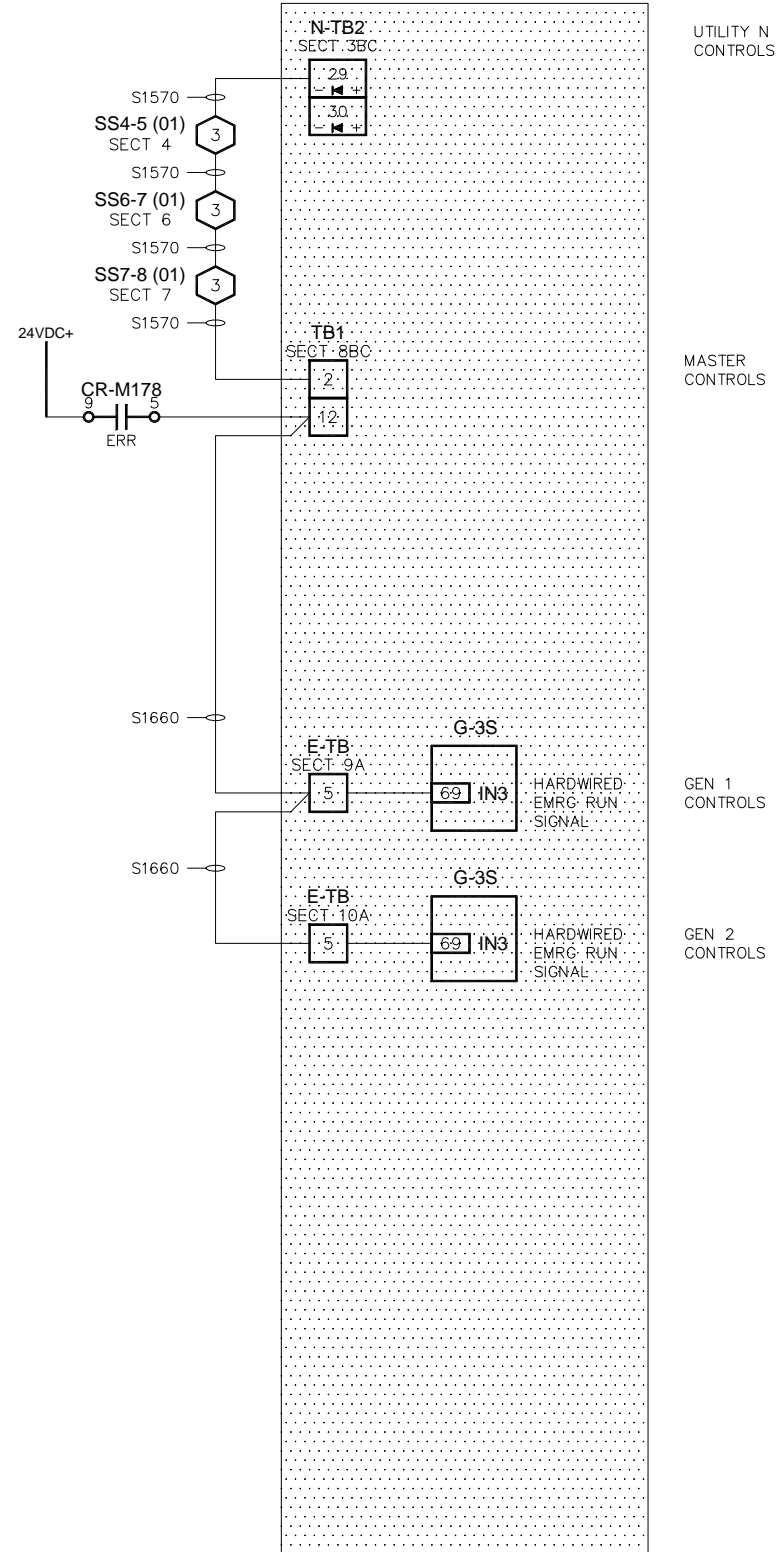
36368 (S)

NO.	REVISION	DATE
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0.2	RE-ISSUED FOR SUBMITTAL	07-15-11
1.0	ISSUED FOR PRODUCTION	10-10-11
2.0	ISSUED FOR FIELD STARTUP	01-17-12
3.0	ISSUED FOR AS BUILT	10-18-12
3.1	RE-ISSUED FOR AS BUILT	05-14-13

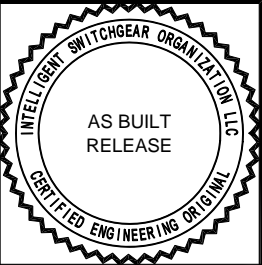
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EMERGENCY START LOGIC

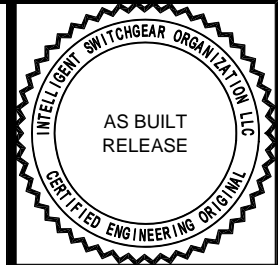


NOTE:
1) ALL WIRING TO BE 14AWG UNLESS NOTED.
2) HATCHED AREA SHOWS CONTROLS DUPLICATED IN GROUP DRAWING SETS.



WES CCSD #1 INTERTIE DIVERSION			
SYSTEM DETAILS - HOT BUS/EMERGENCY START			
480V UTILITY / GENERATOR PARALLELING SWITCHGEAR			
APPROVED BY	SCALE	REV.	DRAWN BY
<i>C. Waggaman</i>	N.T.S.	3.1	HC
DATE APPROVED			DATE CREATED
05-14-13			01-22-11
FILE NAME			DATE MODIFIED
36368 (S)			
			SHEET NUMBER
			1 of 6

NO.	REVISION	DATE
0.0	ISSUED FOR SUBMITTAL	02-24-11
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3.0	ISSUED FOR AS BUILT	10-18-12
3.1	RE-ISSUED FOR AS BUILT	05-14-13



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**WES CCSD #1 INTERTIE DIVERSION
AUTOMATION COMMUNICATION PLAN - INTERCONNECT**

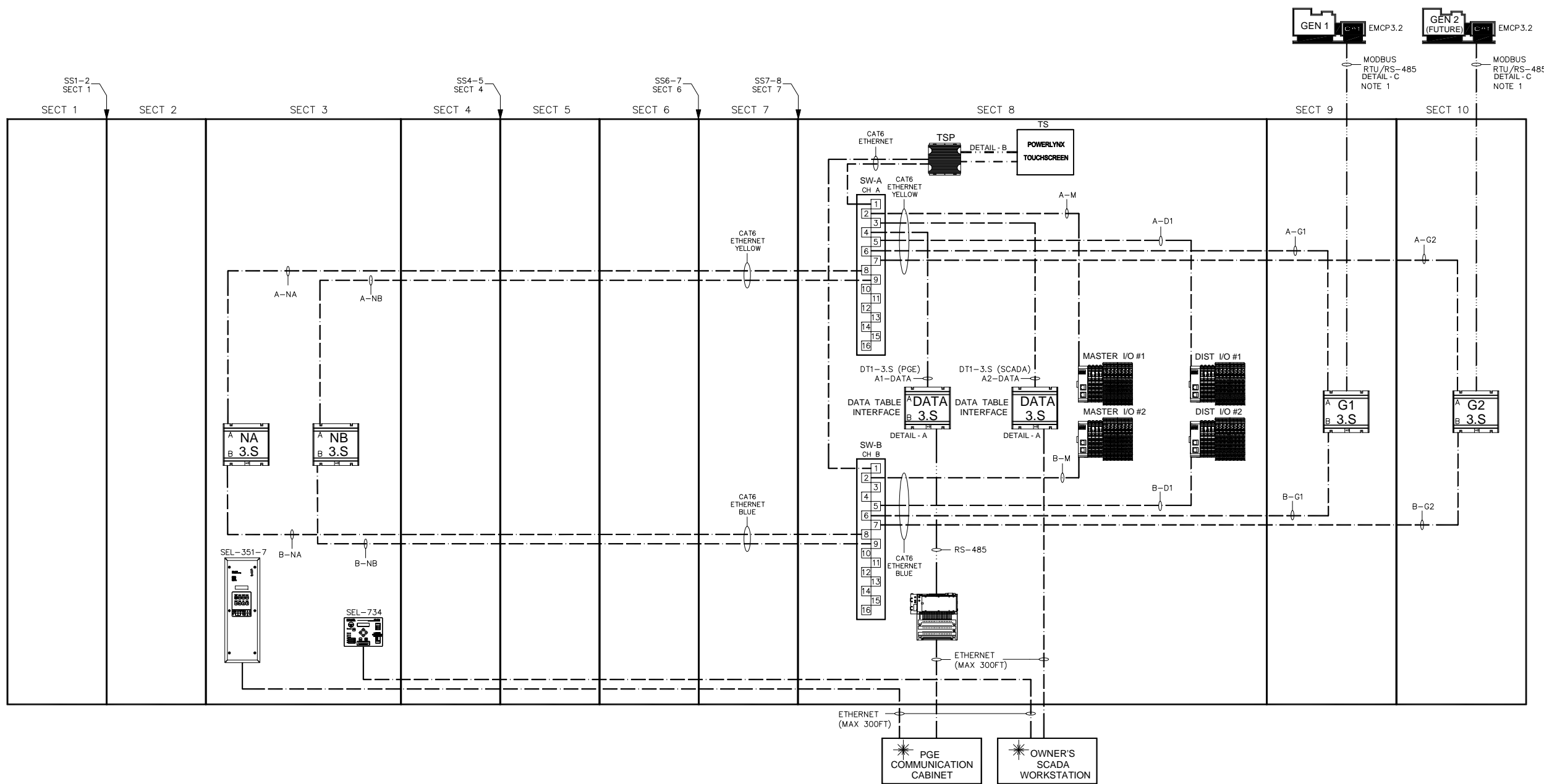
480V UTILITY / GENERATOR PARALLELING SWITCHGEAR

APPROVED BY: *C. Waggaman*
DATE APPROVED: 05-14-13
SCALE: N.T.S.
REV: 3.1
DRAWN BY: HC
MODIFIED BY: LBM
DATE CREATED: 01-22-11
DATE MODIFIED: 10-16-12
SHEET NUMBER: 2 of 6

S02

FILE NAME: 36368 (S)

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1.0	ISSUED FOR PRODUCTION	10-10-11
2.0	ISSUED FOR FIELD STARTUP	01-17-12
3.0	ISSUED FOR AS BUILT	10-18-12
3.1	RE-ISSUED FOR AS BUILT	05-14-13



WIRE LEGEND

---	RS-232
---	VIDEO CABLE
---	CHANNEL "A" CAT6 ETHERNET (YELLOW)
---	CHANNEL "B" CAT6 ETHERNET (BLUE)
---	MODBUS RTU/RS-485
---	ETHERNET

DEVICE LEGEND

DATA TABLE INTERFACE	19 INCH TOUCHSCREEN	GENSET CONTROL
MODICON PLC	REVENUE METERING SYSTEM	PHOENIX ETHERNET BUS COUPLER
DIRECTIONAL OVERCURRENT RECLOSING RELAY	PHOENIX ETHERNET SWITCH	TOUCH SCREEN PROCESSOR XYCOM

☼ SUPPLIED BY OTHERS

NOTES:

- MODBUS RTU/RS-485 MAXIMUM 1500ft TOTAL NETWORK LENGTH
- CONTROL NETWORK COMPRISED OF CAT6 CABLES

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ETHERNET SWITCH #1 CONFIGURATION (ESW-M160)

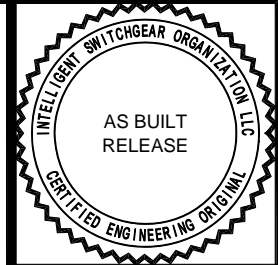
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X1	TSP	5
X2	MAST I/O	5
X3	DTI-3.S (PGE)	5
X4	DTI-3.S (SCADA)	8
X5	DIST I/O	5
X6	G1	5
X7	G2	8
X8	NA	15
X9	NB	15
X10		
X11		
X12		
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X14		
X15		
X16		

YELLOW ETHERNET CABLES

ETHERNET SWITCH #2 CONFIGURATION (ESW-M164)

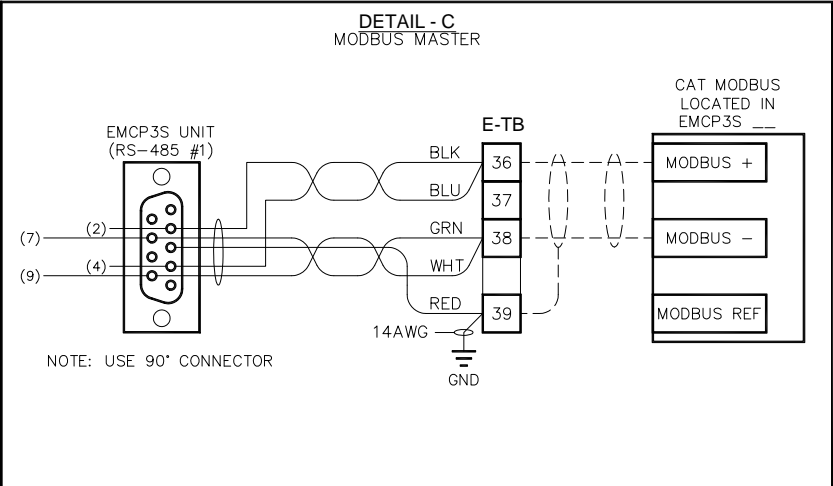
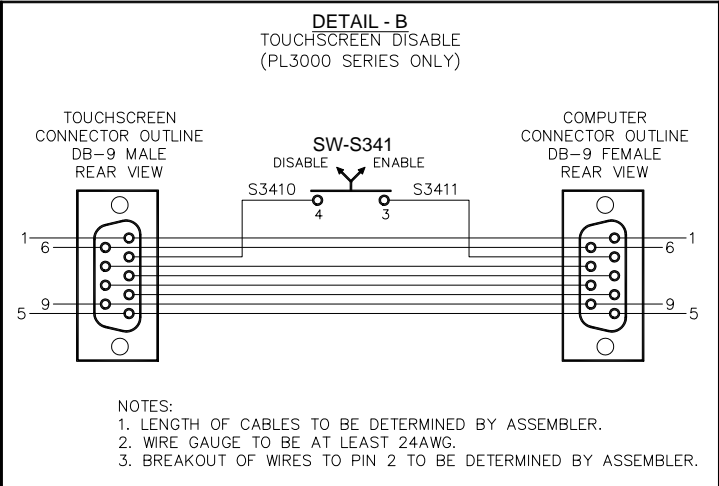
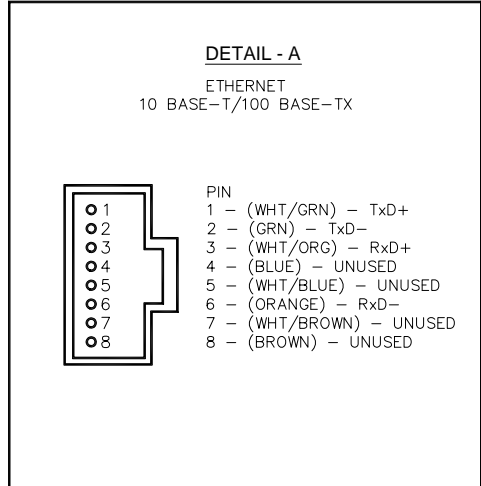
PORT	USAGE	CABLE LENGTH
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X2	MAST I/O	5
X3		
X4		
X5	DIST I/O	5
X6	G1	5
X7	G2	8
X8	NA	15
X9	NB	15
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X14		
X15		
X16		

BLUE ETHERNET CABLES



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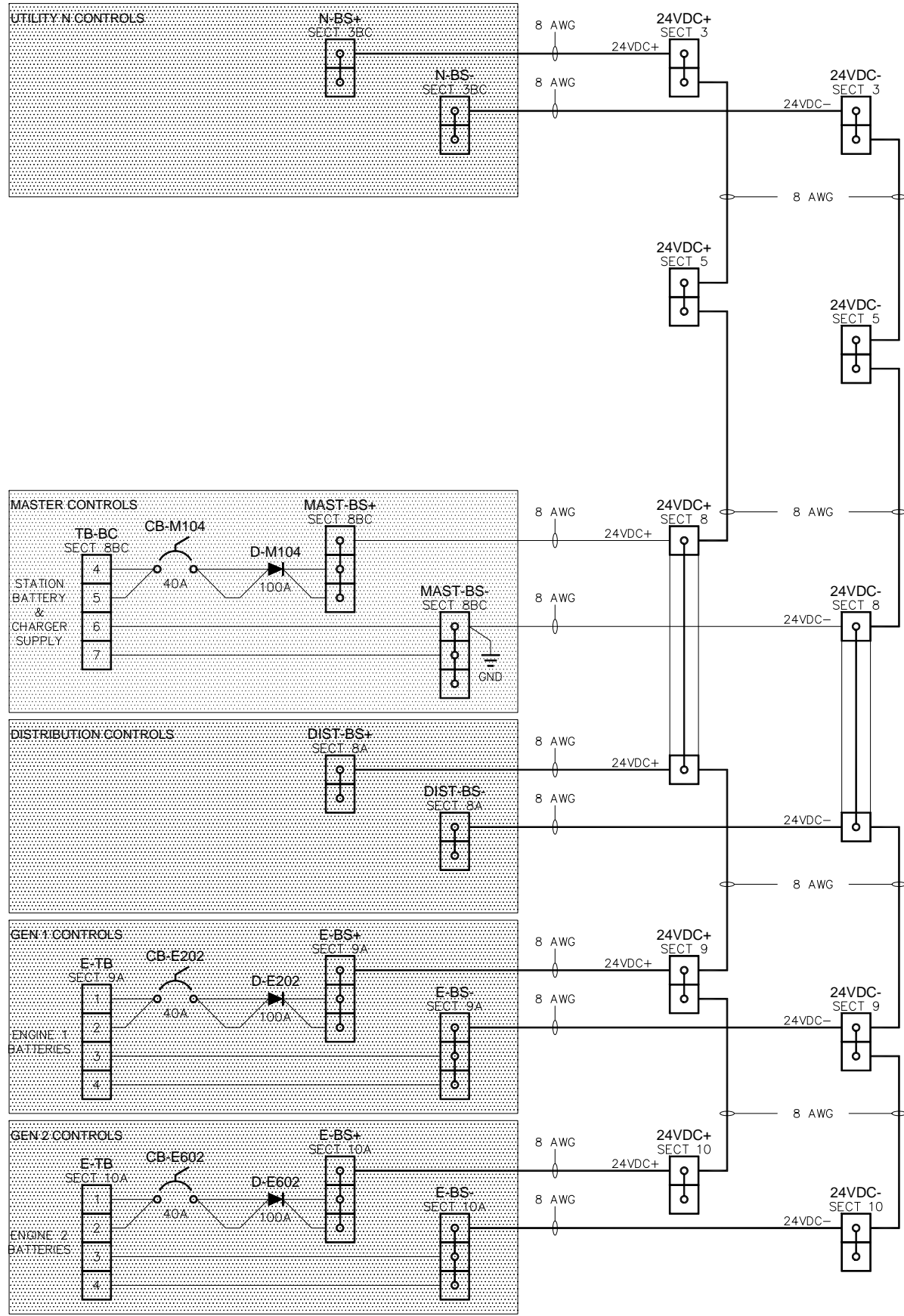
WES CCSD #1 INTERTIE DIVERSION AUTOMATION COMMUNICATION PLAN - DETAIL 480V UTILITY / GENERATOR PARALLELING SWITCHGEAR	
APPROVED BY <i>C. Waggaman</i>	SCALE N.T.S.
DATE APPROVED 05-14-13	REV. 3.1
FILE NAME 36368 (S)	REV. 3.1
	MODIFIED BY HC
	DATE CREATED 01-22-11
	DATE MODIFIED
	SHEET NUMBER 3 of 6



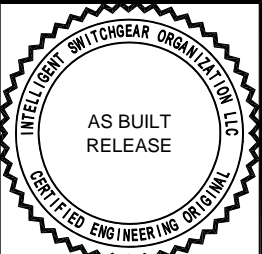
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3.0	ISSUED FOR AS BUILT	10-18-12
3.1	RE-ISSUED FOR AS BUILT	05-14-13

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BEST SOURCE BUSWAY



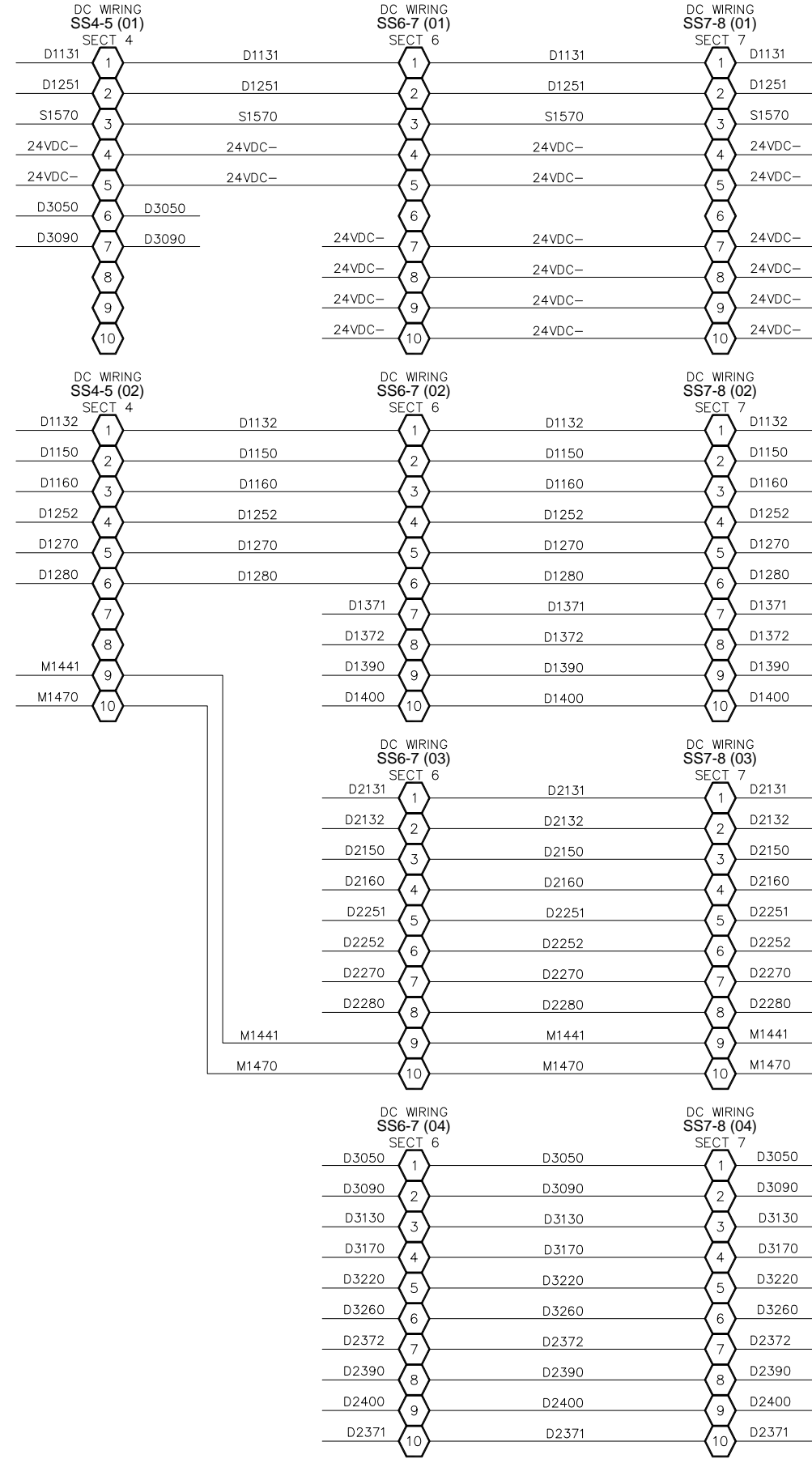
- NOTE:
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2) HATCHED AREA SHOWS CONTROLS DUPLICATED IN GROUP DRAWING SETS.



TITLE:		WES CCSD #1 INTERTIE DIVERSION	
SCALE:		N.T.S.	
REV.	REV.	3.1	3.1
DRAWN BY:		HC	
DATE CREATED:		01-22-11	
DATE MODIFIED:			
SHEET NUMBER:		4 of 6	
APPROVED BY:		<i>C. Waggaman</i>	
DATE APPROVED:		05-14-13	
FILE NAME:		36368 (S)	

NO.	REVISION	DATE
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0.2	RE-ISSUED FOR SUBMITTAL	07-15-11
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2.0	ISSUED FOR FIELD STARTUP	01-17-12
3.0	ISSUED FOR AS BUILT	10-18-12
3.1	RE-ISSUED FOR AS BUILT	05-14-13

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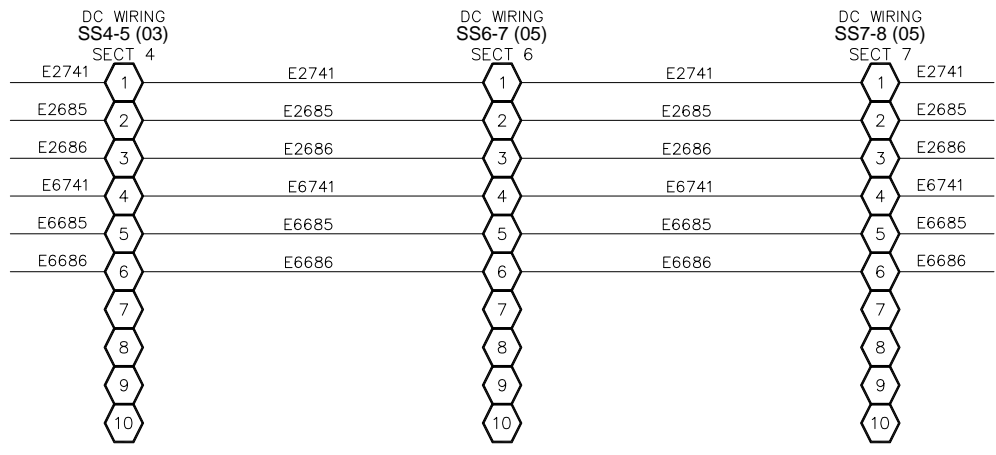


WES CCSD #1 INTERTIE DIVERSION
SHIPPING SPLIT DETAIL
480V UTILITY / GENERATOR PARALLELING SWITCHGEAR

APPROVED BY <i>C. Waggaman</i>	SCALE N.T.S.	REV. 3.1	DRAWN BY HC	MODIFIED BY HC
DATE APPROVED 05-14-13			DATE CREATED 01-22-11	DATE MODIFIED 01-14-12
FILE NAME 36368 (S)			SHEET NUMBER 5 of 6	

NO.	REVISION	DATE
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0.2	RE-ISSUED FOR SUBMITTAL	07-15-11
1.0	ISSUED FOR PRODUCTION	10-10-11
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3.0	ISSUED FOR AS BUILT	10-18-12
3.1	RE-ISSUED FOR AS BUILT	05-14-13

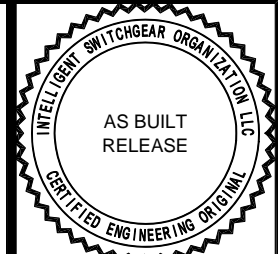
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TITLE: **WES CCSD #1 INTERTIE DIVERSION**
SHIPPING SPLIT DETAIL
480V UTILITY / GENERATOR PARALLELING SWITCHGEAR
 APPROVED BY: *C. Waggaman*
 DATE APPROVED: 05-14-13
 SCALE: N.T.S.
 REV. 3.1
 DRAWN BY: HC
 DATE CREATED: 08-17-11
 MODIFIED BY:
 DATE MODIFIED:
 SHEET NUMBER: 6 of 6
 FILE NAME: 36368 (S)

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3.1	RE-ISSUED FOR AS BUILT	05-14-13

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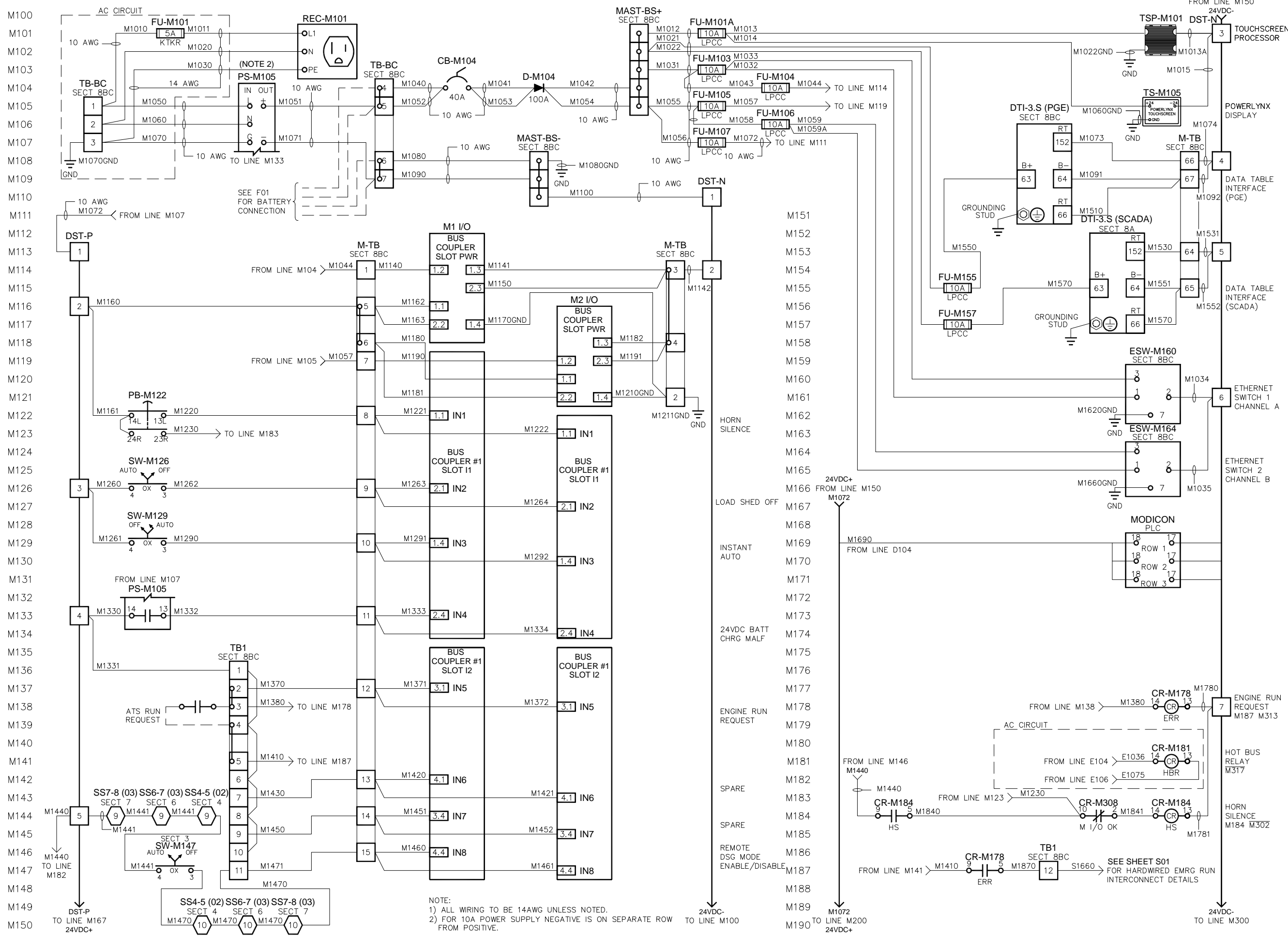
**WES CCSD #1 INTERTIE DIVERSION
MASTER CONTROLS - 1**

480V UTILITY / GENERATOR PARALLELING SWITCHGEAR

APPROVED BY: *C. Waggaman*
SCALE: N.T.S.
REV: 3.1
DATE APPROVED: 05-14-13
DATE MODIFIED: 01-22-11
DATE CREATED: 10-16-12
DRAWN BY: HC
MODIFIED BY: LBM
SHEET NUMBER: 1 of 4

M01

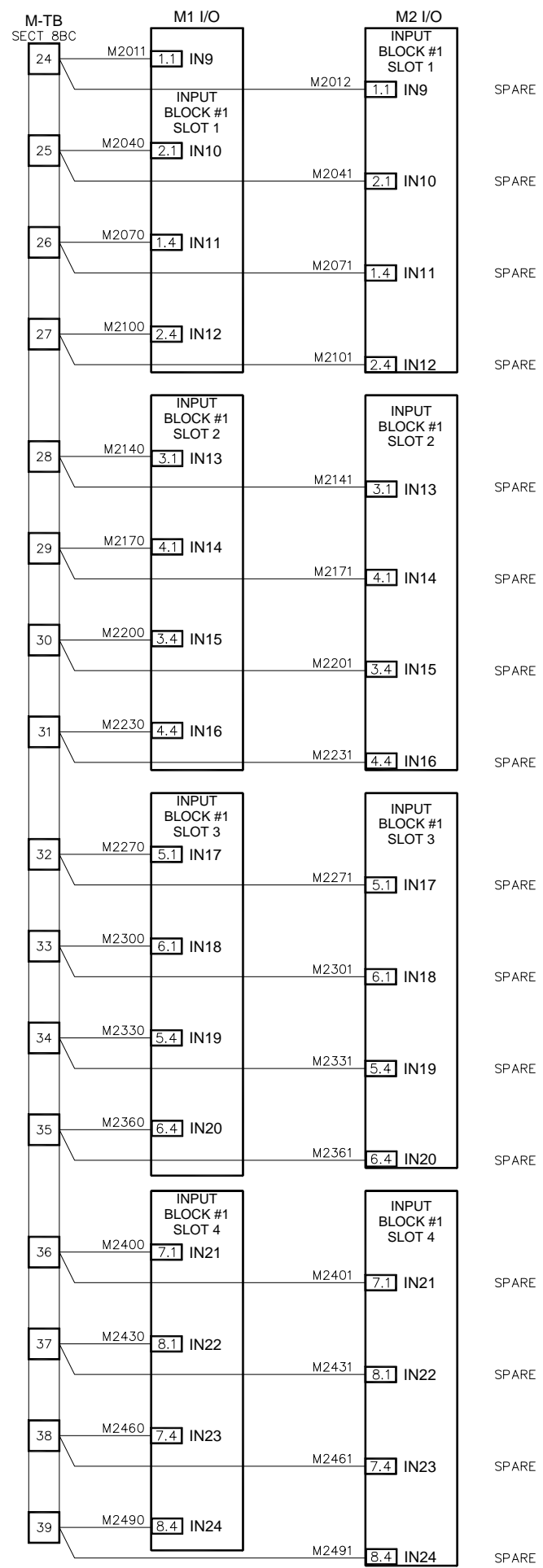
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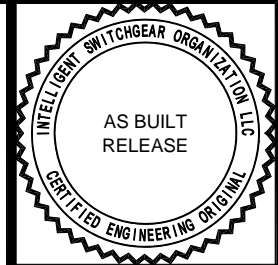
NOTE:
1) ALL WIRING TO BE 14AWG UNLESS NOTED.
2) FOR 10A POWER SUPPLY NEGATIVE IS ON SEPARATE ROW FROM POSITIVE.

NO.	REVISION	DATE
0.0	ISSUED FOR SUBMITTAL	02-24-11
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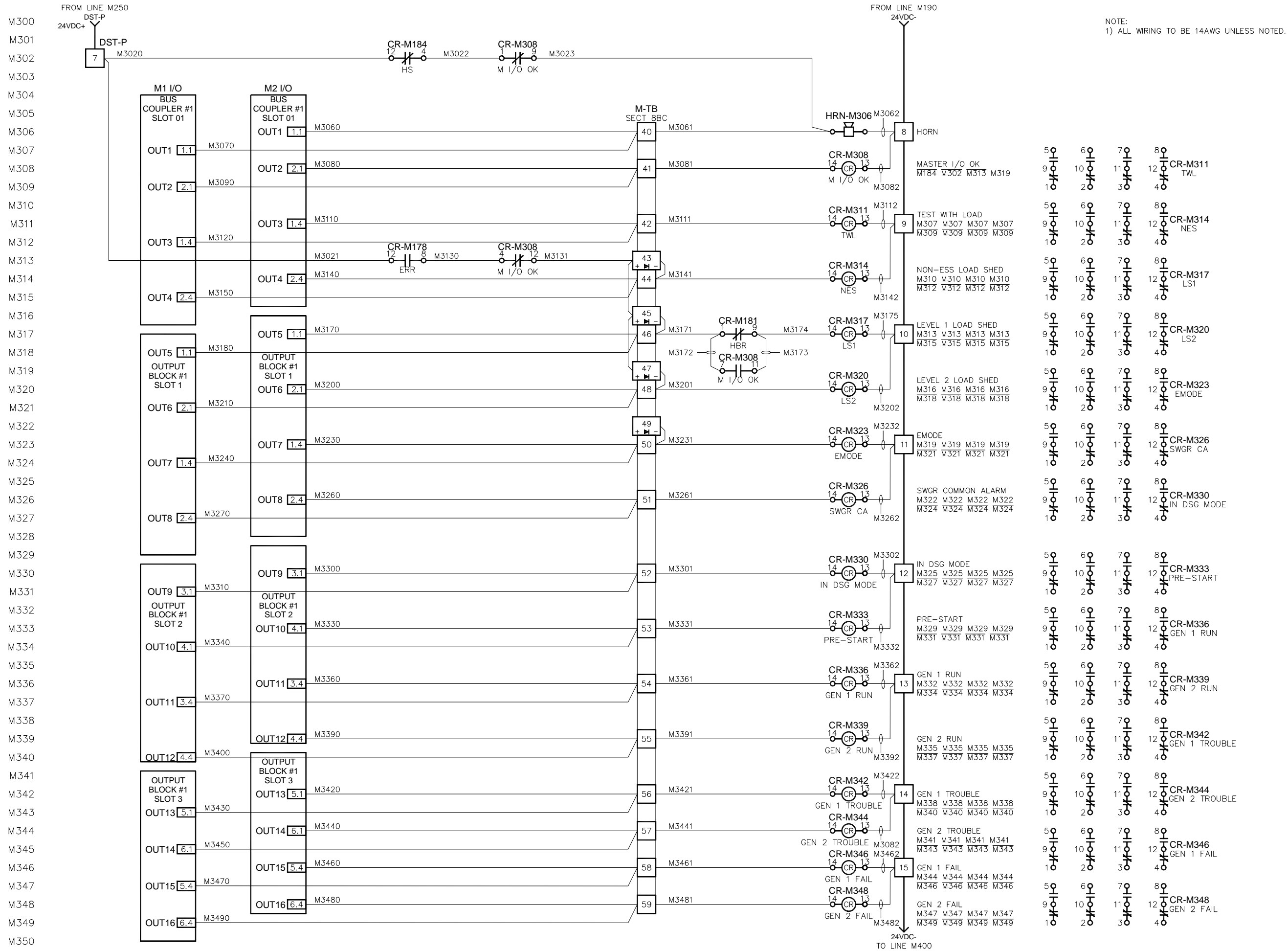
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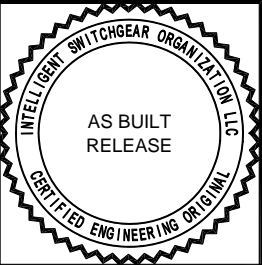
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APPROVED BY <i>C. Waggaman</i>	SCALE N.T.S.	REV. 3.1	MODIFIED BY HC
DATE APPROVED 05-14-13		DATE CREATED 01-22-11	DATE MODIFIED
FILE NAME 36368 (M)		SHEET NUMBER 2 of 4	

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NOTE:
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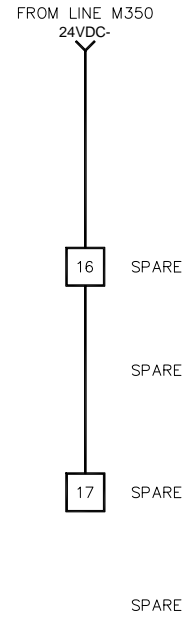
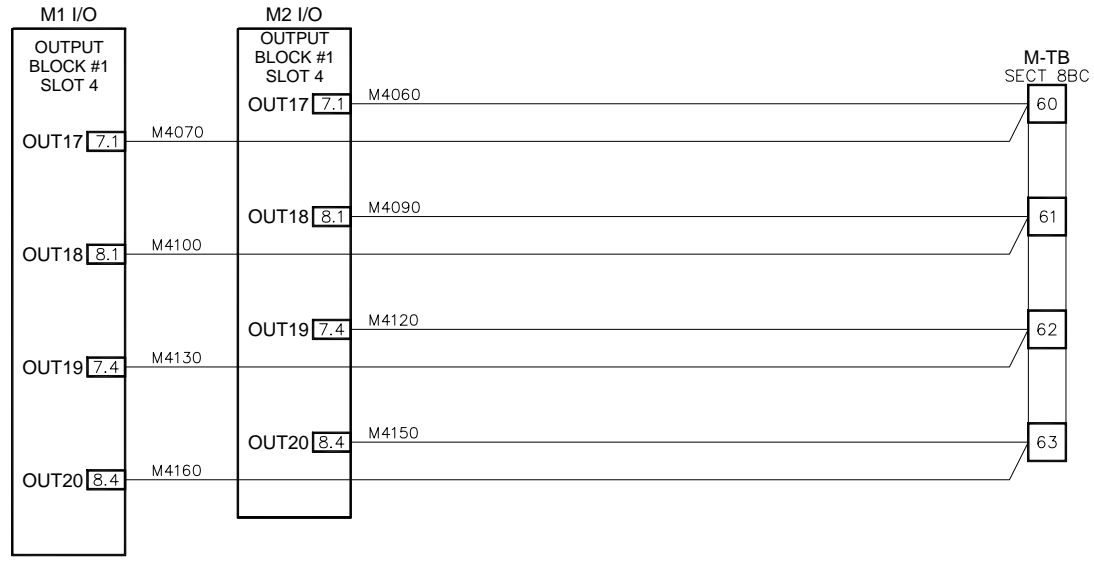


WES CCSD #1 INTERTIE DIVERSION		REV. 3.1		MODIFIED BY HC	
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480V UTILITY / GENERATOR PARALLELING SWITCHGEAR		REV. 3.1		DATE MODIFIED 01-14-12	
DRAWN BY HC		REV. 3.1		SHEET NUMBER 3 OF 4	
APPROVED BY C. Waggaman		REV. 3.1		DATE APPROVED 05-14-13	
FILE NAME		REV. 3.1		36368 (M)	

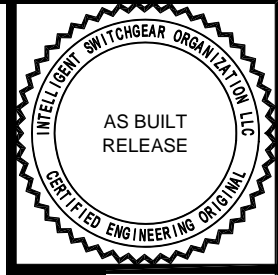
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0.2	RE-ISSUED FOR SUBMITTAL	07-15-11
1.0	ISSUED FOR PRODUCTION	10-10-11
2.0	ISSUED FOR FIELD STARTUP	01-17-12
3.0	ISSUED FOR AS BUILT	10-18-12
3.1	RE-ISSUED FOR AS BUILT	05-14-13

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NOTE:
1) ALL WIRING TO BE 14AWG UNLESS NOTED.



WES CCSD #1 INTERTIE DIVERSION
MASTER CONTROLS - 4
480V UTILITY / GENERATOR PARALLELING SWITCHGEAR

APPROVED BY: *C. Waggaman*
DATE APPROVED: 05-14-13

SCALE: N.T.S.
REV: 3.1

DRAWN BY: HC
DATE CREATED: 01-22-11

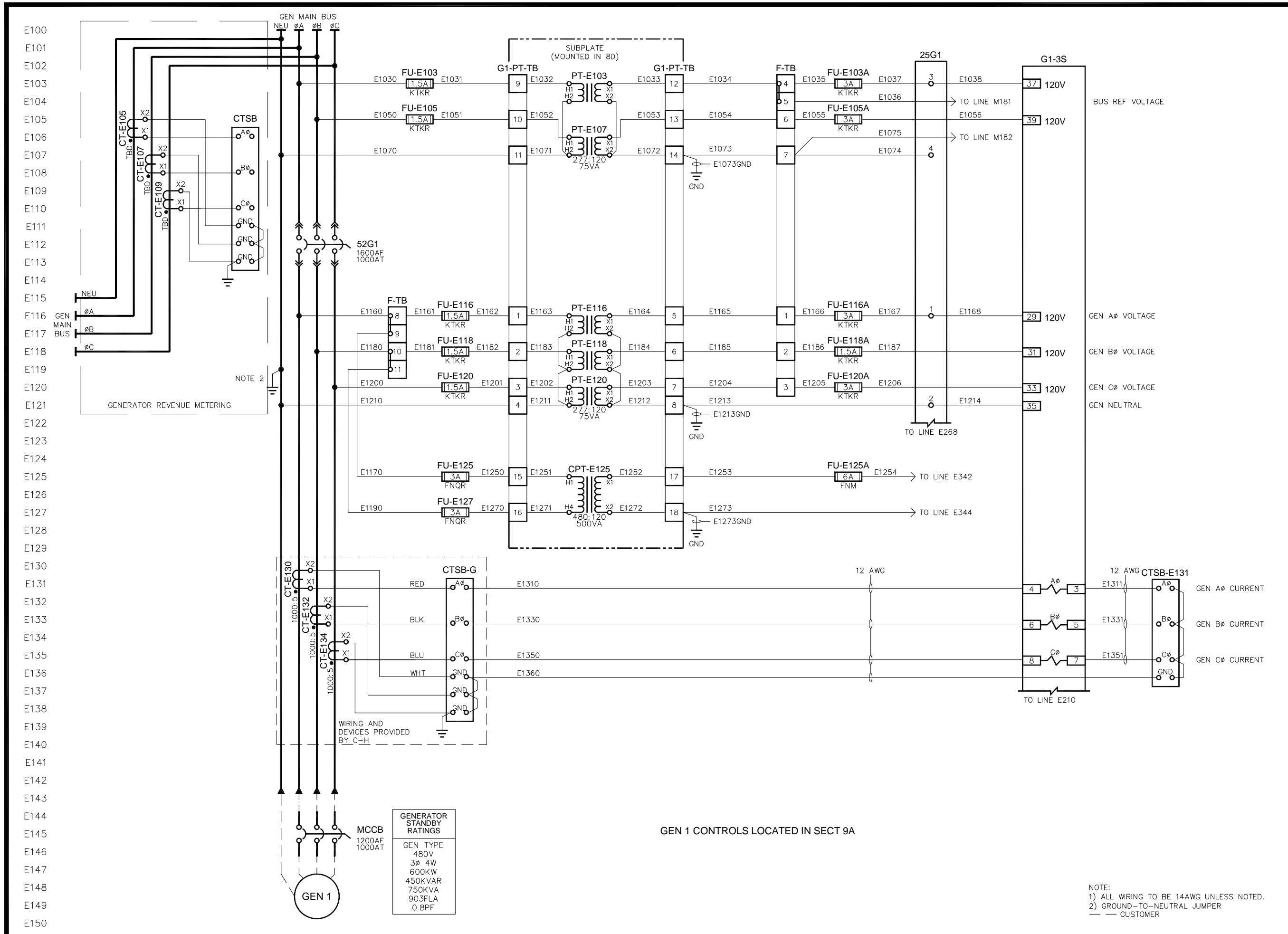
MODIFIED BY: []
DATE MODIFIED: []

FILE NAME: 36368 (M)

SHEET NUMBER: 4 of 4

M04

NO.	REVISION	DATE
0.0	ISSUED FOR SUBMITTAL	02-24-11
0.1	RE-ISSUED FOR SUBMITTAL	03-01-11
0.2	RE-ISSUED FOR SUBMITTAL	07-15-11
1.0	ISSUED FOR PRODUCTION	10-10-11
2.0	ISSUED FOR FIELD STARTUP	01-17-12
3.0	ISSUED FOR AS BUILT	10-18-12
3.1	RE-ISSUED FOR AS BUILT	05-14-13



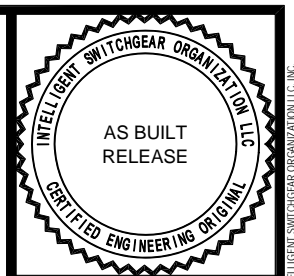
GENERATOR STANDBY RATINGS

GEN TYPE	480V
3ø 4W	600KW
450KVAR	750KVA
903FLA	0.8PF

MCCB
1200AF
1000AT

GEN 1 CONTROLS LOCATED IN SECT 9A

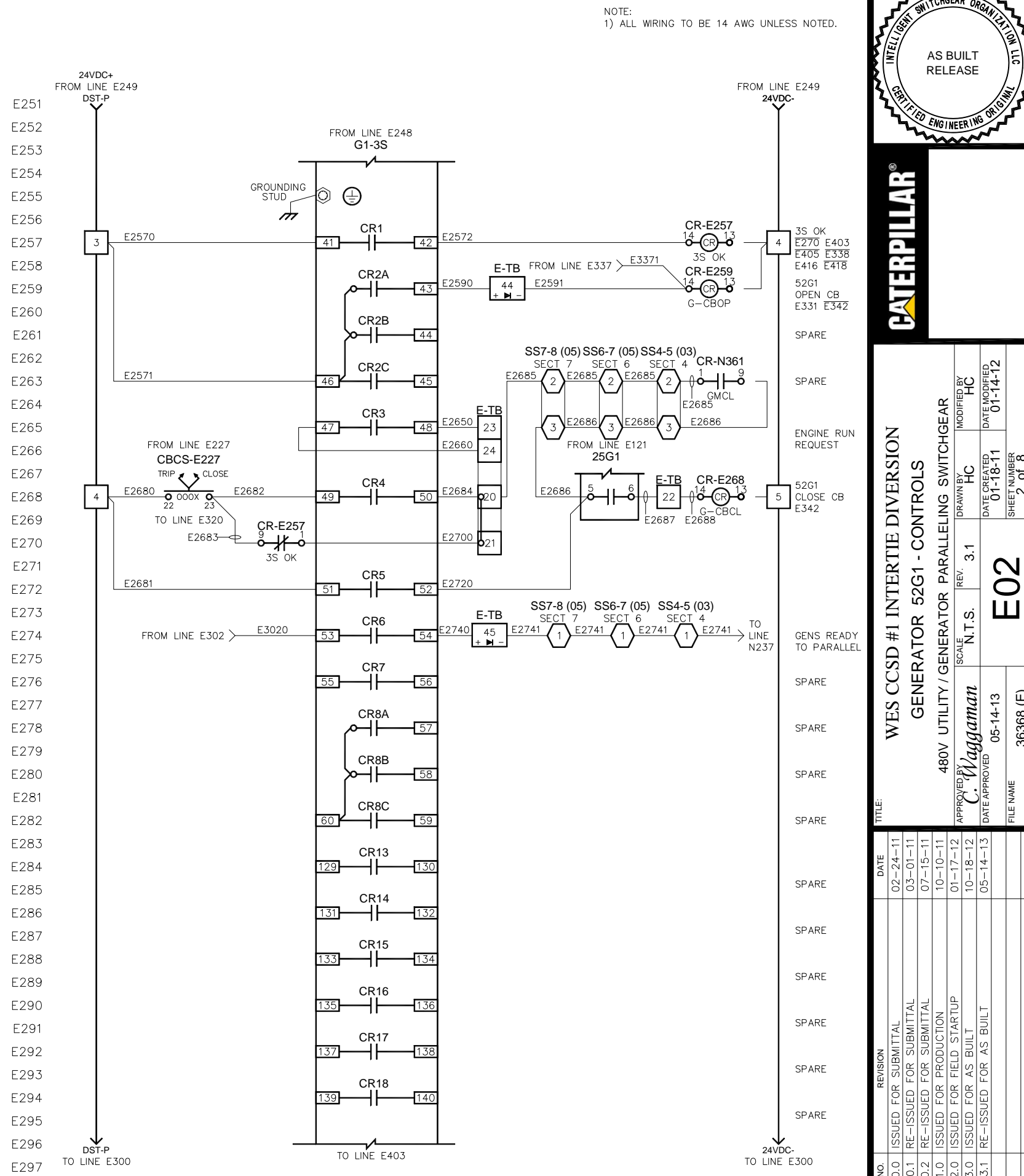
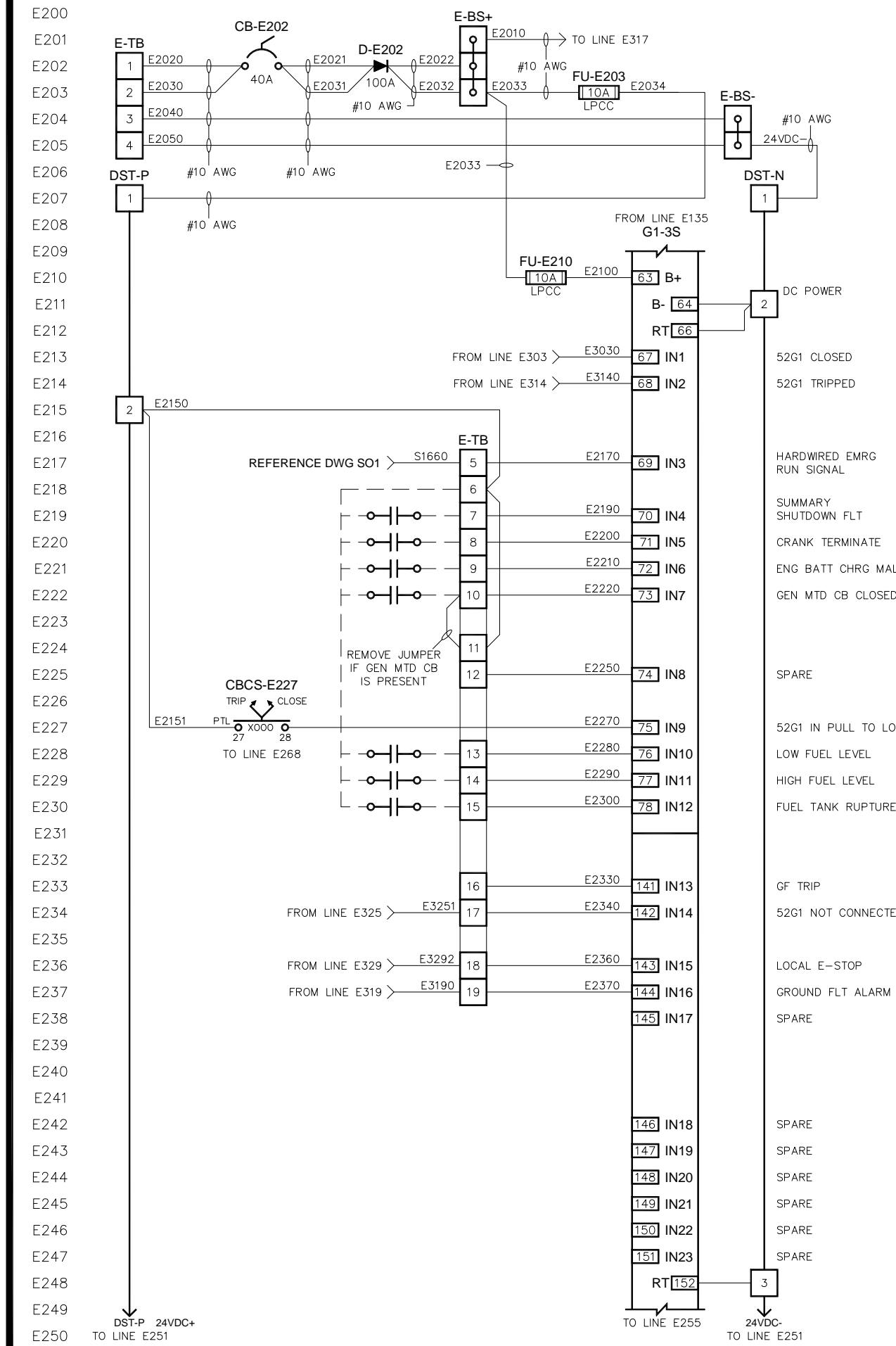
NOTE:
1) ALL WIRING TO BE 14AWG UNLESS NOTED.
2) GROUND-TO-NEUTRAL JUMPER
— CUSTOMER



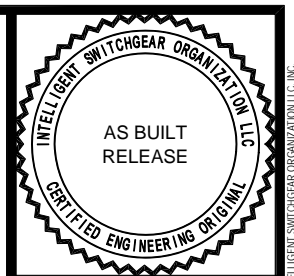
WES CCSD #1 INTERTIE DIVERSION GENERATOR 52G1 - AC INSTRUMENTATION 480V UTILITY / GENERATOR PARALLELING SWITCHGEAR	
APPROVED BY <i>C. Waggaman</i>	SCALE N.T.S.
DATE APPROVED 05-14-13	REV. 3.1
FILE NAME 36368 (E)	SHEET NUMBER 1 of 8
DRAWN BY HC	MODIFIED BY HC
DATE CREATED 01-18-11	DATE MODIFIED 01-14-12

NO.	REVISION	DATE
0.0	ISSUED FOR SUBMITTAL	02-24-11
0.1	RE-ISSUED FOR SUBMITTAL	03-01-11
0.2	RE-ISSUED FOR SUBMITTAL	07-15-11
1.0	ISSUED FOR PRODUCTION	10-10-11
2.0	ISSUED FOR FIELD STARTUP	01-17-12
3.0	ISSUED FOR AS BUILT	10-18-12
3.1	RE-ISSUED FOR AS BUILT	05-14-13

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NOTE:
1) ALL WIRING TO BE 14 AWG UNLESS NOTED.

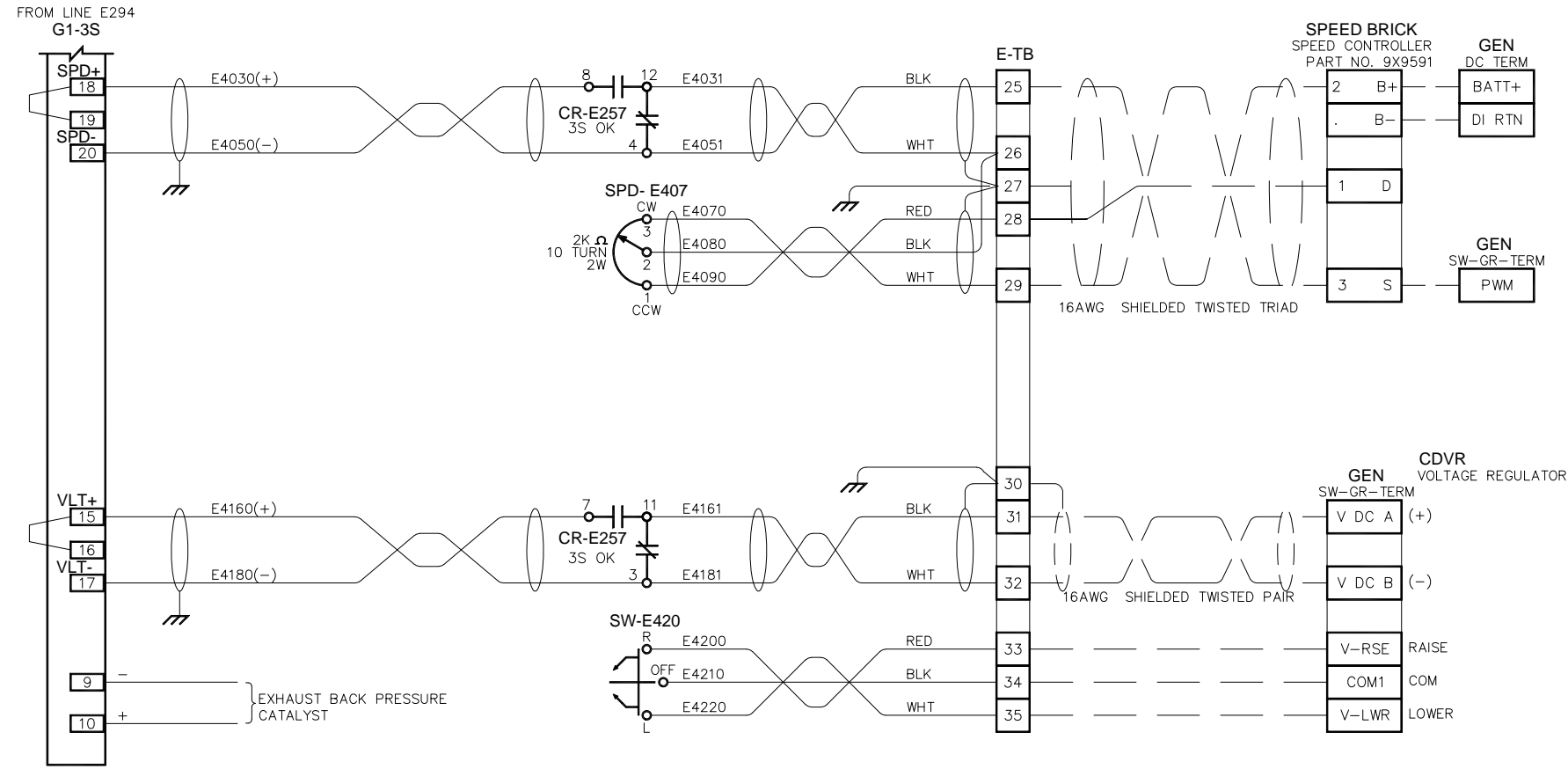


TITLE:	
WES CCSD #1 INERTIE DIVERSION	
GENERATOR 52G1 - CONTROLS	
480V UTILITY / GENERATOR PARALLELING SWITCHGEAR	
APPROVED BY:	C. Waggaman
SCALE:	N.T.S.
REV.:	3.1
DRAWN BY:	HC
MODIFIED BY:	HC
DATE CREATED:	01-18-11
DATE MODIFIED:	01-14-12
SHEET NUMBER:	2 of 8
FILE NAME:	36368 (E)
DATE APPROVED:	05-14-13

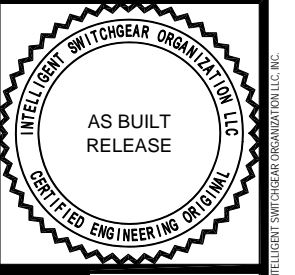
NO.	REVISION	DATE
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0.1	RE-ISSUED FOR SUBMITTAL	03-01-11
0.2	RE-ISSUED FOR SUBMITTAL	07-15-11
1.0	ISSUED FOR PRODUCTION	10-10-11
2.0	ISSUED FOR FIELD STARTUP	01-17-12
3.0	ISSUED FOR AS BUILT	10-18-12
3.1	RE-ISSUED FOR AS BUILT	05-14-13

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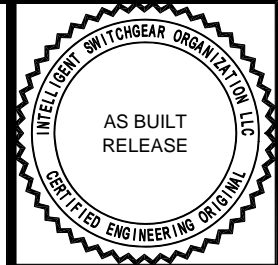
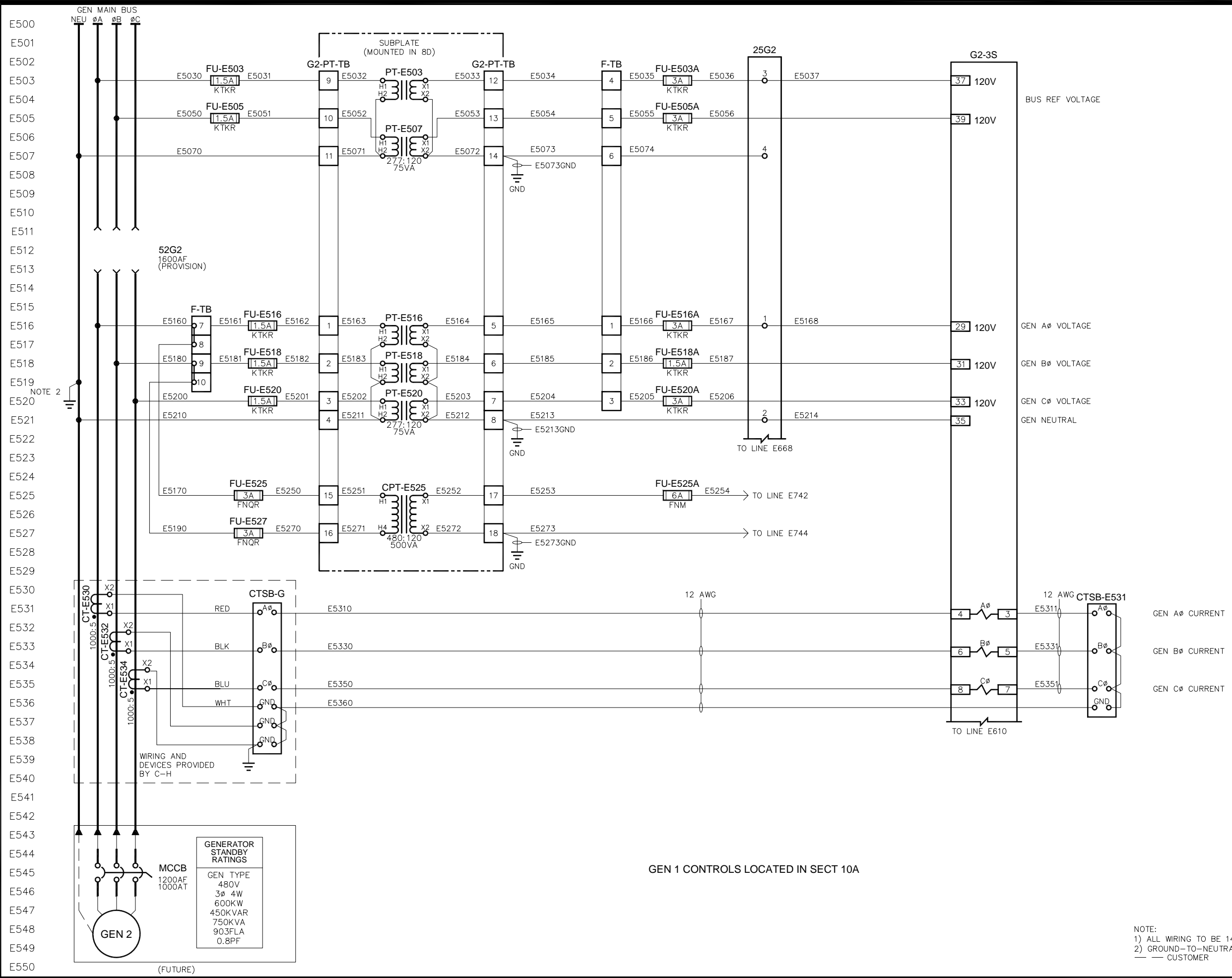
NOTE:
1) ALL WIRING TO BE 16 AWG UNLESS NOTED.



TITLE:		WES CCSD #1 INTERTIE DIVERSION GENERATOR 52G1 - ANALOG I/O	
APPROVED BY	SCALE	REV.	REV.
<i>C. Waggaman</i>	N.T.S.	3.1	3.1
DATE APPROVED	DATE CREATED	DATE MODIFIED	DATE MODIFIED
05-14-13	01-18-11	01-18-11	10-16-12
FILE NAME	SHEET NUMBER	DRAWN BY	
E04	4 of 8	LBM	
36368 (E)		MODIFIED BY	
		HC	

NO.	REVISION	DATE
0.0	ISSUED FOR SUBMITTAL	02-24-11
0.1	RE-ISSUED FOR SUBMITTAL	03-01-11
0.2	RE-ISSUED FOR SUBMITTAL	07-15-11
1.0	ISSUED FOR PRODUCTION	10-10-11
2.0	ISSUED FOR FIELD STARTUP	01-17-12
3.0	ISSUED FOR AS BUILT	10-18-12
3.1	RE-ISSUED FOR AS BUILT	05-14-13

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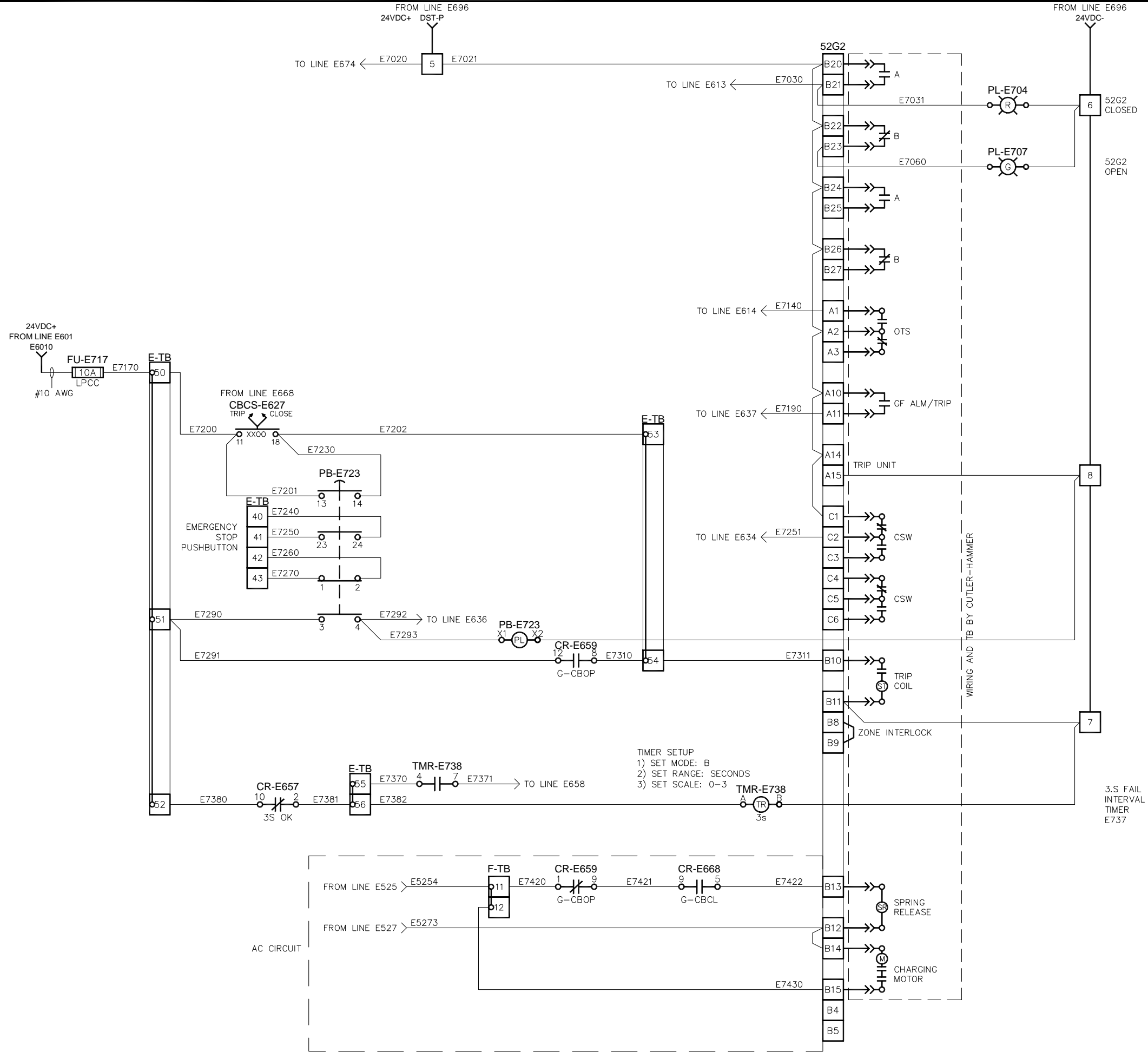
WES CCSD #1 INTERTIE DIVERSION GENERATOR 52G2 - AC INSTRUMENTATION 480V UTILITY / GENERATOR PARALLELING SWITCHGEAR	
APPROVED BY <i>C. Waggaman</i>	SCALE N.T.S.
DATE APPROVED 05-14-13	REV. 3.1
FILE NAME 36368 (E)	SHEET NUMBER 5 of 8
DATE 02-24-11 03-01-11 07-15-11 10-10-11 01-17-12 10-18-12 05-14-13	REVISION 0.0 ISSUED FOR SUBMITTAL 0.1 RE-ISSUED FOR SUBMITTAL 0.2 RE-ISSUED FOR SUBMITTAL 1.0 ISSUED FOR PRODUCTION 2.0 ISSUED FOR FIELD STARTUP 3.0 ISSUED FOR AS BUILT 3.1 RE-ISSUED FOR AS BUILT

GEN 1 CONTROLS LOCATED IN SECT 10A

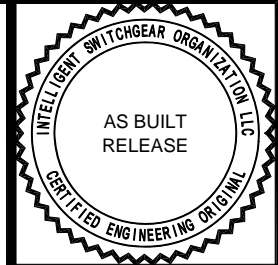
NOTE:
 1) ALL WIRING TO BE 14AWG UNLESS NOTED.
 2) GROUND-TO-NEUTRAL JUMPER
 --- CUSTOMER

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NOTE:
1) ALL WIRING TO BE 14 AWG UNLESS NOTED.

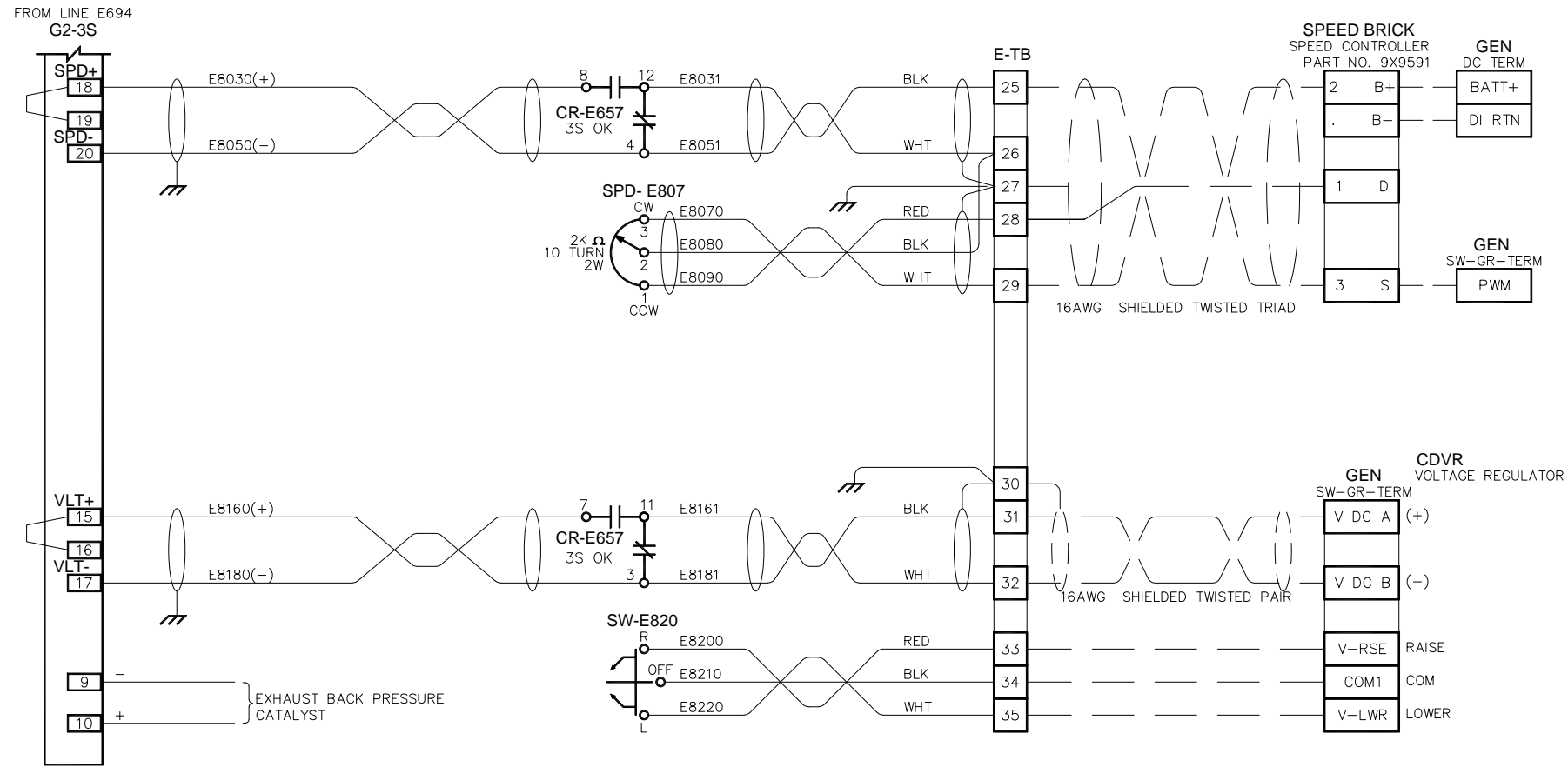


WES CCSD #1 INTERTIE DIVERSION GENERATOR 52G2 - CB INTERFACE	
APPROVED BY <i>C. Waggaman</i>	SCALE N.T.S.
DRAWN BY HC	REV. 3.1
DATE CREATED 01-18-11	DATE MODIFIED 01-14-12
DATE APPROVED 05-14-13	SHEET NUMBER 7 of 8
FILE NAME 36368 (E)	E07

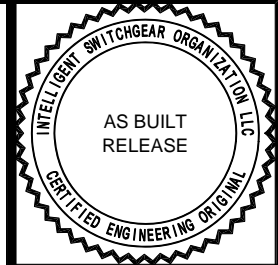
NO.	REVISION	DATE
0.0	ISSUED FOR SUBMITTAL	02-24-11
0.1	RE-ISSUED FOR SUBMITTAL	03-01-11
0.2	RE-ISSUED FOR SUBMITTAL	07-15-11
1.0	ISSUED FOR PRODUCTION	10-10-11
2.0	ISSUED FOR FIELD STARTUP	01-17-12
3.0	ISSUED FOR AS BUILT	10-18-12
3.1	RE-ISSUED FOR AS BUILT	05-14-13

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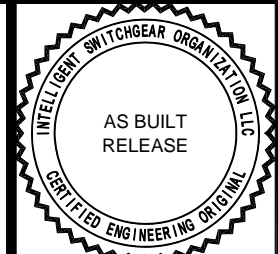
NOTE:
1) ALL WIRING TO BE 16 AWG UNLESS NOTED.



WES CCSD #1 INTERTIE DIVERSION GENERATOR 52G2 - ANALOG I/O 480V UTILITY / GENERATOR PARALLELING SWITCHGEAR			
APPROVED BY <i>C. Waggaman</i>	SCALE N.T.S.	REV. 3.1	MODIFIED BY LBM
DATE APPROVED 05-14-13		DATE CREATED 01-18-11	DATE MODIFIED 10-16-12
FILE NAME 36368 (E)		SHEET NUMBER 8 of 8	

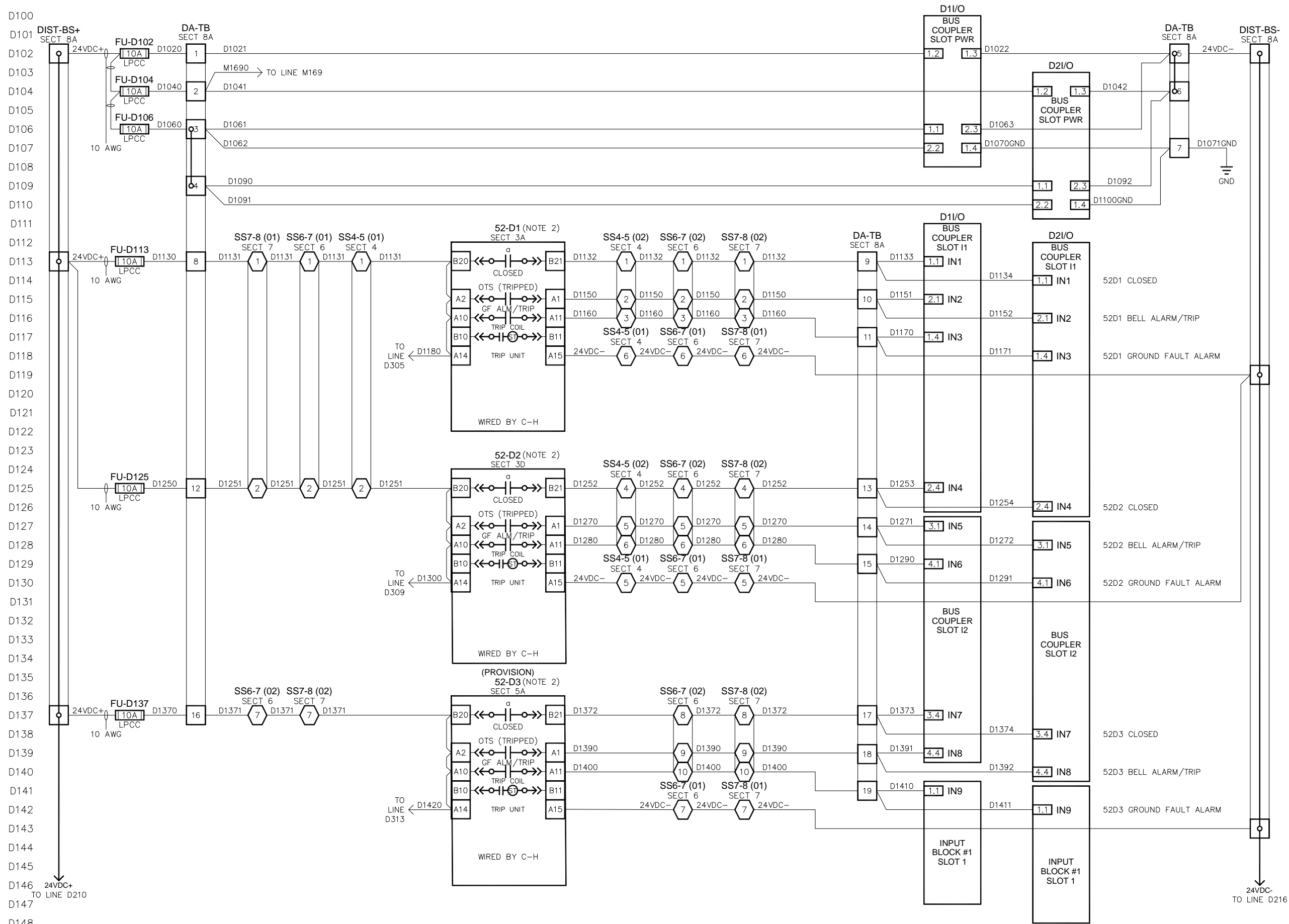
NO.	REVISION	DATE
0.0	ISSUED FOR SUBMITTAL	02-24-11
0.1	RE-ISSUED FOR SUBMITTAL	03-01-11
0.2	RE-ISSUED FOR SUBMITTAL	07-15-11
1.0	ISSUED FOR PRODUCTION	10-10-11
2.0	ISSUED FOR FIELD STARTUP	01-17-12
3.0	ISSUED FOR AS BUILT	10-18-12
3.1	RE-ISSUED FOR AS BUILT	05-14-13

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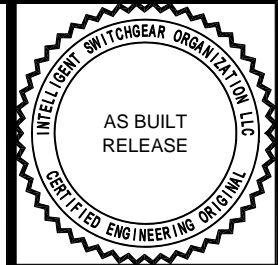
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DISTRIBUTION CONTROLS - 1		DRAWN BY	HC	REVISED BY	LBM	DATE CREATED	02-08-11	SHEET NUMBER	
480V UTILITY / GENERATOR PARALLELING SWITCHGEAR									
APPROVED BY		C. Waggaman							
DATE APPROVED		05-14-13							
SHEET NUMBER		1 of 3							

NO.	REVISION	DATE
0.0	ISSUED FOR SUBMITTAL	02-24-11
0.1	RE-ISSUED FOR SUBMITTAL	03-01-11
0.2	RE-ISSUED FOR SUBMITTAL	07-15-11
1.0	ISSUED FOR PRODUCTION	10-10-11
2.0	ISSUED FOR FIELD STARTUP	01-17-12
3.0	ISSUED FOR AS BUILT	10-18-12
3.1	RE-ISSUED FOR AS BUILT	05-14-13



NOTE:
 1) ALL WIRING TO BE 14AWG UNLESS NOTED.
 2) A14/A15 TRIP UNIT POWER SUPPLY.
 IF NOT PRESENT, NO CONNECTIONS REQUIRED

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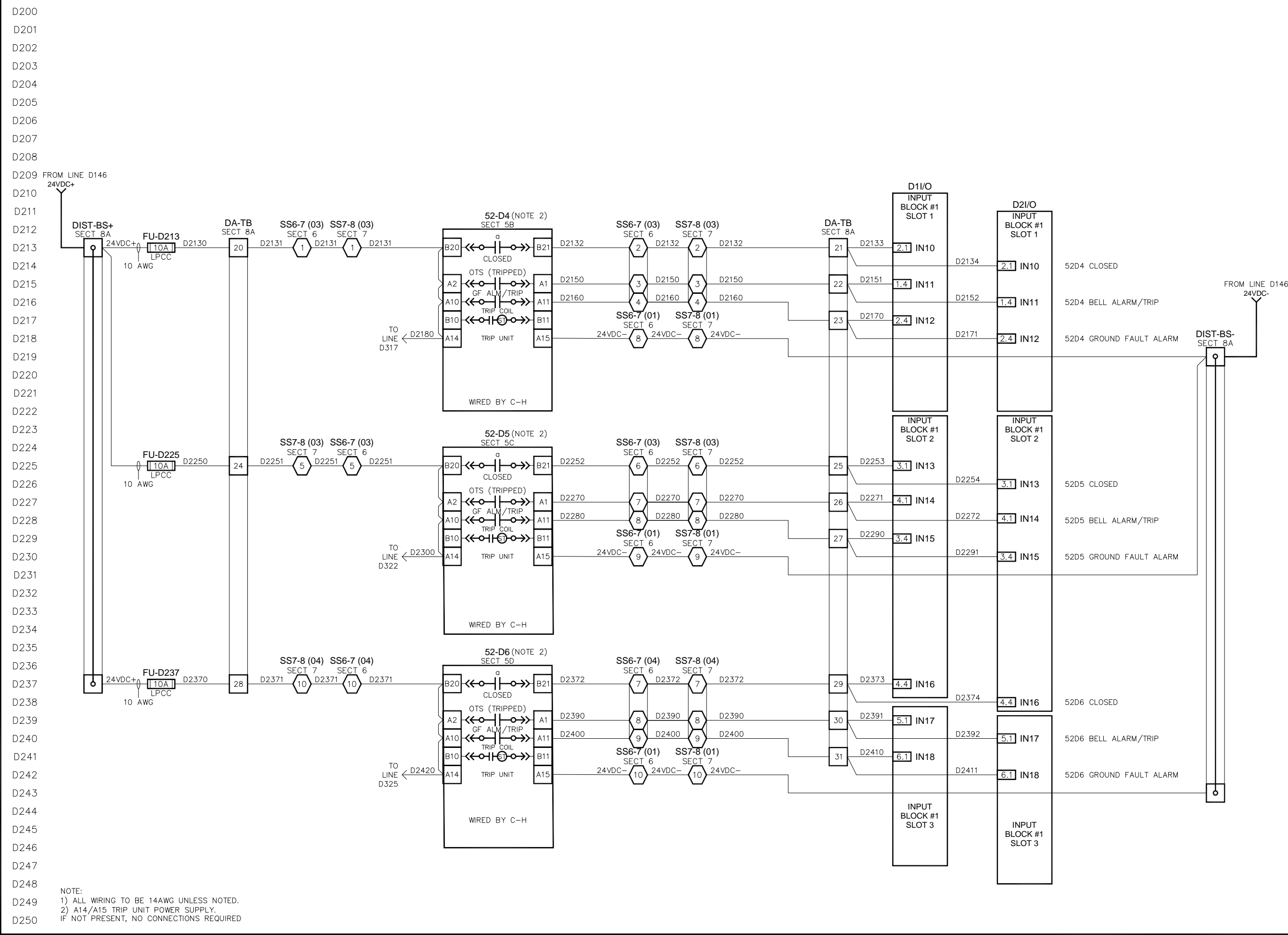
**WES CCSD #1 INTERTIE DIVERSION
DISTRIBUTION CONTROLS - 2**

480V UTILITY / GENERATOR PARALLELING SWITCHGEAR

APPROVED BY	SCALE	REV.	REV.	DATE CREATED	DATE MODIFIED	SHEET NUMBER
<i>C. Waggaman</i>	N.T.S.	3.1	HC	02-08-11		2 of 3
DATE APPROVED	FILE NAME					
05-14-13	36368 (D)					

NO.	REVISION	DATE
0.0	ISSUED FOR SUBMITTAL	02-24-11
0.1	RE-ISSUED FOR SUBMITTAL	03-01-11
0.2	RE-ISSUED FOR SUBMITTAL	07-15-11
1.0	ISSUED FOR PRODUCTION	10-10-11
2.0	ISSUED FOR FIELD STARTUP	01-17-12
3.0	ISSUED FOR AS BUILT	10-18-12
3.1	RE-ISSUED FOR AS BUILT	05-14-13

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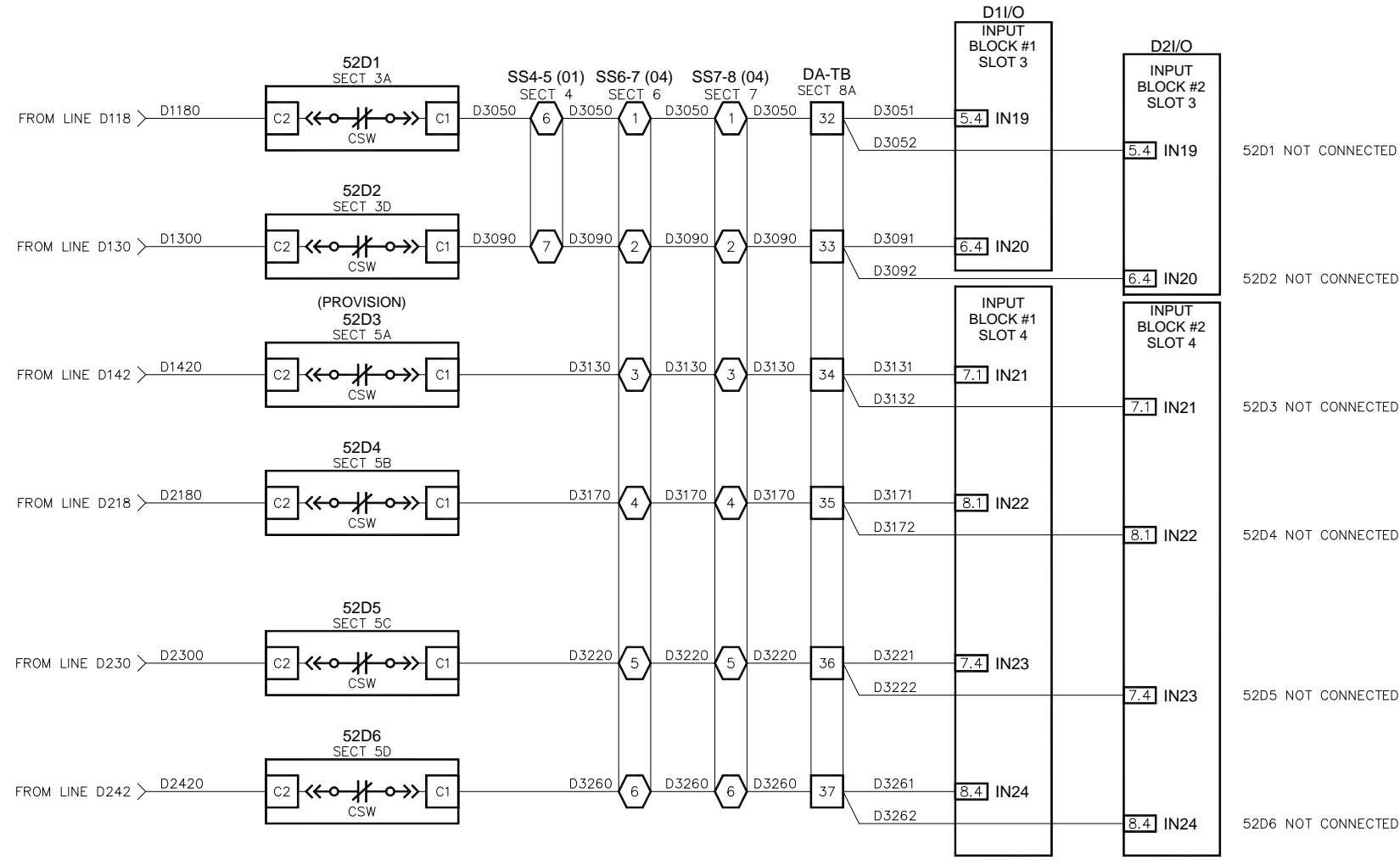


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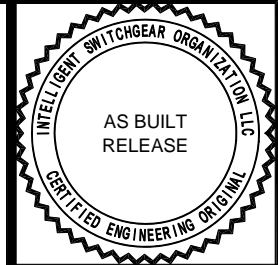
NOTE:
1) ALL WIRING TO BE 14AWG UNLESS NOTED.
2) A14/A15 TRIP UNIT POWER SUPPLY.
IF NOT PRESENT, NO CONNECTIONS REQUIRED

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NOTE:
1) ALL WIRING TO BE 14AWG UNLESS NOTED.



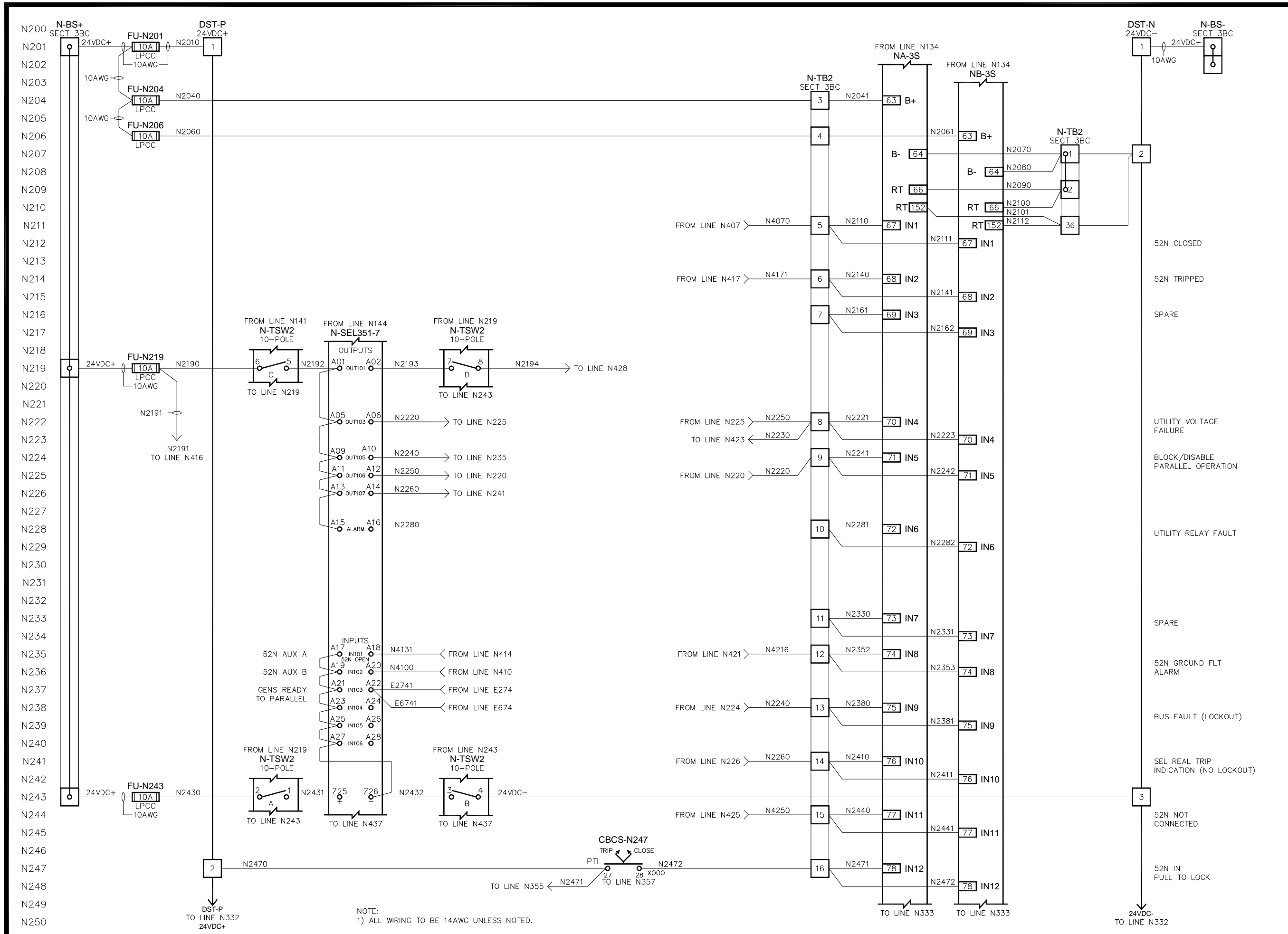
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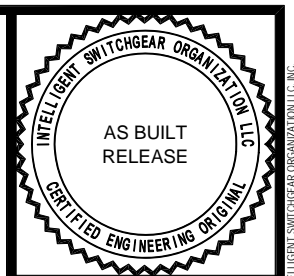
WES CCSD #1 INTERTIE DIVERSION DISTRIBUTION CONTROLS - 3 480V UTILITY / GENERATOR PARALLELING SWITCHGEAR			
APPROVED BY <i>C. Waggaman</i>	SCALE N.T.S.	REV. 3.1	DRAWN BY HC
DATE APPROVED 05-14-13		DATE CREATED 02-11-11	DATE MODIFIED
FILE NAME 36368 (D)		SHEET NUMBER 3 of 3	

NO.	REVISION	DATE
0.0	ISSUED FOR SUBMITTAL	02-24-11
0.1	RE-ISSUED FOR SUBMITTAL	03-01-11
0.2	RE-ISSUED FOR SUBMITTAL	07-15-11
1.0	ISSUED FOR PRODUCTION	10-10-11
2.0	ISSUED FOR FIELD STARTUP	01-17-12
3.0	ISSUED FOR AS BUILT	10-18-12
3.1	RE-ISSUED FOR AS BUILT	05-14-13

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NOTE:
1) ALL WIRING TO BE 14AWG UNLESS NOTED.

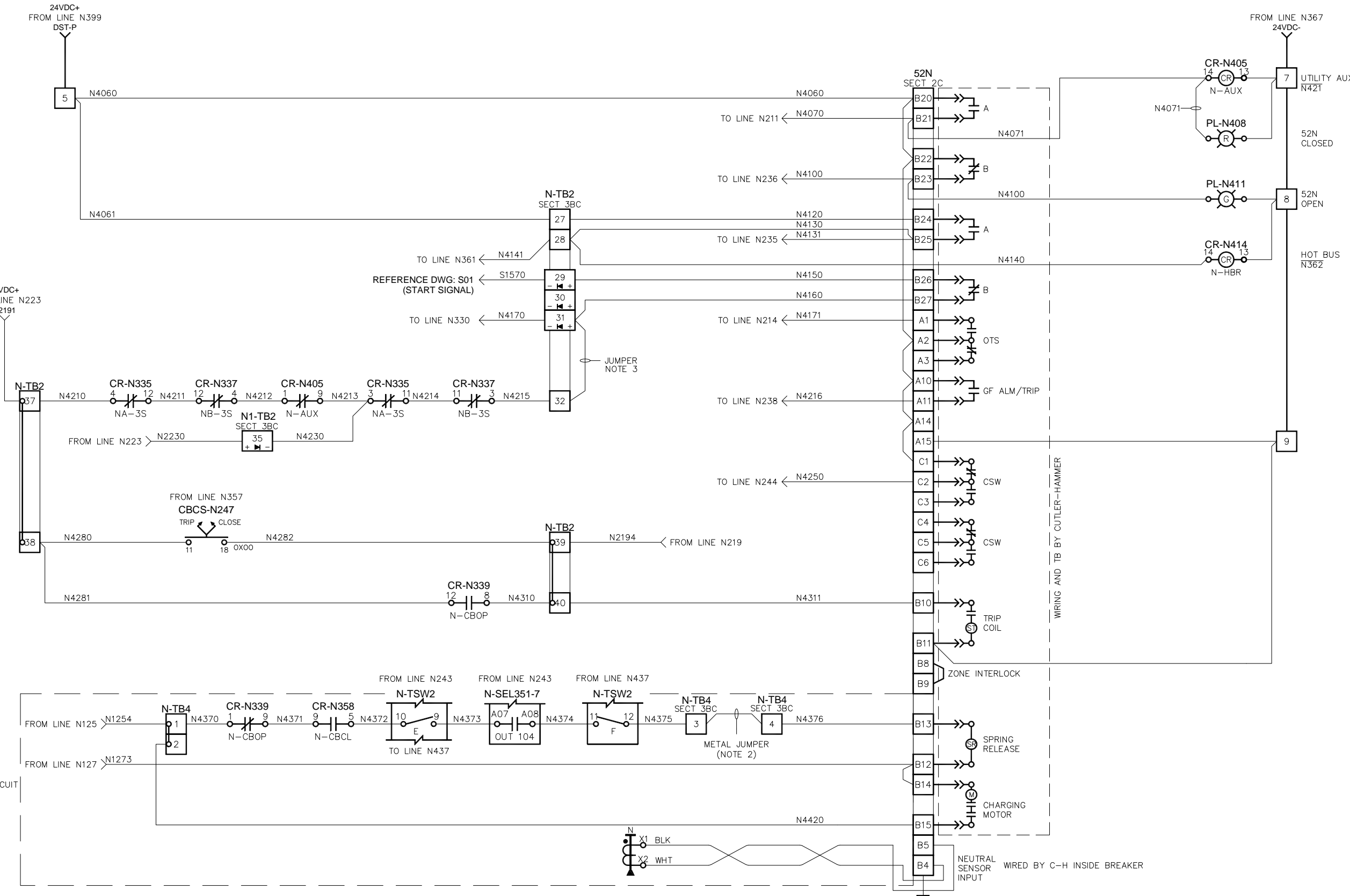


WES CCSD #1 INTERTIE DIVERSION UTILITY 52N - PROTECTIVE CONTROLS 480V UTILITY / GENERATOR PARALLELING SWITCHGEAR		REV. 3.1	SCALE N.T.S.	DATE APPROVED 05-14-13	FILE NAME 36368 (N)
DRAWN BY HC		MODIFIED BY LBM	DATE CREATED 01-18-11		SHEET NUMBER 2 of 4
DATE MODIFIED 10-16-12					

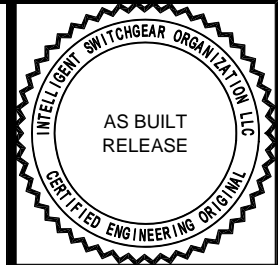
NO.	REVISION	DATE
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0.1	RE-ISSUED FOR SUBMITTAL	03-01-11
0.2	RE-ISSUED FOR SUBMITTAL	07-15-11
1.0	ISSUED FOR PRODUCTION	10-10-11
2.0	ISSUED FOR FIELD STARTUP	01-17-12
3.0	ISSUED FOR AS BUILT	10-18-12
3.1	RE-ISSUED FOR AS BUILT	05-14-13

THIS DOCUMENT AND THE DETAILS EMBODIED THEREIN CONSTITUTE CONFIDENTIAL AND PROPRIETARY INFORMATION WHICH IS THE PROPERTY OF INTELLIGENT SWITCHGEAR ORGANIZATION LLC. ANY PART EXCEPT AND TO THE EXTENT IN THE MANNER AUTHORIZED BY INTELLIGENT SWITCHGEAR ORGANIZATION LLC, IN GA, 3005, U.S.A., AND IS NOT TO BE USED OR REPRODUCED IN ANY MANNER WITHOUT THE WRITTEN PERMISSION OF INTELLIGENT SWITCHGEAR ORGANIZATION LLC.

N400
N401
N402
N403
N404
N405
N406
N407
N408
N409
N410
N411
N412
N413
N414
N415
N416
N417
N418
N419
N420
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N435
N436
N437
N438
N439
N440
N441
N442
N443
N444
N445
N446
N447
N448
N449
N450



NOTES:
1) ALL WIRING TO BE 14AWG UNLESS NOTED.
2) 52T/b HARDWIRE INTERLOCK IF REQUIRED.
3) REMOVE JUMPER TO RESET 3S FAILED 52N OPEN LATCHING CIRCUIT. JUMPER MUST BE REPLACED ONCE 52N HAS BEEN MANUALLY RECLOSED.



WES CCSD #1 INTERTIE DIVERSION UTILITY 52N - CB INTERFACE	
480V UTILITY / GENERATOR PARALLELING SWITCHGEAR DRAWN BY HC DATE CREATED 01-18-11 DATE APPROVED 05-14-13	MODIFIED BY HC DATE MODIFIED 01-14-12 SHEET NUMBER 4 of 4
N04	
APPROVED BY <i>C. Waggaman</i> SCALE N.T.S. REV. 3.1 DATE APPROVED 05-14-13	FILE NAME 36368 (N)

NO.	REVISION	DATE
0.0	ISSUED FOR SUBMITTAL	02-24-11
0.1	RE-ISSUED FOR SUBMITTAL	03-01-11
0.2	RE-ISSUED FOR SUBMITTAL	07-15-11
1.0	ISSUED FOR PRODUCTION	10-10-11
2.0	ISSUED FOR FIELD STARTUP	01-17-12
3.0	ISSUED FOR AS BUILT	10-18-12
3.1	RE-ISSUED FOR AS BUILT	05-14-13

THIS DOCUMENT AND THE DETAILS EMBODIED THEREIN CONSTITUTE CONFIDENTIAL AND PROPRIETARY INFORMATION WHICH IS THE PROPERTY OF INTELLIGENT SWITCHGEAR ORGANIZATION LLC. ANY PART EXCEPT AND TO THE EXTENT IN THE MANNER AUTHORIZED BY INTELLIGENT SWITCHGEAR ORGANIZATION LLC, INC.

BILL OF MATERIALS

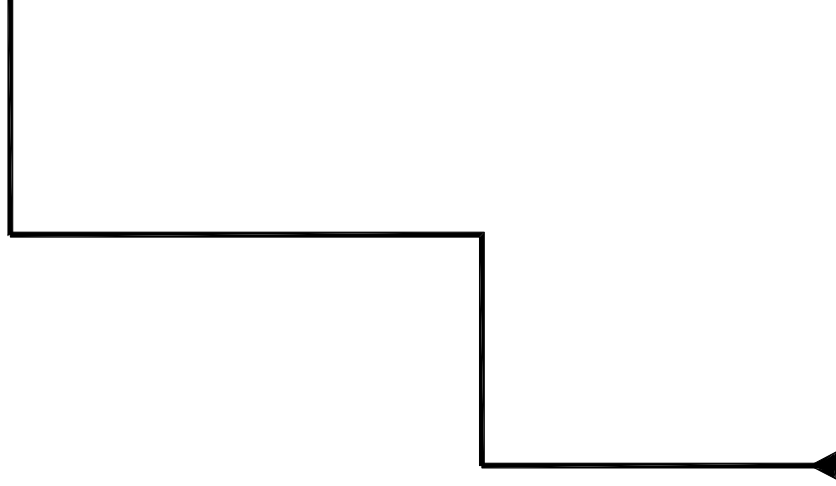
NO	QTY	DESC	MFG	PART_NUMBER
1	1	CAT LOGO HEADER	MODAGRAPHICS	LBL-303-3451-00

SHIPPING
SPLIT

SECT 1



UTILITY REVENUE METERING



NO.	REVISION	DATE
1.0	ISSUED FOR PRODUCTION	10-10-11
2.0	ISSUED FOR FIELD STARTUP	01-17-12
3.0	ISSUED FOR AS BUILT	10-18-12
3.1	RE-ISSUED FOR AS BUILT	05-14-13

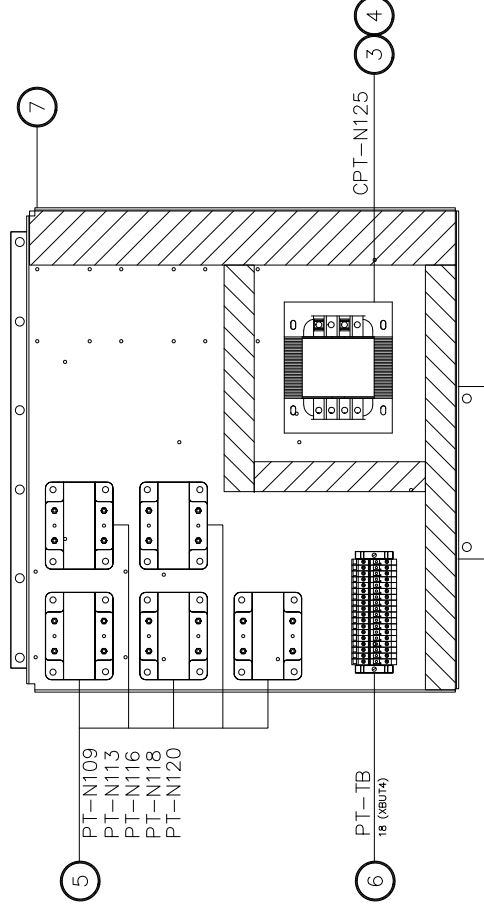
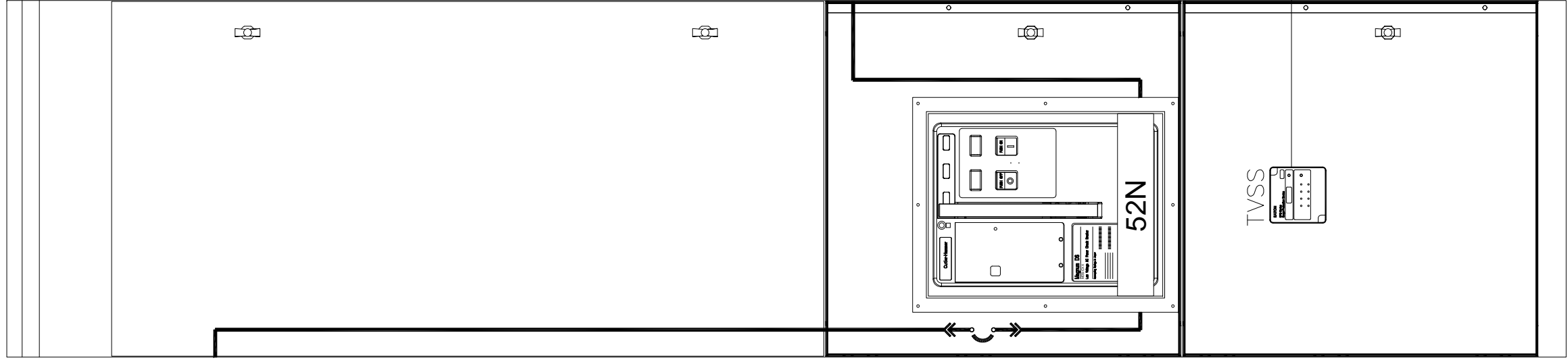
TITLE: WES CCSD #1 INTERTIE DIVERSION DOOR ASSEMBLY - SECT 1	
APPROVED BY: <i>C. Waggaman</i> DATE APPROVED: 05-14-13 FILE NAME: 36368-A	SCALE: 1/8"=1" REV. 3.1 A01
DRAWN BY: GLG DATE CREATED: 02-22-11 SHEET NUMBER: 1	MODIFIED BY: DATE MODIFIED: of 15



BILL OF MATERIALS

NO	QTY	DESC	MFG	PART_NUMBER
1	1	TVSS SURGE DEVICE	C-H	SPD250480Y2B
2	1	4FT REMOTE DISPLAY CABLE	C-H	SPDRDCB04
3	2	FINGERSAFE COVER	SQUARE D	9070FSC2
4	1	XFMR 500VA 480:120	SQUARE D	9070T500D1
5	5	POTENTIAL XFMR 75VA 277:120	ITI	468-277
6	18	TERMINAL BLOCK 10AWG	CUTLER HAMMER	XBUT4
7	2	LV PT MOUNTING BRACKET	ACCUFAB	30000-M102

SECT 2



ADD END STOPS TO DEVICES
MOUNTED ON DIN RAILS
LOCATED IN SECTION
2A

NO.	REVISION	DATE
1.0	ISSUED FOR PRODUCTION	10-10-11
2.0	ISSUED FOR FIELD STARTUP	01-17-12
3.0	ISSUED FOR AS BUILT	10-18-12
3.1	RE-ISSUED FOR AS BUILT	05-14-13

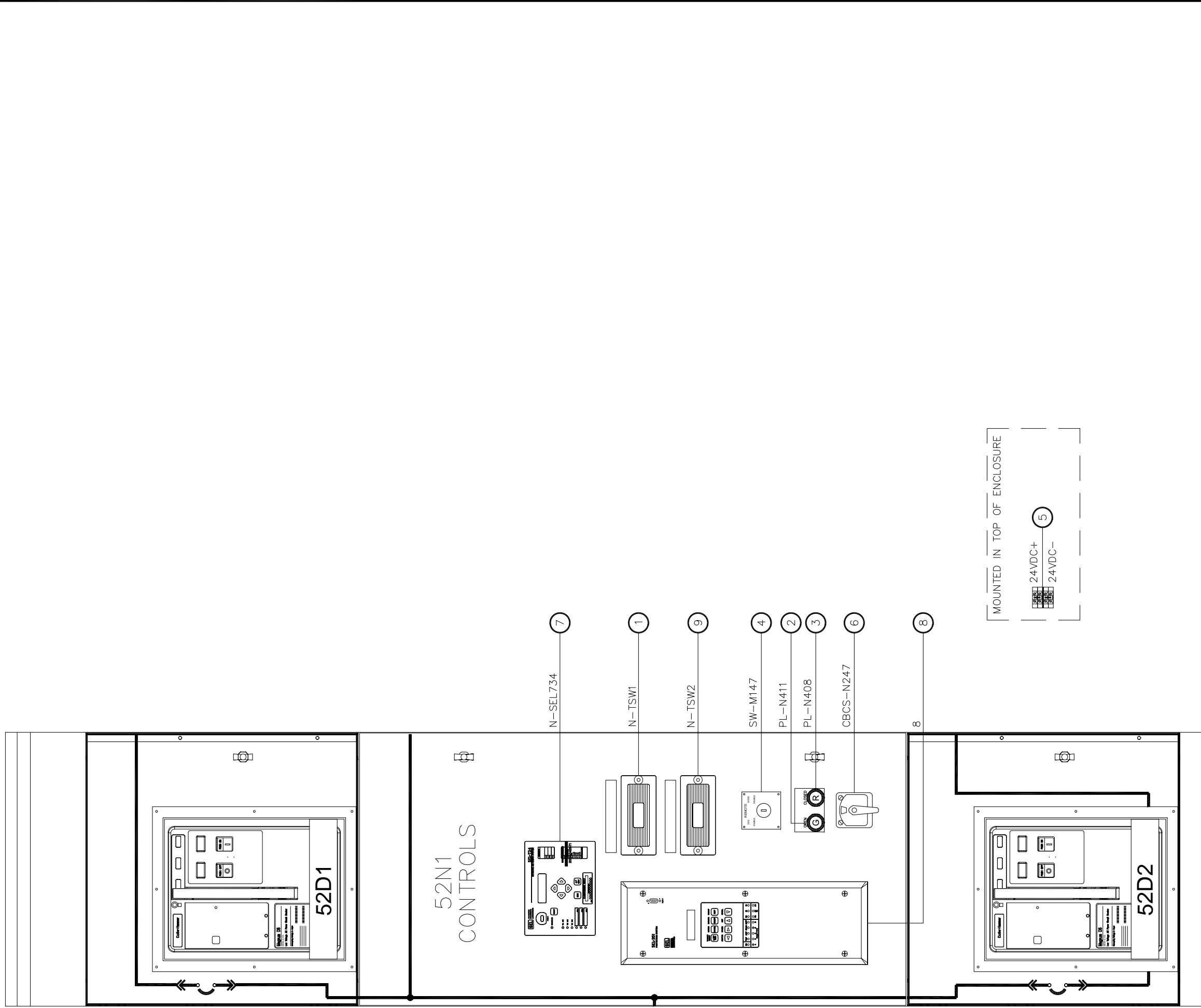
TITLE:		WES CCSD #1 INTERTIE DIVERSION	
		DOOR ASSEMBLY - SECT 2	
APPROVED BY:		DRAWN BY:	
<i>C. Waggaman</i>		GLG	
DATE APPROVED:	REV.:	DATE CREATED:	DATE MODIFIED:
05-14-13	3.1	02-22-11	
FILE NAME:	SCALE:	SHEET NUMBER:	of
36368-A	1/8"=1"	2	15



BILL OF MATERIALS

NO	QTY	DESC	MFG	PART_NUMBER
1	1	TEST SWITCH 10-POLE	ABB	129A514G01
2	1	GREEN LED INDICATOR LIGHT	CUTLER HAMMER	10250T197LGP24
3	1	RED LED INDICATOR LIGHT	CUTLER HAMMER	10250T197LRP24
4	1	SWITCH 2 POS-KEY	CUTLER HAMMER	EM22K53C
5	4	TERMINAL BLOCK 6AWG	CUTLER HAMMER	XBUT10
6	1	CIRCUIT BREAKER CONTROL SWITCH	ELECTROSWITCH	749020F
7	1	SEL-734 REVENUE METERING SYSTEM	SCHWEITZER	0734009H3A1126GXXX3A
8	1	PRIY SEL 351-7 VERT 3U	SEL	035179A2E51X21
9	1	TEST SWITCH 10-POLE	ABB	C716B562G26

SECT 3



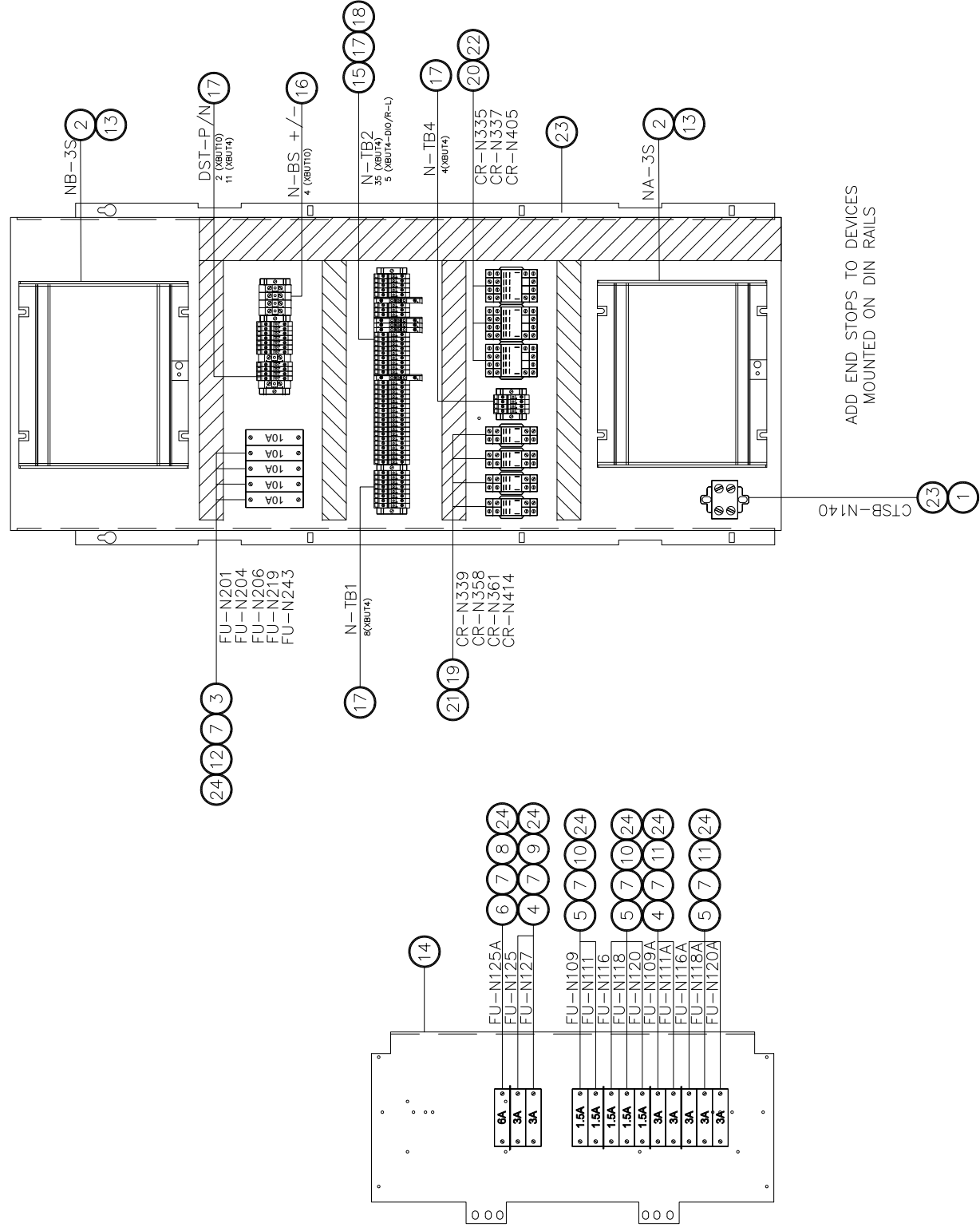
NO.	REVISION	DATE
1.0	ISSUED FOR PRODUCTION	10-10-11
2.0	ISSUED FOR FIELD STARTUP	01-17-12
3.0	ISSUED FOR AS BUILT	10-18-12
3.1	RE-ISSUED FOR AS BUILT	05-14-13

TITLE: WES CCSD #1 INTERTIE DIVERSION DOOR ASSEMBLY - SECT 3 480V UTILITY / GENERATOR PARALLELING SWITCHGEAR	
APPROVED BY: <i>C. Waggaman</i>	SCALE: 1/8" = 1" REV. 3.1 DRAWN BY: GLG DATE CREATED: 02-22-11 SHEET NUMBER: 3 of 15
DATE APPROVED: 05-14-13 FILE NAME: 36368-A	MODIFIED BY: DATE MODIFIED:



BILL OF MATERIALS

NO	QTY	DESC	MFG	PART_NUMBER
1	1	SHORTING BLOCK 2 POLE +COVER	USD	KUSC-2WC
2	4	3.S CONTROLLER MTG BRKT	ACCUFAB	30000-M71
3	5	FUSE BLOCK 1 POLE	BUSSMANN	BC6031PQ
4	3	FUSE BLOCK 2 POLE	BUSSMANN	BC6032PQ
5	2	FUSE BLOCK 3 POLE	BUSSMANN	BC6033PQ
6	1	FUSE BLOCK 1 POLE	BUSSMANN	BM6031PQ
7	13	ADAPTER FUSE BLOCK DIN RAIL	BUSSMANN	DRA-1
8	1	FUSE 6A 65 KAIC	BUSSMANN	FNM-6
9	2	FUSE FNQ-R-3A 200KAIC	BUSSMANN	FNQ-R-3
10	5	FUSE 1.5A	BUSSMANN	KTK-R-1.5
11	5	FUSE 3A	BUSSMANN	KTK-R-3
12	5	FUSE LP-CC-10A 200KAIC	BUSSMANN	LP-CC-10
13	2	EMCP 3.S XLM	CATERPILLAR	8440-2025
14	1	SIDE MOUNTING PLATE	CUTLER HAMMER	9257C28HT9
15	3	TERMINAL BLOCK DIODE END COVER	CUTLER HAMMER	XBACUKK35
16	6	TERMINAL BLOCK 6AWG	CUTLER HAMMER	XBUT10
17	58	TERMINAL BLOCK 10AWG	CUTLER HAMMER	XBUT4
18	5	TERMINAL BLOCK DIODE	CUTLER HAMMER	XBUT4-DIO/R-L
19	4	DPDT RELAY-24VDC IND	IDEC	RH2B-ULDC24V
20	3	4PDT RELAY 24VDC IND	IDEC	RH4B-ULDC24V
21	4	DPDT RELAY BASE	IDEC	SH2B-05
22	3	4PDT RELAY BASE	IDEC	SH4B-05
23	2	DIN-RAIL ADAPTER	MARATHON	DIN R 1
24	15	FUSE COVER/PULLER	LITTELFUSE	SPL001



NO.	REVISION	DATE
1.0	ISSUED FOR PRODUCTION	10-10-11
2.0	ISSUED FOR FIELD STARTUP	01-17-12
3.0	ISSUED FOR AS BUILT	10-18-12
3.1	RE-ISSUED FOR AS BUILT	05-14-13

APPROVED BY *C. Waggaman*
 DATE APPROVED 05-14-13
 FILE NAME 36368-A

TITLE: **WES CCSD #1 INTERTIE DIVERSION**
SUBPAN ASSEMBLY - SECT 3BC
480V UTILITY / GENERATOR PARALLELING SWITCHGEAR
 SCALE 1/8"=1"
 REV. 3.1
 DRAWN BY GLG
 DATE CREATED 02-22-11
 SHEET NUMBER 4
A04 of 15



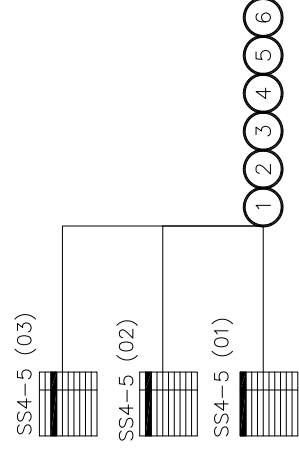
BILL OF MATERIALS

NO	QTY	DESC	MFG	PART_NUMBER
1	3	KEYING STAR	PHOENIX	3040588
2	6	SNAP-LOCK FITTING	PHOENIX	3040630
3	3	CONNECTOR COUPLING 4.0 8-PT	PHOENIX	3042515
4	3	CONNECTOR PLUG 4.0 10-PT	PHOENIX	3042984
5	3	CONNECTOR DIN RAIL 4.0 COVER	PHOENIX	3043307
6	6	CONNECTOR DIN RAIL 4.0	PHOENIX	3043404

SHIPPING
SPLIT

SECT 4

FRONT
ACCESS
POWER
CABLE
FOR
52D1,
52D2



SHADED AREA
REPRESENTS KEY

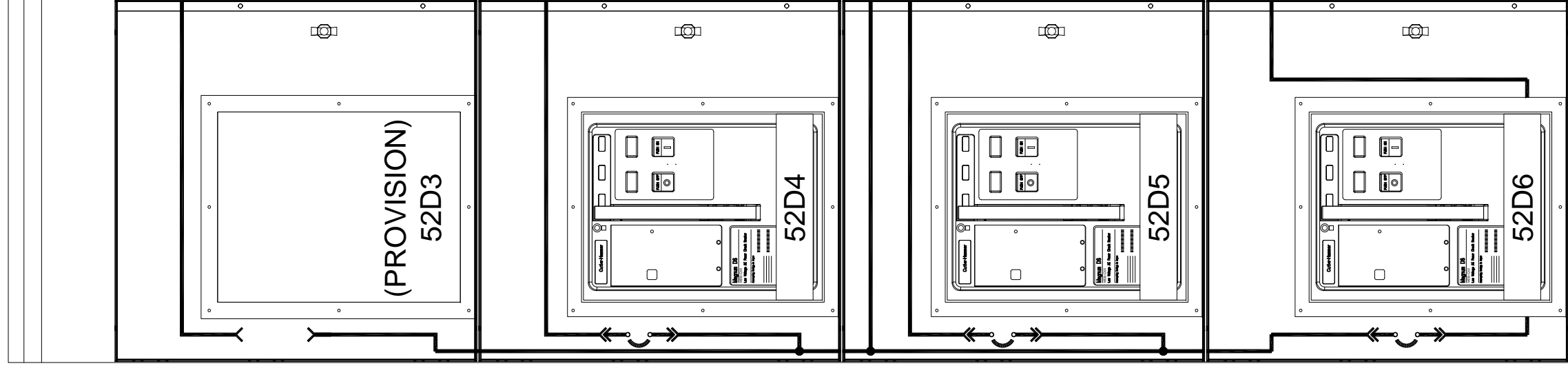
NO.	REVISION	DATE
1.0	ISSUED FOR PRODUCTION	10-10-11
2.0	ISSUED FOR FIELD STARTUP	01-17-12
3.0	ISSUED FOR AS BUILT	10-18-12
3.1	RE-ISSUED FOR AS BUILT	05-14-13

TITLE: WES CCSD #1 INTERTIE DIVERSION DOOR ASSEMBLY - SECT 4 480V UTILITY / GENERATOR PARALLELING SWITCHGEAR	
APPROVED BY: <i>C. Waggaman</i>	DRAWN BY: GLG
DATE APPROVED: 05-14-13	REV. 3.1 DATE CREATED: 02-22-11
FILE NAME: 36368-A	MODIFIED BY: DATE MODIFIED: SHEET NUMBER: 5 of 15



BILL OF MATERIALS			
NO	QTY	DESC	PART_NUMBER
1	4	TERMINAL BLOCK 6AWG	CUTLER HAMMER
			XBUT10

SECT 5



MOUNTED IN TOP OF ENCLOSURE



NO.	REVISION	DATE
1.0	ISSUED FOR PRODUCTION	10-10-11
2.0	ISSUED FOR FIELD STARTUP	01-17-12
3.0	ISSUED FOR AS BUILT	10-18-12
3.1	RE-ISSUED FOR AS BUILT	05-14-13

TITLE: WES CCSD #1 INTERTIE DIVERSION DOOR ASSEMBLY - SECT 5 480V UTILITY / GENERATOR PARALLELING SWITCHGEAR	
APPROVED BY: <i>C. Waggaman</i>	SCALE: 1/8"=1"
DATE APPROVED: 05-14-13	REV.: 3.1
FILE NAME: 36368-A	DRAWN BY: GLG
	DATE CREATED: 02-22-11
	DATE MODIFIED: 02-22-11
	SHEET NUMBER: 6
	of 15



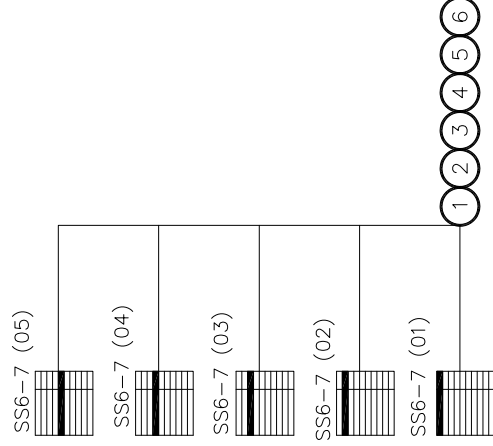
BILL OF MATERIALS

NO	QTY	DESC	MFG	PART_NUMBER
1	5	KEYING STAR	PHOENIX	3040588
2	10	SNAP-LOCK FITTING	PHOENIX	3040630
3	5	CONNECTOR COUPLING 4.0 8-PT	PHOENIX	3042515
4	5	CONNECTOR PLUG 4.0 10-PT	PHOENIX	3042984
5	5	CONNECTOR DIN RAIL 4.0 COVER	PHOENIX	3043307
6	10	CONNECTOR DIN RAIL 4.0	PHOENIX	3043404

SHIPPING
SPLIT

SECT 6

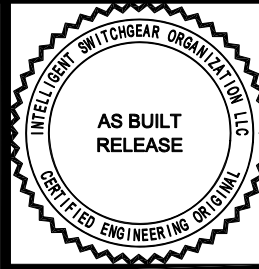
FRONT
ACCESS
POWER
CABLE
FOR
52D3
(PROVISION),
52D4,
52D5 & 52D6



SHADED AREA
REPRESENTS KEY

NO.	REVISION	DATE
1.0	ISSUED FOR PRODUCTION	10-10-11
2.0	ISSUED FOR FIELD STARTUP	01-17-12
3.0	ISSUED FOR AS BUILT	10-18-12
3.1	RE-ISSUED FOR AS BUILT	05-14-13

TITLE: WES CCSD #1 INTERTIE DIVERSION DOOR ASSEMBLY - SECT 6 480V UTILITY / GENERATOR PARALLELING SWITCHGEAR	
APPROVED BY: <i>C. Waggaman</i>	REV. 3.1 SCALE 1/8"=1"
DATE APPROVED 05-14-13	DRAWN BY GLG DATE CREATED 02-22-11 SHEET NUMBER 7 of 15
FILE NAME 36368-A	MODIFIED BY DATE MODIFIED



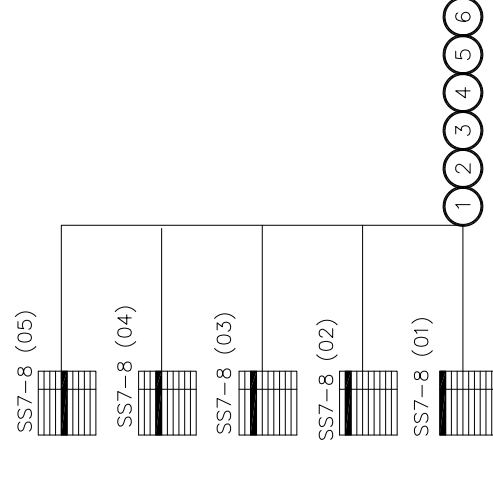
BILL OF MATERIALS

NO	QTY	DESC	MFG	PART_NUMBER
1	5	KEYING STAR	PHOENIX	3040588
2	10	SNAP-LOCK FITTING	PHOENIX	3040630
3	5	CONNECTOR COUPLING 4.0 8-PT	PHOENIX	3042515
4	5	CONNECTOR PLUG 4.0 10-PT	PHOENIX	3042984
5	5	CONNECTOR DIN RAIL 4.0 COVER	PHOENIX	3043307
6	10	CONNECTOR DIN RAIL 4.0	PHOENIX	3043404

SHIPPING
SPLIT

SECT 7

GENERATOR REVENUE METERING



SHADED AREA
REPRESENTS KEY

NO.	REVISION	DATE
1.0	ISSUED FOR PRODUCTION	10-10-11
2.0	ISSUED FOR FIELD STARTUP	01-17-12
3.0	ISSUED FOR AS BUILT	10-18-12
3.1	RE-ISSUED FOR AS BUILT	05-14-13

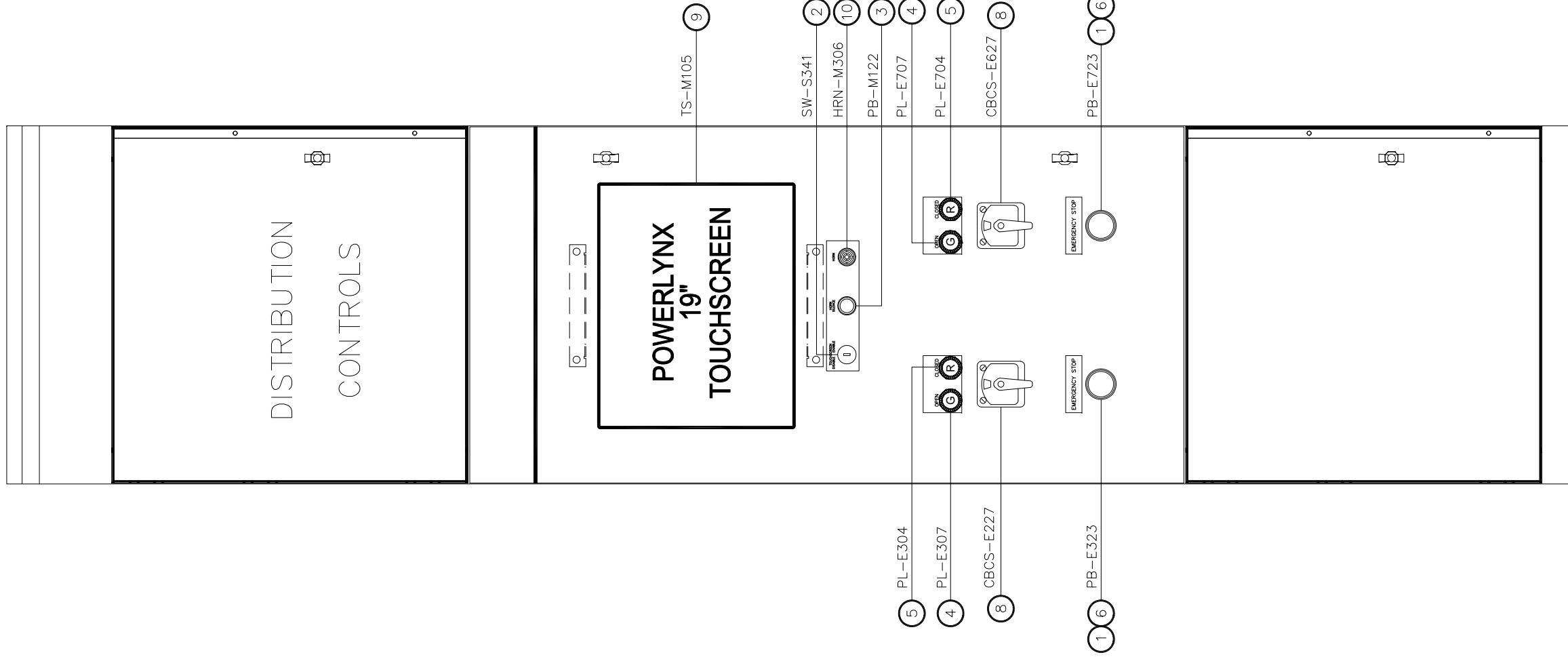
TITLE: WES CCSD #1 INTERTIE DIVERSION DOOR ASSEMBLY - SECT 7	
APPROVED BY: <i>C. Waggaman</i> DATE APPROVED: 05-14-13 FILE NAME: 36368-A	DRAWN BY: GLG DATE CREATED: 02-22-11 SHEET NUMBER: 8 of 15
REV. 3.1 SCALE 1/8"=1"	MODIFIED BY: DATE MODIFIED:



BILL OF MATERIALS

NO	QTY	DESC	MFG	PART_NUMBER
1	2	SHROUD	ALLEN BRADLEY	800E-AMRG
2	1	SWITCH 2 POS KEY	C-H	EM22K53C
3	1	SW PB BLK-FLUSH 2NO	C-H	EM22PID
4	2	GREEN LED INDICATOR LIGHT	CUTLER HAMMER	10250T197LGP24
5	2	RED LED INDICATOR LIGHT	CUTLER HAMMER	10250T197LRP24
6	2	E-STOP SWITCH ASSEMBLY	CUTLER HAMMER	EM22LP2VW
7	4	TERMINAL BLOCK 6AWG	CUTLER HAMMER	XBUT10
8	2	CIRCUIT BREAKER CONTROL SWITCH	ELECTROSWITCH	749020F
9	1	19" ELO VI TOUCHSCREEN	ELO	TS-19-24VDC-ISO-VI
10	1	HORN 24VDC	MALLORY	SC628P

SECT 8



MOUNTED IN TOP OF ENCLOSURE

24VDC+ 7
24VDC-

NO.	REVISION	DATE
1.0	ISSUED FOR PRODUCTION	10-10-11
2.0	ISSUED FOR FIELD STARTUP	01-17-12
3.0	ISSUED FOR AS BUILT	10-18-12
3.1	RE-ISSUED FOR AS BUILT	05-14-13

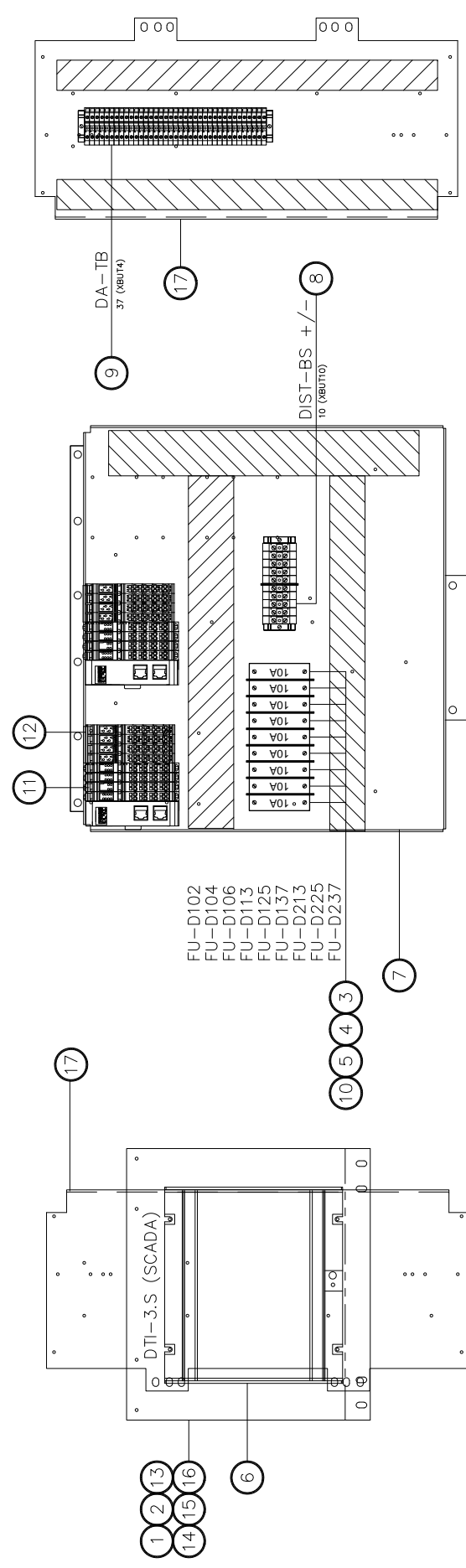
APPROVED BY *C. Waggaman*
 DATE APPROVED 05-14-13
 FILE NAME 36368-A

TITLE: **WES CCSD #1 INTERTIE DIVERSION**
DOOR ASSEMBLY - SECT 8
480V UTILITY / GENERATOR PARALLELING SWITCHGEAR
 SCALE 1/8"=1"
 REV. 3.1
 DRAWN BY GLG
 DATE CREATED 02-22-11
 SHEET NUMBER 9 of 15

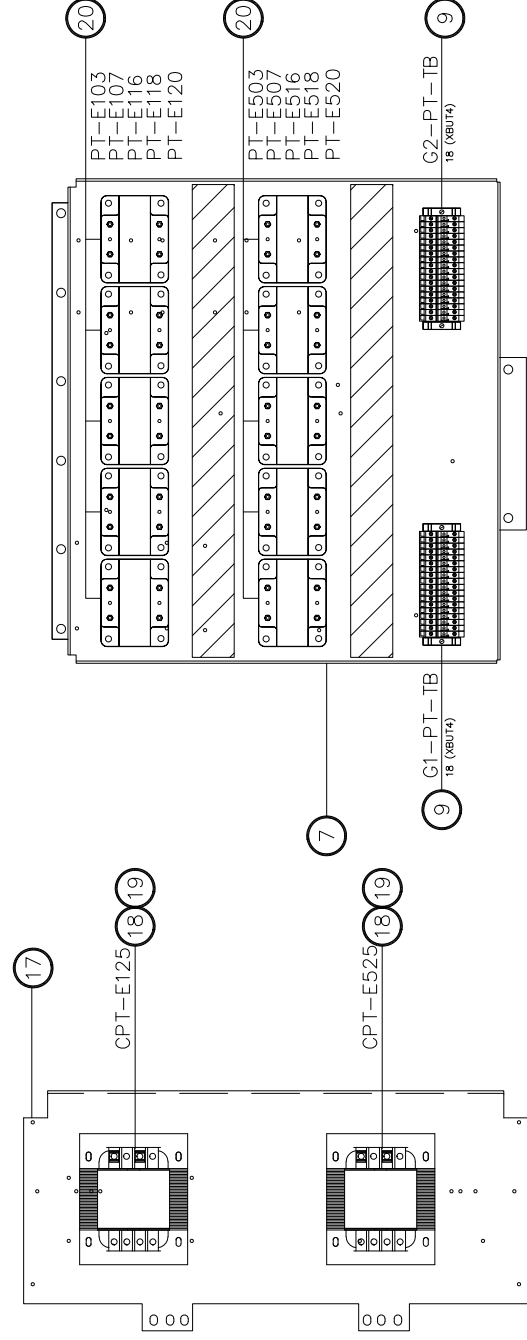


BILL OF MATERIALS

NO	QTY	DESC	MFG	PART_NUMBER
1	1	DTI MOUNTING PLATE	ACCUFAB	30000-M90
2	1	DTI MOUNTING BRACKET	ACCUFAB	30000-M91
3	9	FUSE BLOCK 1 POLE	BUSSMANN	BC6031PQ
4	9	ADAPTER FUSE BLOCK DIN RAIL	BUSSMANN	DRA-1
5	9	FUSE LP-CC-10A 200KAIC	BUSSMANN	LP-CC-10
6	1	EMCP 3-S XLM	CATERPILLAR	8440-2025
7	2	REAR GEN MOUNTING PLATE	CUTLER HAMMER	9257C28HT6
8	10	TERMINAL BLOCK 6AWG	CUTLER HAMMER	XBUT10
9	73	TERMINAL BLOCK 10AWG	CUTLER HAMMER	XBUT4
10	9	FUSE COVER/PULLER	LITTELFUSE	SPL001
11	2	ETHERNET TCP/IP COUPLER	PHOENIX	2703981
12	2	16-PT INPUT MODULE	PHOENIX	2897156
13	2	OVAL HD 1/4-TURN STUD	SOUTHCO	82-11-280-16
14	2	PLASTIC RETAINER	SOUTHCO	82-32-301-12
15	2	CLIP-ON RECEPTACLE	SOUTHCO	82-47-113-15
16	2	DUAL LATCH RELEASE HINGE	SOUTHCO	F6-N1-3W1
17	3	SIDE MOUNTING PLATE	CUTLER HAMMER	9257C28HT9
18	4	FINGERSAFE COVER	SQUARE D	9070FSC2
19	2	XFMR 500VA 480:120	SQUARE D	9070T500D1
20	10	POTENTIAL XFMR 75VA 277:120	ITI	468-277



ADD END STOPS TO DEVICES MOUNTED ON DIN RAILS LOCATED IN SECTION 8A



ADD END STOPS TO DEVICES MOUNTED ON DIN RAILS LOCATED IN SECTION 8D

NO.	REVISION	DATE
1.0	ISSUED FOR PRODUCTION	10-10-11
2.0	ISSUED FOR FIELD STARTUP	01-17-12
3.0	ISSUED FOR AS BUILT	10-18-12
3.1	RE-ISSUED FOR AS BUILT	05-14-13

APPROVED BY *C. Waggaman*
 DATE APPROVED 05-14-13
 FILE NAME 36368-A

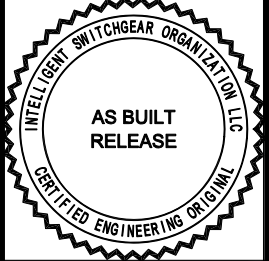
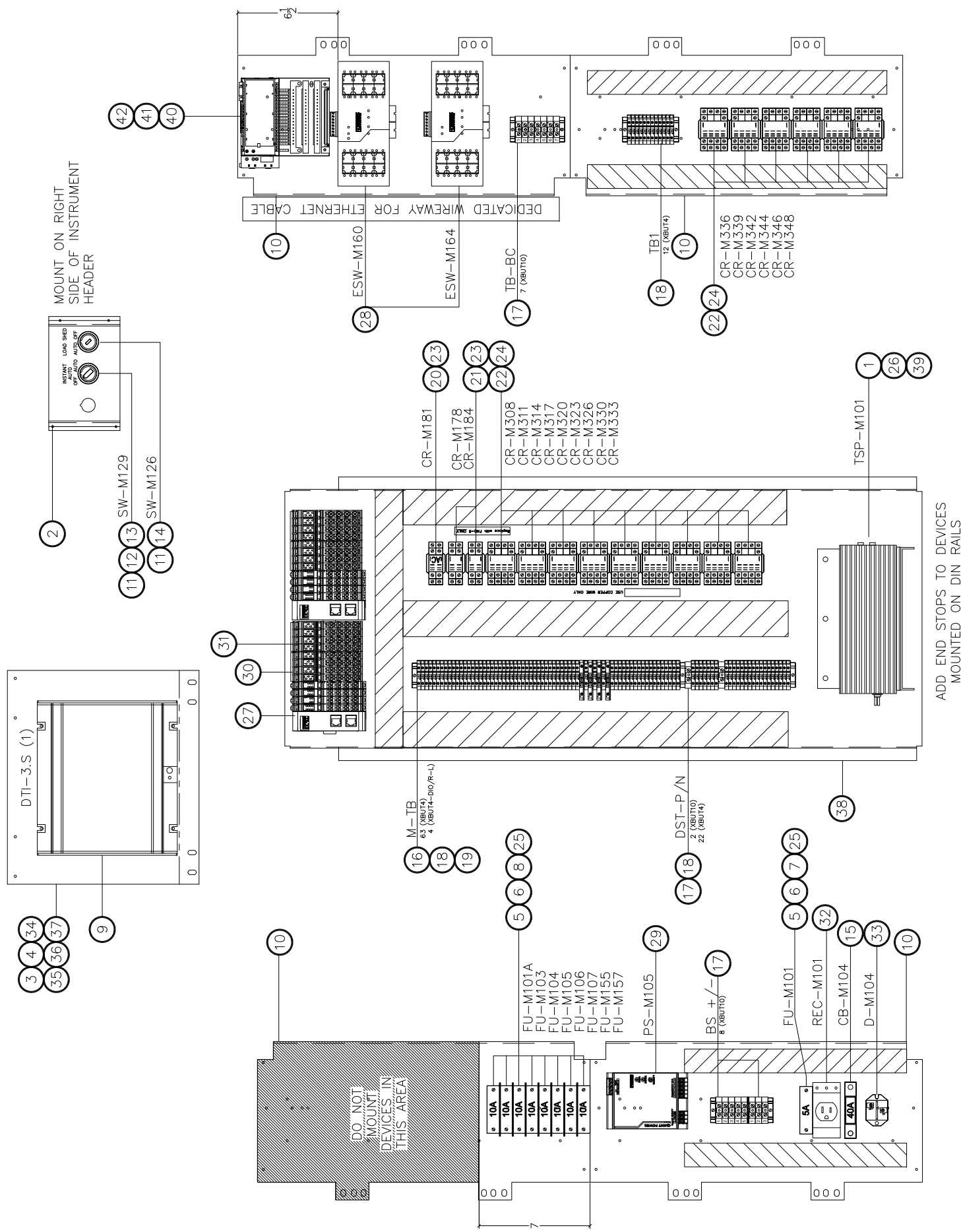
SCALE 1/8"=1"
 REV. 3.1
 DRAWN BY GILG
 DATE CREATED 02-22-11
 SHEET NUMBER 10 of 15

TITLE: WES CCSD #1 INTERTIE DIVERSION
 SUBSPAN ASSEMBLY - SECT 8A
 480V UTILITY / GENERATOR PARALLELING SWITCHGEAR



BILL OF MATERIALS

NO	QTY	DESC	MFG	PART_NUMBER
1	1	XYCOM MOUNTING BRACKET	ACCUFAB	30000-M69
2	1	SELECTOR SWITCH BRACKET, 3-WIDE	ACCUFAB	30000-M87
3	1	DTI MOUNTING PLATE	ACCUFAB	30000-M90
4	1	DTI MOUNTING BRACKET	ACCUFAB	30000-M91
5	9	FUSE BLOCK 1 POLE	BUSSMANN	BC6031PQ
6	9	ADAPTER FUSE BLOCK DIN RAIL	BUSSMANN	DRA-1
7	1	FUSE 5A	BUSSMANN	KTK-R-5
8	8	FUSE LP-CC-10A 200KAIC	BUSSMANN	LP-CC-10
9	1	EMCP 3.5 XLM	CATERPILLAR	8440-2025
10	4	SIDE MOUNTING PLATE	CUTLER HAMMER	9257C28H19
11	2	CONTACT 1-NC	CUTLER HAMMER	M22-K01
12	1	CONTACT 1-NO	CUTLER HAMMER	M22-K10
13	1	SW 2 POS SEL SPRING RETURN	CUTLER HAMMER	M22-WK
14	1	SWITCH 2 POS KEY	CUTLER HAMMER	M22-WRS
15	1	CB 1P 40A	CUTLER HAMMER	WMZSD40
16	4	TERMINAL BLOCK DIODE END COVER	CUTLER HAMMER	XBACUKK35
17	17	TERMINAL BLOCK 6AWG	CUTLER HAMMER	XBUT10
18	99	TERMINAL BLOCK 10AWG	CUTLER HAMMER	XBUT4
19	4	TERMINAL BLOCK DIODE	CUTLER HAMMER	XBUT4-DIO/R-L
20	1	DPDT RELAY-120VAC IND	IDEC	RH2B-ULAC120V
21	2	DPDT RELAY-24VDC IND	IDEC	RH2B-ULDC24V
22	15	4PDT RELAY 24VDC IND	IDEC	RH4B-ULDC24V
23	3	DPDT RELAY BASE	IDEC	SH2B-05
24	15	4PDT RELAY BASE	IDEC	SH4B-05
25	9	FUSE COVER/PULLER	LITTELFUSE	SPL001
26	1	DUAL ETHERNET CARD		
27	2	ETHERNET TCP/IP COUPLER	PHOENIX	2703981
28	2	ETHERNET SWITCH 16-PT	PHOENIX	2832849
29	1	POWER SUPPLY SFB 24VDC 20A	PHOENIX	2866776
30	2	16-PT INPUT MODULE	PHOENIX	2897156
31	2	16-PT OUTPUT MODULE	PHOENIX	2897253
32	1	SERVICE OUTLET	PHOENIX	2963860
33	1	DIODE 100A	POWEREX	CS241210
34	2	OVAL HD 1/4-TURN STUD	SOUTHCO	82-11-280-16
35	2	PLASTIC RETAINER	SOUTHCO	82-32-301-12
36	2	CLIP-ON RECEPTACLE	SOUTHCO	82-47-113-15
37	2	DUAL LATCH RELEASE HINGE	SOUTHCO	F6-N1-3W1
38	1	REAR MOUNTING PANEL	STOCK C-H	9256C16H19
39	1	INDUSTRIAL NODE PC 24VDC	XYCOM	PM-090017
40	1	MODULE 16 PT I/O 24VDC	MODICON	170ADM85010
41	1	CP M1 512K RAM	MODICON	171CCC98030
42	1	ADAPTER MB+ COM PORT OPT	MODICON	172PNN21022



CATERPILLAR

WES CCSD #1 INTERTIE DIVERSION
SUBSPAN ASSEMBLY - SECT 8BC

480V UTILITY / GENERATOR PARALLELING SWITCHGEAR

APPROVED BY *C. Waggaman*

DATE APPROVED 05-14-13

FILE NAME 36368-A

SCALE 1/8"=1"

REV. 3.1

DRAWN BY GLG

MODIFIED BY LBM

DATE CREATED 02-22-11

DATE MODIFIED 10-16-12

SHEET NUMBER 11

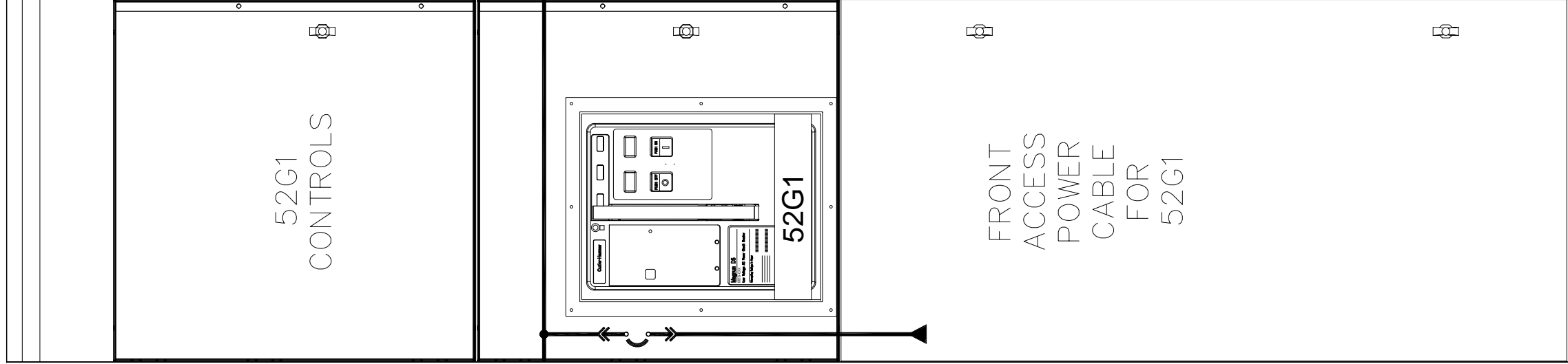
of 15

NO.	REVISION	DATE
1.0	ISSUED FOR PRODUCTION	10-10-11
2.0	ISSUED FOR FIELD STARTUP	01-17-12
3.0	ISSUED FOR AS BUILT	10-18-12
3.1	RE-ISSUED FOR AS BUILT	05-14-13

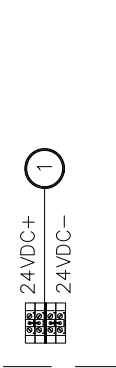
BILL OF MATERIALS

NO	QTY	DESC	MFG	PART_NUMBER
1	4	TERMINAL BLOCK 6AWG	CUTLER HAMMER	XBUT10

SECT 9



MOUNTED IN TOP OF ENCLOSURE



NO.	REVISION	DATE
1.0	ISSUED FOR PRODUCTION	10-10-11
2.0	ISSUED FOR FIELD STARTUP	01-17-12
3.0	ISSUED FOR AS BUILT	10-18-12
3.1	RE-ISSUED FOR AS BUILT	05-14-13

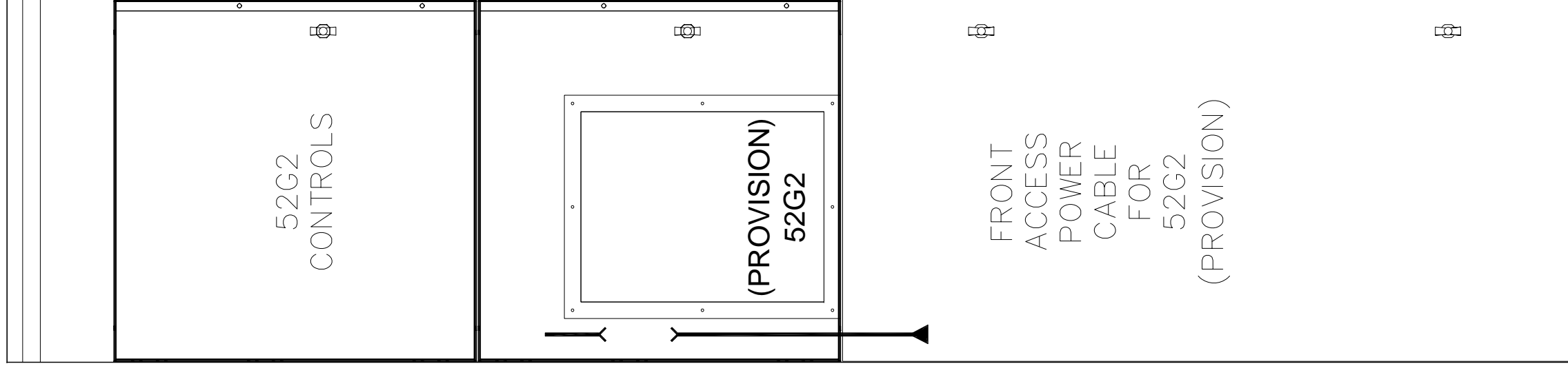
TITLE: WES CCSD #1 INTERTIE DIVERSION DOOR ASSEMBLY - SECT 9 480V UTILITY / GENERATOR PARALLELING SWITCHGEAR	
APPROVED BY <i>C. Waggaman</i>	DRAWN BY GLG
DATE APPROVED 05-14-13	REV. 3.1
FILE NAME 36368-A	SCALE 1/8"=1"
	DATE CREATED 02-22-11
	DATE MODIFIED 02-22-11
	SHEET NUMBER 12
	of 15



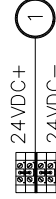
BILL OF MATERIALS

NO	QTY	DESC	MFG	PART_NUMBER
1	4	TERMINAL BLOCK 6AWG	CUTLER HAMMER	XBUT10

SECT 10



MOUNTED IN TOP OF ENCLOSURE



NO.	REVISION	DATE
1.0	ISSUED FOR PRODUCTION	10-10-11
2.0	ISSUED FOR FIELD STARTUP	01-17-12
3.0	ISSUED FOR AS BUILT	10-18-12
3.1	RE-ISSUED FOR AS BUILT	05-14-13

TITLE: WES CCSD #1 INTERTIE DIVERSION DOOR ASSEMBLY - SECT 10 480V UTILITY / GENERATOR PARALLELING SWITCHGEAR	
APPROVED BY: <i>C. Waggaman</i>	SCALE: 1/8" = 1"
DATE APPROVED: 05-14-13	REV. 3.1
FILE NAME: 36368-A	DRAWN BY: GLG
	DATE CREATED: 02-22-11
	DATE MODIFIED: 05-14-13
	SHEET NUMBER: 1 of 15





SAFETY

Procedures

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CATERPILLAR EMERGENCY RESPONSE INFORMATION

Important Safety Information

Most accidents that involve product operation, maintenance, and repair are caused by failure to observe basic safety rules or precautions. An accident can often be avoided by recognizing potentially hazardous situations before an accident occurs. A person must be alert to potential hazards. This person should also have the necessary training, skills, and tools to perform these functions properly.

Improper operation, maintenance, or repair of this product can be dangerous and could result in injury or death.

Do not operate or perform any maintenance or repair on this product until you have read and fully understand the operation, maintenance, and repair information.

Safety precautions and warnings are provided in this manual and on the product. If these hazard warnings are not heeded bodily injury or death could occur to you or other persons.

The hazards are identified by the "Safety Alert Symbol" and followed by a "Signal Word" such as "DANGER", "WARNING", or "CAUTION". The safety warning alert signal is shown below.



The meaning of this safety alert symbol is as follows:

ATTENTION! Become alert! Your safety is involved!

The message that appears under the warning explains the hazard and can either be written or pictorially presented.

"NOTICE" labels on the product and in this publication identify operations that may cause product damage.

Caterpillar cannot anticipate every possible circumstance that might involve potential hazard. Therefore, the warnings in this publication and on the product are not all inclusive. If a tool, procedure, work method, or operating technique that is not specifically recommended by Caterpillar is used, you must satisfy yourself that it is safe for you and others. You should also ensure that the product will not be damaged or be made unsafe by the operation, maintenance, or repair procedure that you choose.

The information, specifications, and illustrations in this publication are based on information that was available at the time that the publication was written. The specifications, torques, pressures, measurements, adjustments, illustrations, and other items can change at any time. These changes can affect the service that is given to the product. Obtain the complete and most current information before you start any job. Caterpillar dealers have the most current information available.



When replacement parts are required for this product, Caterpillar recommends using Caterpillar replacement parts or parts with equivalent specifications, including but not limited to physical dimensions, type, strength, and material.

Failure to heed this warning can lead to permanent failures, product damage, personal injury, or death.

24 Hour Emergency Response Center

(866) 883-3879

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SAFETY STATEMENT

The successful operation of switchboards is dependent upon the proper handling, installation, operation and maintenance. Neglecting fundamental installation and maintenance requirements may lead to personnel injury as well as damage to electrical equipment or other property.

Switchboard assemblies should be installed and maintained by qualified personnel thoroughly trained in maintaining switchboards and are familiar with the hazards inherent to working with electricity and in the proper way to perform such work.

RECEIVING

ISO LLC switchboards are fully factory tested and inspected prior to being prepared for shipment by personnel experienced in the handling of electrical equipment.

Upon receipt of the equipment, the purchaser should immediately check the material against the shipping list to insure all components have been received.

A thorough and immediate inspection of the equipment is recommended for any possible shipping damage. If damage or loss is evident or suspected, claims should be filed with the carrier as soon as possible and notification should be given to ISO LLC within 48 hours.

TEMPORARY, PROLONGED PERIODS OF STORAGE

Equipment, which cannot be installed and put into service immediately, should be stored in a clean, dry area, preferably climate controlled. Conditions such as dampness, temperature changes and contaminants in the atmosphere should be carefully avoided. If outdoor storage is necessary, special precautions will be required to keep the equipment clean and dry, and within uniform temperature and humidity levels. This may require the installation of temporary heating. Approximately 250 watts per vertical section should be sufficient under average conditions. If storage is for a prolonged period, the equipment should be inspected on a regular basis for any evidence of dampness or contaminants.

Visually check and manually operate mechanical moving parts such as drawout mechanisms, slide rails and hinged doors to insure proper Operation. If for any reason insulating barriers, supports or access covers have been removed during installation, assure they are properly reinstalled. Thoroughly inspect main power conductors for any evidence of insulation damage that might have occurred during installation. Also inspect to insure conductors have sufficient bend radius and are not exerting excessive pressure at terminations.

Instruction Booklet IB01901001E

Effective July 2011

Instructions for Magnum DS
Metal-Enclosed Low-Voltage Assemblies

Read and understand these instructions before attempting to unpack, assemble, operate or maintain this type equipment. All possible contingencies which may arise during installation, operation or maintenance, and all details and variations of this equipment do not purport to be covered by these instructions. If further information is desired by purchaser regarding his particular installation, operation or maintenance of particular equipment, contact the local Eaton representative.

⚠ WARNING

METAL-ENCLOSED LOW-VOLTAGE ASSEMBLIES COVERED BY THESE INSTRUCTIONS ARE DESIGNED AND TESTED TO OPERATE WITHIN THEIR NAMEPLATE RATINGS. OPERATION OUTSIDE OF THESE RATINGS MAY CAUSE THE EQUIPMENT TO FAIL RESULTING IN DEATH, SERIOUS INJURY AND/OR PROPERTY DAMAGE. ALL RESPONSIBLE PERSONNEL SHOULD LOCATE THE EQUIPMENT RATING NAMEPLATE AND BE FAMILIAR WITH THE INFORMATION PROVIDED THEREON. A TYPICAL MAGNUM DS® SWITCHGEAR NAMEPLATE IS SHOWN IN FIGURE 1.

EATON®		LOW VOLTAGE SWITCHGEAR ASSEMBLY			2.2 KV INSULATION LEVEL	
DWG NO.	G.O. NUMBER		ITEM NUMBER	MFD AT	DATE	
VOLTAGE	PHASE	WIRE	HERTZ	SHORT CIRCUIT CURRENT		SHORT TIME CURRENT
MAIN BUS	SECT. BUS					
MAIN NEU.	SECT. NEU.					
MADE IN USA 9253C56H01						

Figure 1. Typical Blank Magnum DS Rating Nameplate

⚠ CAUTION

ALL APPLICABLE SAFETY CODES, SAFETY STANDARDS, AND SAFETY REGULATIONS MUST BE STRICTLY ADHERED TO WHEN INSTALLING, OPERATING, OR MAINTAINING THIS EQUIPMENT.

Purpose

This instruction manual is expressly intended to cover the installation, operation and maintenance of Magnum DS Metal-Enclosed Low-Voltage Assemblies used with Magnum DS, Magnum SB or Series NRX Power Circuit Breakers or CM52 Network Protectors.

For application information consult applicable descriptive bulletins, application publications and/or the applicable industry standards.

For installation, operation and maintenance of Low-Voltage Power Circuit Breakers see separate instruction books listed in Section 7.

NOTICE

THE DANGER, WARNING AND CAUTION MESSAGES INCLUDED AS PART OF THE PROCEDURAL STEPS IN THIS MANUAL ARE FOR PERSONNEL SAFETY AND PROTECTION OF EQUIPMENT FROM DAMAGE. AN EXAMPLE OF A TYPICAL WARNING LABEL HEADING IS SHOWN ABOVE THIS PARAGRAPH TO FAMILIARIZE PERSONNEL WITH THE TYPE OF PRESENTATION. THIS WILL HELP TO ASSURE THAT PERSONNEL ARE ALERT TO THESE MESSAGES. IN ADDITION, THESE MESSAGES ARE ALL UPPERCASE AND BOLDFACE.

Section 1: Introduction

1.1 General information

Magnum DS Switchgear Low Voltage assemblies with Magnum DS, Magnum SB or Series NRX AC Power Circuit Breakers, or CM52 Network Protectors, control and protect power circuits up to and including 600 volts ac and interrupting capacities up to and including 200kA. The switchgear or switchboard assembly is composed of vertical sections that are arranged to suit the customer's requirements. Magnum DS Low Voltage assemblies utilize a four-cell high structure design consisting of various combinations of Magnum DS, Magnum SB or Series NRX Low-Voltage ac Power Circuit Breakers or CM52 Network Protectors and auxiliary compartments (Figure 2). Bus and cable compartments provide space for connections, maintenance and inspection. These spaces are rear-accessible as a standard, or may be front-accessible as an option. See Section 3 for details.

This instruction manual contains important procedures and information pertinent to the receiving, handling, storage, installation, operation and maintenance of Magnum DS Metal-Enclosed Low-Voltage Assemblies. Information provided in this instruction manual and by other supplied documentation and/or drawings should be read and understood by all personnel responsible for supervision, operation or maintenance. Familiarization should always include the characteristics of each piece of equipment contained in or mounted on the assembly.

Proper installation, operation and maintenance are essential to assure continued satisfactory service from the equipment. It should not be installed in places where it will be required to operate at voltage, currents or fault capacities greater than those for which it was designed, or where the environmental conditions are dirty, corrosive, humid or otherwise harsh or unsuitable. (Ref. ANSI C37.20.1 for abnormal operation conditions).



Figure 2. Typical Magnum DS Low-Voltage Indoor Switchgear (Front View)

The information given in this manual applies to both NEMA1 (Indoor) Low Voltage assemblies utilizing Magnum DS, Magnum SB or Series NRX drawout power circuit breakers unless otherwise noted. For other options, see the addendum documents listed in Section 7.

1.2 Safety Features

Each Magnum DS Assembly is manufactured with built in interlocks and safety-related features. They are provided to reduce hazards to operating personnel and provide proper operating sequences.

⚠ DANGER

METAL-ENCLOSED LOW-VOLTAGE ASSEMBLIES ARE PROVIDED WITH MANY SAFETY FEATURES. NEVERTHELESS, WHEN CONNECTED THEY CONTAIN POWER CIRCUITS WITH HIGH FAULT CAPACITY. THE VOLTAGES AND POWER LEVELS AVAILABLE IN THIS EQUIPMENT MAKE CONTACT WITH BARE CONDUCTORS OR TERMINALS EXTREMELY DANGEROUS, AND IS LIKELY TO BE FATAL. ALL POWER SHOULD BE TURNED OFF OR APPROPRIATE PROTECTIVE EQUIPMENT USED WHEN WORKING ON SUCH EQUIPMENT. IN ADDITION TO THE HAZARDS INHERENT TO THE LOW-VOLTAGE ASSEMBLY ITSELF, OPERATION BY UNQUALIFIED PERSONS MAY CAUSE INDIRECT DAMAGE TO CONNECTED EQUIPMENT AND INJURY TO OPERATORS OF CONNECTED EQUIPMENT.

UNDER NO CIRCUMSTANCE SHOULD THE INTERLOCKS OR OTHER SAFETY FEATURES BE MADE INOPERATIVE OR DISABLED, AS THIS MAY RESULT IN DEATH, BODILY INJURY OR PROPERTY DAMAGE.

TO PROTECT PERSONNEL DURING THE INSTALLATION, OPERATION AND MAINTENANCE OF THIS EQUIPMENT, THE FOLLOWING PRACTICES MUST BE FOLLOWED:

1.3 Safety Practices

Magnum DS Low-Voltage assemblies are complex, high current electrical equipment designed to operate within the voltage and current limitations shown on their respective nameplates (Figure 1). Do not apply this equipment to systems with voltages and/or currents in excess of these limits.

1. Only qualified electrical personnel familiar with the construction and operation of this equipment and the associated hazards should be permitted to work on such equipment. Additionally, only qualified personnel should be permitted to install or operate such equipment.
2. Always be certain that the primary and secondary circuits are de-energized before attempting any maintenance.
3. For maximum safety, only insert a completely assembled breaker into an energized cell. Front covers are safety features and must be in place when energized.
4. While in the assembly, always ensure that drawout circuit breakers are in one of three intended positions: "Connect," "Test," or "Disconnect." A circuit breaker permitted to remain in an intermediate position could result in control circuits being improperly connected causing other equipment to malfunction.
5. Do not remove access covers unless the circuits to be exposed are de-energized.
6. Use calibrated test equipment of known reliability to confirm that all circuits are de-energized before servicing.
7. After maintenance, be certain every current transformer secondary circuit is completely connected or shorted.

⚠ DANGER

IF THE SECONDARY CIRCUIT OF ANY CURRENT TRANSFORMER IS LEFT OPEN WITHOUT LOAD, AND ITS PRIMARY CIRCUIT IS ENERGIZED, A DANGEROUSLY HIGH VOLTAGE IS DEVELOPED ACROSS TRANSFORMER SECONDARY TERMINALS. TO PREVENT DEATH, BODILY INJURY OR ELECTRICAL SHOCK, EITHER DE-ENERGIZE THE CIRCUIT BY OPENING THE BREAKER, OR SHORT CIRCUIT CURRENT TRANSFORMER SECONDARY TERMINALS, BEFORE ENERGIZING THE CIRCUIT AND PROCEEDING WITH MAINTENANCE.

8. Always be certain that all assembly hardware is in place and bolted tightly before inserting a drawout circuit breaker into its compartment.

⚠ WARNING

FAILURE TO FOLLOW THESE DIRECTIONS MAY RESULT IN DEATH, SERIOUS BODILY INJURY OR PROPERTY DAMAGE.

1.4 Qualified Personnel

For the purpose of operating switchgear and switchboard assemblies, a person who has been thoroughly trained in the operation of power circuit breakers and any included instrumentation and who has complete knowledge of the loads connected to the assembly may be considered to be a qualified person.

For the purpose of installing, inspecting and maintaining switchgear and switchboard assemblies, a qualified person must ALSO be thoroughly trained in regard to the hazards inherent to working with electricity and in the proper way to perform such work. The individual should be able to de-energize, clear and lockout/tagout circuits in accordance with established safety practices. In addition, the individual should be equipped with, and trained in the use of, personal protective equipment (rubber gloves, arc-flash clothes, etc.) for those occasions when it is not possible to de-energize all circuits before doing maintenance work in the area.

1.5 Precautions

1. If relays are included, remove all blocking. Check control circuits (except voltage and current transformer circuits) for grounds and short circuits before applying control power.
2. Connect the assembly to the station ground before applying any power.
3. In case of fire, do not use liquid fire extinguisher until all circuits have been disconnected.
4. If an indoor assembly is to be stored prior to installation, it must be protected from the weather and kept free of condensation.
5. If an outdoor assembly is to be stored prior to installation, provisions must be made for energizing the space heaters to prevent condensation of moisture inside the assembly.

1.6 Other Publications And Documentation

In addition to this instruction manual, other printed information and documentation is supplied with each assembly. This additional information will include, but not necessarily be limited to, a Magnum DS Low-Voltage Power Circuit Breaker instruction manual, arrangement drawings, and connection diagrams. For additional references see Section 7.

Section 2: Receiving, Handling and Storage

2.1 General Information

Magnum DS Metal-Enclosed Low-Voltage assemblies are shipped in one or more shipping groups, depending on the number of vertical sections, or the limitations of handling facilities at the installation site. This would usually be up to five vertical sections for an indoor assembly, or up to three or four sections for an outdoor assembly.

Indoor shipping groups are secured by lag bolts to wooden skids that extend beyond all sides of the switchgear. All shipping sections are shipped so as to be protected from the weather during shipment but are not suitable for storage outdoors as shipped. Outdoor assemblies are not weatherproof until completely assembled. Treat them the same as indoor equipment until fully assembled. See IB01900002E for more information.

2.2 Receiving

When a switchgear assembly reaches its destination, the purchaser should check the material received against the shipping list to be certain that all items have arrived. Note accurately any discrepancies. Each shipping group is plainly marked with or accompanied by an identifying shop order number, general order number and shipping weight. Each shipment includes a contents list which is a part of the overall package of shipping papers. To avoid the loss of any parts, the contents of each container should be carefully checked against the packing list. Do not discard any packing material until it is certain that every item has been received in the proper condition and that certain packing material will not be required later for equipment storage. Larger items, such as indoor traveling lifters, are shipped in separate cartons or boxes. Other loose and unmounted items may be packed in the same box as the lifter (Figure 3). These items, such as shipping split hardware, should be logged in and set aside in a safe location until the assembly has been set in its final position.

Equipment shipped from the factory is carefully packed and inspected prior to its departure. On occasion, however, equipment damage is incurred during transportation. If any damage is found, file a damage claim immediately with the transportation carrier and notify an Eaton representative. All claims should be filed as soon as possible and include applicable part numbers, shop order numbers and/or general order numbers.

2.3 Precautions

It is preferable to use an overhead crane when moving the assembly. Circumstances at the installation location may prevent the use of an overhead crane for all movement. In such instances, the careful use of rollers can be employed. Although the methods for moving indoor and outdoor assemblies are similar, the techniques vary slightly. The differences are highlighted in this section.



Figure 3. Carton Containing Indoor Lifter Assembly



Documentation

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ISO Standard Manufacturer's Two-Year Warranty

Full Parts and Labor Coverage

ISO warrants its products and materials to be free of defects in material and workmanship for the lesser period of (1) two years from the date of equipment startup, (2) two years from date of beneficial use, or (3) thirty months from the date of shipment from its factory. This warranty applies to all equipment and materials supplied by ISO. This warranty expressly excludes all materials and equipment supplied by others, whether new or existing, which are incorporated in ISO equipment, whether installed by ISO or not.

ISO reserves the right of final acceptance of any and all claims for warranty. The Customer is responsible for any and all charges related to a warranty claim should the claim be disallowed. Equipment will, at ISO's option, be replaced, or repaired FOB ISO's facility, freight prepaid, and in accordance with the following:

ISO requires all non-conforming goods be returned at Buyer's expense for evaluation, unless specifically stated otherwise in writing by ISO. Unless otherwise agreed in writing, ISO assumes no responsibility with respect to the suitability of the Customer's equipment or with respect to any latent defects in the same. This warranty does not cover damage to Customer's equipment, components or parts resulting in whole or in part from their deteriorated condition. This warranty does not cover failure or damage due to accident, misuse, abuse or negligence. This warranty does not cover reimbursement for access, removal, installation, temporary power or any other expense, which may be incurred in connection with repair or replacement. The correction of any defects by repair or replacement by ISO shall constitute fulfillment of all obligations and liability of ISO to the purchaser under this warranty.

Warranty service is provided at no charge during normal business hours. Warranty service provided outside normal business hours is chargeable at published rates less the cost of normal business hours execution. Standby time is billable at published rates regardless of time of day. Warranty includes parts and labor for ISO material and equipment for the stated warranty period. A replacement part is warranted for the remainder of the warranty period and expressly does not extend the warranty period.

ISO is not responsible for failure of or damage to its equipment as a result of improper environment, storage, handling, installation, maintenance, operation, repair or adjustment; or as a result of acts of God, such as but not limited to lightning, fire, wind or flood. Further, any damage or subsequent failure as a result of operation of equipment above its rated capacity, or voltage for any reason, intentional or otherwise, is specifically excluded. Unauthorized repair or adjustment of ISO equipment will void this warranty.

No other representations, guarantees or warranties, whether expressed or implied, are made by the seller and the foregoing Warranty is in Lieu of all other representations and warranties, whether expressed or implied, which are hereby expressly disclaimed and waived by Buyer, including any warranty of merchantability or of fitness for particular purpose.

WARRANTED EQUIPMENT AND LOCATION:

ISO Manufacturing ID #: 36368
End User Name: WES CCSD#1
Equipment Location Street Address: 13425 SE Johnson Rd.
Equipment Location City, State & Zip Code: Milwaukie, OR 97222
SHIP DATE: 12/29/2011
WARRANTY START DATE: 1/1/2012
WARRANTY EXPIRATION DATE: 1/1/2014

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Generator Switchgear Products
Automatic Transfer Switches

START-UP TEST Procedure

CCSD #1 Intertie 2 Pump Station

Job# 36368

**Peterson Power
Systems**

STARTUP TEST PROCEDURE



Generator Switchgear Products
Automatic Transfer Switches

Startup Documentation & Contacts

Project Number 36368
Project Name WES CCSD Intertie #1
Site Location _____

Personnel:	Print Legibly or Type Name	Telephone Number
ISO Project Manager		
CAT Project Manager		
ISO Project Engineer	Chris Waggaman	404-379-1446
ISO Startup Technician		
CAT Startup Technician		
CH-ESS Technician		
Customer Witness or Site Authority		
Coordination Study		

Coordination Study	Yes	No
Electronic File		
Hard Copy		

Product Support Center Help Desk 866-883-3879 FAX 770-442-3869

Notes:

STARTUP TEST PROCEDURE



Generator Switchgear Products
Automatic Transfer Switches

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STARTUP TEST PROCEDURE



Generator Switchgear Products
Automatic Transfer Switches

XLM Startup Test Procedures Level 1

Introduction

These procedures provide a detailed description of the steps required to accomplish the Level 1 Startup Activities.

Tested By (print name and company/title): _____

Date Started: _____

GALEN SMITH PETERSON CAT

1.0 Administrative Tasks

		Initial
1.1	Verify completion of preliminary and pre-start up inspections: Switchgear installed per manufacturers specifications and is level and free of tools and debris.	GS
1.2	Verify Load Bank(s) are available for startup.	↓
1.3	Notify end user(s) of start-up and confirm an understanding that multiple interruptions to the downstream service for extended periods of time are required.	
1.4	Review test documentation from electrical contractor (if applicable).	
1.5	Review Coordination Study from consulting engineer (if applicable).	
1.6	Confirm rotation to be A-B-C clockwise for utility and generators.	

2.0 Engine / Generator Inspection

		G1	G2
2.1	Ensure battery chargers are operational and engine-cranking batteries are charging. Insure Engine Battery negative is grounded.	GS	
2.2	Generator Power Cables installation complete.	↓	
2.3	Fuel System completely installed and filled.		
2.4	Cooling System completely installed and filled.		
2.5	Lube Oil system completely installed and filled.		
2.6	Exhaust System installation complete.		
2.7	Engine jacket water heaters complete, energized and functioning.		
2.8	Louvers and exhaust fans connected, powered, and or unobstructed.		
2.9	Set each engine cool down time to (0 min).		
2.10	Verify Engine ECS is in the [Off] position.		

3.0 Switchgear Inspection

		Initial
3.1	Verify switchboard is properly set and all sections are bolted together.	GS
3.2	Verify bus splice installation at switchgear shipping splits completed and properly torqued.	↓
3.3	Visually inspect all bus work inside of the switchgear to verify no objects (i.e. screwdriver, wrench, etc.) are in the bus compartment.	
3.4	Verify the frame size and rating plug of all breakers match the drawings.	
3.5	Rack out and lock out all utility and generator breakers.	
3.6	Verify power cables between generator and switchboard have been meggered. If the specs call for hi-potting the cables, verify this also has been done. Obtain certified test reports showing the cables have been meggered and/or hi-potted.	
3.7	Verify power cables between utility transformer and switchboard have been meggered. If	

STARTUP TEST PROCEDURE



Generator Switchgear Products
Automatic Transfer Switches

	the specs call for hi-potting the cables, verify this also has been done. Obtain certified test reports showing the cables have been meggered and/or hi-potted.	GS.
3.8	Visually inspect power cables connected at each generator to verify there are no problems such as nicks in the insulation or cables lying against sharp edges. Note the color-coding on the cables.	↓
3.9	Visually inspect power cables connected at the switchboard coming from each generator to verify there are no problems such as nicks in the insulation or cables lying against sharp edges. Verify that the cables are landed at the proper generator breaker stabs. The breaker stabs are labeled and indicate which generator should connect to them and which phase should connect to them. When facing the rear of the cubicle the phases are A-B-C right to left. Also, verify the color-coding on the cables is the same as that at the generator.	
3.10	Visually inspect power cables connected at the utility breaker stabs in the switchboard to verify there are no problems such as nicks in the insulation or cables lying against sharp edges. The breaker stabs are labeled "utility" and indicate phasing. When facing the rear of the cubicle the phases are A-B-C right to left.	
3.11	Verify field wiring complete from generators to switchgear per ISO field drawings.	
3.12	Verify field wiring complete between multiple boards (if applicable) per ISO field drawings.	
3.13	Perform continuity check on all field interconnect wiring.	
3.14	Verify shipping split terminal blocks are connected and clipped.	
3.15	All best-source DC cabling between sections connected.	
3.16	Verify all relays are firmly seated in their bases.	
3.17	Verify all AC fuses are in their correct fuse blocks.	
3.18	Pull the shorting pins from all the CT shorting blocks.	
3.19	Verify all small molded case DC circuit breakers in the switchboard are in the off position.	
3.20	Verify batteries for ISO switchgear mounted external to the switchgear and wiring completed per field wiring drawings.	
3.21	Verify AC power is connected to station battery charger and station batteries are charging properly.	
3.22	Place the utility close lockout switch on the front of the switchboard in the locked out position.	
3.23	Pull the Ethernet cables from each controller and I/O module to the Master control section. Connect each Ethernet cable to its assigned port on the Channel A and Channel B Ethernet switches.	
3.24	Verify communication cabling for remote access installed.	

4.0 Energization of DC Power on Switchboard

		Initial
4.1	Verify proper polarity and voltage on the line side of the DC breaker being fed from the station batteries. Verify proper DC voltage and polarity on the incoming wires from each set of engine batteries. Terminate the wires as shown on the field interconnect diagram. Then verify with an ohmmeter there is no short between the +24VDC distribution block and the 24VDC ground distribution block.	GS.
4.2	Close DC breaker allowing station batteries to energize the switchgear.	↓
4.3	Install the DC fuse that provides power to the Ethernet Switch for Channel A (FU-M103). Verify the Ethernet Switch powers up properly.	
4.4	Verify proper DC voltage and polarity on the incoming wires from each set of engine batteries. Terminate the wires as shown on the field interconnect diagram. Close its respective DC breaker in the switchboard.	
4.5	Open the Master Section DC breaker and verify the Ethernet Switch de-energizes.	
4.6	Individually close and open each Generator DC breaker to verify the Ethernet switch powers-up and de-energizes appropriately with each DC source. Once all Best-Source DC sources have been verified, close all the Best Source DC source breakers and verify proper operation of the Ethernet Switch.	
4.7	Individually install each DC fuse in the switchgear and verify proper power-up of each component powered from its respective fuse prior to installing the next fuse. This is done	

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	to ensure that wiring and field interconnect problems do not burn up multiple components.	GS
4.8	After all the DC fuses have been installed with no component problems, verify proper EMCP3.S controller operation. There are two LEDs on the EMCP3.S controller. For the gen master controller, verify that both LEDs are blinking green. For all other controllers, verify that the COMMS LED is blinking green and the RUN LED is solid green. If any of these statuses do not exist, please refer to the GAP programming manual.	↓
4.9	Verify System Battery Source. Open all the Best Source DC breakers except for the Master Section DC breaker which is powered by the System Battery. Verify all DC components in the switchgear remain energized. Reclose all Best Source DC breakers.	
4.10	Turn on the Touch Screen processor inside of the control section and verify it boots up properly and displays the overview screen on the Touch Screen. Verify the Touch Screen enable/disable key switch on the door works properly. Go to each generator screen to verify no images are ghosted (no values are appearing).	

5.0 Check Ethernet Bus A and Bus B Operation

		Initial
5.1	Verify the communication light is blinking Green on all EMCP3S controllers	GS
5.2	Disable Channel A and verify the communication light is blinking Amber on all EMCP3S controllers. Restore Channel A.	↓
5.3	Disable Channel B and verify the communication light is blinking Amber on all EMCP3S controllers. Restore Channel B.	
5.4	Disable Channel A and B and verify the communication light is blinking Red on all EMCP3S controllers. Restore both Channels.	
5.5	From the system Alarm Summary screen, verify no controllers are logged as "Known Node Missing" or "Unknown Node on Network".	↓
5.6	For PL2000 projects, switch the Touch Screen to channel B, and verify no controllers are logged as "Known Node Missing" or "Unknown Node on Network" on the Alarm Summary screen.	NA
5.7	Verify all I/O modules have the appropriate communication light status. Verify the "D" LED is illuminated and the Master I/O output #2 is illuminated. And each pair of I/O modules are sending and receiving the same information.	GS

6.0 Coordination Study Settings

		Initial
	The Consulting Engineer typically provides the following settings.	
6.1	Check/Set utility protective relay settings with approved Coordination Study.	GS
6.2	Check/Set utility breaker settings with approved Coordination Study.	↓
6.3	Check/Set generator protective relay settings with approved Coordination Study.	
6.4	Check/Set generator breaker settings with approved Coordination Study.	
6.5	Check/Set tie protective relay settings with approved Coordination Study.	
6.6	Check/Set tie breaker settings with approved Coordination Study.	

Eaton

7.0 Running Gensets (Local)

		G1	G2
7.1	Open the Genset Mounted Ckt Bkr (if applicable).	GS	MA
7.2	Start the Engine from the Local Control. Bring the engine up to rated speed and verify proper frequency and voltage.	↓	↓
7.3	Stop the Engine and leave the Local ECS in [AUTO].	↓	↓
7.4	Verify the Genset Mounted Ckt Bkr is closed (if applicable).	↓	↓

8.0 Running Gensets (Remote)

		G1	G2
8.1	Turn the speed pot in the switchboard to the midpoint. It is a ten-turn pot so it should be	GS	NA

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	turned five times to reach the midpoint.	GS	NA
8.2	With the EMCP ECS at the engine in the [AUTO] position, place that Switchgear ECS on the Touchscreen in the [Manual Run] position and verify the engine starts.		
8.3	Place the speed adjust slider on the engine control screen in the middle and fine tune the generator frequency with the speed pot at the switchboard. Verify Speed Pot properly adjusts genset speed. Leave the pot set at rated frequency.		
8.4	Place the voltage adjust slider on the engine control screen in the middle and fine tune the generator voltage with the voltage adjustment device at the switchboard. Verify voltage adjustment device properly adjusts genset voltage. Leave the device set at rated voltage.		
8.5	Verify the generator develops rated voltage and frequency.		
8.6	Verify the speed adjust slider on the Touchscreen works properly. When the slider is moved to the left the frequency should decrease and when it's moved to the right the frequency should increase.		
8.7	Verify the voltage adjust slider on the Touchscreen works properly. When the slider is moved to the left the voltage should decrease and when it's moved to the right the voltage should increase.		
8.8	Place the Switchgear ECS on the Touchscreen in the [Off] position and verify the engine stops. If the engine does not immediately stop then verify the engine cool down timer on the EMCP is set to zero.		

9.0 EMCP & Switchgear Communication

		G1	G2
9.1	Start the engine from the Switchgear ECS.	GS	NA
9.2	Verify proper engine readings at the engine-monitoring screen on the Touchscreen.		
9.3	Verify proper engine readings on Engine Trend Screens.		
9.4	Stop the engine by placing the Switchgear ECS in the [OFF] position.		

10.0 Engine Alarms and Shutdowns

Start the engine by placing the generator EMCP ECS at the engine in the Auto position and the Switchgear ECS on the Touchscreen in the [Manual Run] position.

Refer to the EMCP service manual for instructions to adjust alarm and shutdown setpoints.

Simulate the engine alarms and shutdowns by adjusting the engine parameters setpoints from the EMCP. With each new engine alarm verify that horn sounds, the proper window on the Generator Annunciator screen at the Touchscreen flashes, and the engine doesn't shut down.

Then press the horn silence button and verify the horn stops sounding and the alarm window on the Generator Annunciator screen constantly illuminates.

	Engine Pre Alarms	G1	G2
10.1	Pre-High Coolant Temperature	GS	NA
10.2	Pre-Low Oil Pressure	GS	
10.3	Low Fuel	GS	
10.4	Low Engine Battery	GS	
10.5	Low Coolant Temperature	GS	
10.6	EMCP Shutdown Fault		
10.7	High Fuel	GS	
10.8	Rupture Leak	GS	
10.9	Low coolant level	GS	

With each new engine shutdown verify that horn sounds, the proper window on the Generator Annunciator screen at the Touchscreen flashes, and the engine shuts down.

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Then press the horn silence button and verify the horn stops sounding and the shutdown window on the Generator Annunciator screen constantly illuminates.
The system must be reset by placing the EMCP ECS switch to [OFF] and then placing the Switchgear ECS on the Touchscreen in [OFF] before the engine can be started again to test the next engine shutdown.

	Engine Shutdowns	G1	G2
10.10	Low Coolant Level (if Present)		NA
10.11	Over Speed	GS	
10.12	Over Crank	GS	
10.13	E-Stop	GS	
10.14	High Coolant Temperature	GS	
10.15	Low Oil Pressure	GS	
10.16	Gen Circuit Breaker Tripped	GS	
10.17	EMCP Shut down Fault	GS	
10.18			↓
10.19			

11.0 Genset Protectives

Check the under/over generator voltage and under/over generator frequency protective relaying.
Start the engine by placing the generator EMCP ECS at the engine in the Auto position and the Switchgear ECS on the Touchscreen in the [Manual Run] position. Place the switchgear Sync Switch in the [OFF] position.

Once the generator is running at rated voltage and frequency move the frequency slider to the left until the frequency decreases below the setpoint displayed on the generator settings screen on the Touchscreen.

Once the delay time set on the generator settings screen has passed verify the generator shuts down, the horn sounds, and the generator under frequency window on the Generator Annunciator screen at the Touchscreen flashes. Then press the horn silence button and verify the horn stops sounding and the generator under frequency window on the Generator Annunciator screen constantly illuminates.

The system must be reset by placing the ECS on the Touchscreen in [OFF] before the engine can be started again.

The under/over voltage and frequency setpoints may need to be adjusted if the sliders don't have enough range to trigger the condition.

Test the generator over frequency in a similar manner except this time move the frequency slider to the right.

Test the generator under and over voltage in a similar manner except this time move the voltage slider.

		G1	G2
11.1	Over Frequency	GS	NA
11.2	Under Frequency		
11.3	Over Voltage		
11.4	Under Voltage	↓	

Level 1 Startup Test Complete

Certified By: Galen Smith

Date Finished: 8/30/12

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XLM Startup Test Procedures Level 2

Introduction

These procedures provide a detailed description of the steps required to accomplish the Level 2 Activities.

Tested By (print name and company/title): _____

Date Started: _____

12.0 Phase Rotation Check

		G1	G2
12.1	Verify each generator breaker is racked out.	✓	N/A
12.2	With each generator running verify phase rotation is A-B-C by placing a phase rotation meter on the incoming generator bus stabs in the switchboard or on a common point on the bus. If the phase rotation is C-B-A then the A & C phase power conductors will need to be swapped either at the bus stabs in the rear of the switchboard or at the bus stabs at the generator. Phase rotation is critical so the phase rotation must be A-B-C.	↓	↓
12.3	Rack in Circuit Breaker for generator 1.		
12.4	With the Gen1 running and the Gen1 breaker closed to the bus, the Sync Scope should be at 12 o'clock. Verify the following voltages at the 25 Sync Check Relay at 12 o'clock: Terminal 1 to terminal 2 120VAC Terminal 3 to terminal 4 120VAC Terminal 1 to terminal 3 0VAC Terminal 2 to terminal 4 0VAC	↓	
12.5	Run each Gen and the Sync Scope should rotate through 12 o'clock. Verify the following voltages at the 25 Sync Check Relay at 12 o'clock: Terminal 1 to terminal 2 120VAC Terminal 3 to terminal 4 120VAC Terminal 1 to terminal 3 0VAC Terminal 2 to terminal 4 0VAC		N/A
12.6	Rack out the Circuit Breaker for Gen1.	✓	
12.7	Rack in the Circuit Breaker for Gen2.		N/A
12.8	Close Gen2 to the dead bus.		N/A
12.9	The Gen1 Sync Scope should rotate through 12 o'clock. Verify the following voltages at the 25 Sync Check Relay at 12 o'clock: Terminal 1 to terminal 2 120VAC Terminal 3 to terminal 4 120VAC Terminal 1 to terminal 3 0VAC Terminal 2 to terminal 4 0VAC	✓	
12.10	Stop All Generators and Rack out All Breakers.	↓	N/A

13.0 Phasing Check

		G1	G2
13.1	Gather and Don Proper PPE. Follow all applicable safety Requirements. For Low Voltage, use a Multi-meter, for Medium and High Voltage, use Hot Sticks for the following Procedure.		
13.2	Rack in the Utility (and Tie?) Breaker	✓	N/A
13.3	Rack out the Breaker for the Generator under test.		
13.4	Place the device leads across the phase A line and load breaker stabs.		
13.5	Close the Utility breaker to the bus and Start the Generator under test.	↓	↓

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13.6	When the Sync-Scope is at the 12 o'clock position, verify that the metering device reads 0 volts across phase A line to load.	(S)	N/A
13.7	Open the Utility breaker and stop the generator under test.		
13.8	Place the device leads across the phase B line and load breaker stabs.		
13.9	Close the Utility breaker to the bus and Start the Generator under test.		
13.10	When the Sync-Scope is at the 12 o'clock position, verify that the metering device reads 0 volts across phase B line to load.		
13.11	Open the Utility breaker and stop the generator under test.		
13.12	Place the device leads across the phase C line and load breaker stabs.		
13.13	Close the Utility breaker to the bus and Start the Generator under test.		
13.14	When the Sync-Scope is at the 12 o'clock position, verify that the metering device reads 0 volts across phase C line to load.		
13.15	Open the Utility breaker and stop the generator under test.	↓	↓

14.0 Breaker Control

Rack in each breaker and place the system in Manual Control.

Do NOT close more than one breaker at any one time.

As the system allows:

These tests are to be performed as the system allows on each breaker to insure that both local manual control is present and that the breaker may be controlled through the system.

Open and Close each breaker using the manual breaker controls.

This is to verify the operation of the OPEN / CLOSE control local to each breaker.

If sync switch exists for respective breaker, place it in the 'Manual Position'.

From the HMI Touchscreen verify that the breaker may be OPENED and CLOSED.

Distribution breakers are controlled by HMI on the Load shed screen.

Use discretion when conducting this test. Before closing a breaker consider what is connected to the system (i.e. loads connected to distribution breakers) and use the test position if necessary.

	Breaker	Door Switch	HMI Manual Button	Deadbus
14.1	Utility	(S)		(S)
14.2	Gen 1	(S)		(S)
14.3	Gen 2	(S)		N/A
14.4	Distribution 1	(S)		
14.5	Distribution 2	(S)		
14.6	Distribution 3	(S)		
14.7	Distribution 4	(S)		
14.8	Distribution 5	(S)		
14.9	Distribution 6	(S)		

15.0 Utility Checkout

		Initial
15.1	Energize incoming utility to the switchboard. Verify all utility metering on the Touchscreen is correct.	(S)
15.2	Verify the Master Mode Selector switch on the Touchscreen is in the [Manual] position.	
15.3	Rack the utility breaker in the switchboard into the connected position.	
15.4	Plug the second row of terminal blocks on the "N1" Momentum PLC back in its base.	
15.5	Place the utility close lockout switch on the front of the switchboard in the [Auto] position.	
15.6	Close the utility breaker and verify all generator bus metering on the Touchscreen is correct.	↓
15.7	Place the utility close lockout switch on the front of the switchboard in the [lockout] position.	N/A

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15.8	Open the utility breaker and Remove it from the cell.	
------	---	--

16.0 Paralleling Generators

		G1	G2
16.1	If there are distribution breakers, verify they are open.	Initial	N/A
16.2	Place the Switchgear ECS on the Touchscreen for generator #1 in the [Auto] position. Place the Switchgear ECS for all other generators in the [Off] position.		
16.3	Verify the Master Mode Selector switch on the Touchscreen is in the [AUTO] position.		
16.4	Place the Sync switch for Gen 1 in the [Auto] position. Place the Sync switch for the generator under test in the [Auto] position.		
16.5	Place the No Load Test switch [ON] and verify generator #1 starts and that the breaker closes to the bus.		
16.6	Place the Switchgear ECS on the Touchscreen for the generator under test in the [AUTO] position.		
16.7	Once the generator has come up to speed and voltage, verify that the coil of the close relay only energizes when the synchroscope is in the 12 o'clock position and the synch check relay light is illuminated.		
16.8	Once convinced the generator breaker will only close when truly in synchronization with Generator 1, stop the generator, place the generator breaker back in its cell, and rack the breaker in.		
16.9	Cause a Engine Run Request and verify that both Generator 1 and the Generator under test start and close to the bus. When the Breaker first closes to the bus, monitor the current meter. If the generator amps quickly rise open the generator breaker via the generator breaker control switch and hold the switch in the Open position and place the ECS in the [Off] position. If this occurs there could be a problem with the generator's voltage regulator. Upon closing generator breaker the generator amperage should have a very quick bump up and then settle back to zero.		
16.10	Place a small amount of load on the Gen Bus and verify that both Generators share the Load Evenly (+/- 20 kW & +/- 20 kVAR).		
16.11	Verify Metering is correct on both generator screens.		
16.12	Once complete, Start Generator 2 and treat Generator 1 as the Generator Under Test.		
16.13	Once all generators have successfully paralleled to the bus shut down all generators and open all generator breakers.		

17.0 Engine Tuning

Load Banks must be connected and operational.

	Individual Gen Sync	
17.1	Place the Switchgear ECS on the Touch screen for Generator 1 in the [Auto] position. Place the Switchgear ECS for all other generators in the [Off] position.	Initial
17.2	Start Generator 1 with the SYNC Switch in the [Auto] Position. Gen 1 should close to the bus.	
17.3	Start the Generator under test with the SYNC switch in the [Off] position.	
17.4	Once the generator under test has come up to speed and voltage, wait until the the synchroscope is in the 6 o'clock position and then put the Sync Mode Switch in [Check]. The 3.S should drive the Gen into Sync fairly quickly. Adjust the Sync tuning parameters until you get a smooth ramp up to sync with as little overshoot as possible.	
17.5	Once finished will all gens, go back and test Generator 1 as the gen under test against one of the other gens.	

	Gen Pair Sync	
17.6	Start Generator 1 & Generator 2 with their Sync Mode switches in [Auto].	Initial
17.7	Verify that within 15 seconds after both generator breakers have closed, both generators are operating within +/- 20 kW and +/- 20 kVAR of no load.	N/A
17.8	Perform this test with all combinations of pairs of generators (i.e. 1-2, 1-3, 1-4, 2-3, etc.).	

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17.9	Stop All Generators.	
	Gen Plant Sync	Initial
17.10	Start all Generators with their Sync Mode Switches in [Auto].	2 Gen Only
17.11	Verify that the first gen to close to the bus does so within 10 seconds.	JP
17.12	Verify that within 15-20 seconds, all generators are operating within +/- 20 kW and +/- 20 kVAR of no load.	
17.13	Adjust Tuning Parameters as Needed.	
17.14	Stop all Generators.	

	Individual Gen Block Loading	Initial
17.15	Connect Generator 1 to the bus. Then with a load bank, step load the generator with 75% of its rated kW.	N/A
17.16	Verify the generator frequency recovers to above 57 Hz within 3 seconds. If the generator shuts down on under frequency, the under frequency setpoint and time delay may need to be loosened accordingly.	
17.17	If the generator cannot recover to 57 Hz within 3 seconds increase the speed gain on the engine tuning screen until it can.	
17.18	Perform this step with each generator.	

	Gen Plant Loading	Initial
17.19	Connect all generators to the bus and then turn on the load bank until each generator is at least at 50% of its rated kW or the load bank is at 100% of its rating.	6.2 Only @ DSG me SE
17.20	Verify all generators are sharing load +/- 20 kW.	

	Gen Unloading	Initial
17.21	Before a generator is taken off line be sure that its removal will not cause the remaining generators to exceed their rated kW.	N/A
17.22	Remove one generator off line.	
17.23	Watch the frequency and kW of the other generators to verify they react smoothly and share load evenly (within +/- 20 kW).	
17.24	Perform this same step by removing a different generator each time.	
17.25	Open all generator breakers and turn of all generators.	

18.0 System Display Operation

Verify on the following screens that voltage, current, kW, kVAR, frequency and power factor are shown properly.

		Initial
18.1	System Overview screen	JP
18.2	System Metering screen	
18.3	Utility Metering screen	
18.4	Gen Metering screen (bus metering on all Gen screens)	
18.5	Plant Test Report screen	
18.6	System Trend	JP

19.0 Generator Display Metering (individual Gens)

Start the generator and close the generator circuit breaker. Verify on the following screens that generator voltage, current, kW, kVAR, frequency and power factor are shown properly and just for that particular generator. Also verify on the Overview screens that the bus is shown energized.

		G1	G2
19.1	System Overview Screen	JP	N/A
19.2	System Metering Screen		
19.3	Generator Metering Screen		
19.4	Generator Historical Trend		

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19.5	Generator Tune Screen	Initial	N/A
19.6	Generator Tune Report Screen		
19.7	Generator Sync Screen		
19.8	Bus Tie Metering Screen		
19.9	Emergency Tie Metering Screen		
19.10	Distribution Metering Screen		N/A
19.11	Plant Test Report (only Test Gen is displayed)		N/A

20.0 Generator Display Metering (all Gens)

Start all generators and close to the bus. Verify on the following screens that generator voltage, current, kW, kVAR, frequency and power factor are shown properly.

		Initial
20.1	System Overview screen	
20.2	System Metering screen	
20.3	Utility Metering screen	
20.4	Generator Metering Screen	
20.5	Generator Historical Trend	
20.6	Generator Tune Screen	
20.7	Generator Tune Report Screen	
20.8	Generator Sync Screen	
20.9	Bus Tie Metering Screen	
20.10	Emergency Tie Metering Screen	
20.11	Distribution Metering Screen	N/A
20.12	Plant Test Report screen	
20.13	System Trend	

21.0 Loss of Field (Reverse VAR) Shutdown Protective

		G1	G2
21.1	On the Setting screen, set the Loss of Field to a minimum value.		N/A
21.2	Select a generator under test (Gen UT).		
21.3	Start and parallel the Gen UT to another generator.		
21.4	Using the voltage adjustment device for the Gen UT decrease the gen voltage of the Gen UT.		
21.5	At some point the Gen UT breaker should open and the Gen UT generator should go into shutdown.		
21.6	Verify that horn sounds, the proper window on the Generator Annunciator screen at the Touchscreen flashes. Then press the horn silence button and verify the horn stops sounding and the alarm window on the Generator Annunciator screen constantly illuminates.		
21.7	Restore the Loss of field setting and the generator voltage adj device to normal settings. Reset the SD Fault.		

22.0 Reverse Power Shutdown Protective

		G1	G2
22.1	On the Setting screen, set the Rev Power to a minimum value.		N/A
22.2	Select a generator under test (Gen UT).		
22.3	Start and parallel the Gen UT to another generator.		
22.4	Using the speed control pot for the Gen UT decrease the gen frequency of the Gen UT.		
22.5	At some point the Gen UT breaker should open and the Gen UT generator should go into shutdown.		
22.6	Verify that horn sounds, the proper window on the Generator Annunciator screen at the Touchscreen flashes. Then press the horn silence button and verify the horn stops sounding and the alarm window on the Generator Annunciator screen constantly		

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	illuminates.		
22.7	Restore the Rev Power setting and the generator speed pot to normal settings. Reset the SD fault.		

23.0 Over-Excitation (Forward kVAR) Shutdown Protective

		G1	G2
23.1	On the Generator Protectives 2 Setting screen, set the Over/Under Excitation setpoint to a minimum value.	NOT DONE	NA
23.2	Select a generator under test (Gen UT).		
23.3	Start and parallel the Gen UT to another generator.		
23.4	Using the voltage adjustment device for the Gen UT increase the generator voltage of the Gen UT.		
23.5	At some point the Gen UT breaker should open and the Gen UT generator should go into shutdown.		
23.6	Verify that horn sounds, the proper window on the Generator Annunciator screen at the Touchscreen flashes. Then press the horn silence button and verify the horn stops sounding and the alarm window on the Generator Annunciator screen constantly illuminates.		
23.7	Restore the Under/Over Excitation setting and the generator voltage adj device to normal settings. Reset the SD Fault.		

Because it's jumb

24.0 System Alarm Testing

Verify the following system alarms/status cause the following to occur:

- 1) Illuminates the correct window on the System Annunciator screen.
- 2) The alarm/status is displayed on the Alarm Summary screen.
- 3) Sounds the horn when applicable.

		Initial
24.1	Bus Underfrequency.	NOT DONE
24.2	PGE Comm Loss.	
24.3	24VDC Station Battery Charger Malfunction.	
24.4	System Controls Not in Auto.	
24.5	Master Switch in Auto.	
24.6	Master Switch in Manual.	
24.7	Master Switch in Closed Transfer to Emergency.	
24.8	Master Switch in DSG.	
24.9	No Load Test Switch Activated.	
24.10	Retransfer Switch in Auto.	
24.11	Retransfer Switch in Manual.	
24.12	Emergency Mode.	
24.13	Known Node Missing.	

Because no load shed

25.0 Generator Status Testing

Verify the following system alarms/status cause the following to occur:

- 1) Illuminates the correct window on the System Annunciator screen.
- 2) The alarm/status is displayed on the Alarm Summary screen.
- 3) Sounds the horn when applicable.

		G1	G2
25.1	Gen Ckt Bkr Open		NA
25.2	Gen Ckt Bkr Closed		
25.3	Gen Ckt Bkr Tripped		
25.4	Gen Ckt Bkr Cntl Switch in Pull to Lock		
25.5	Engine Running		
25.6	Engine Stopped		

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25.7	Engine Cooldown		U/U
25.8	Engine PreAlarm		N/A
25.9	Engine Shutdown Fault		
25.10	Engine ECS Not In Auto		
25.11	SWGR ECS Not in Auto		
25.12	Sync Switch Not in Auto		
25.13	Loss of Engine Comms		

26.0 Moving Master Test

With the addition of the Master control functions embedded into the generator controllers, the Master control functions transfer to the other gens if the current generator fails.

The system always assigns the Master to the first or lowest numbered generator. Should that generator fail or become unavailable then the next highest generator becomes the Master.

Procedure:
Check each generator EMCP3S controller to determine which generator is the master. A blinking green run light in the front of the controller indicates Master. All slave controllers will show a solid green run light.
View the HMI system settings screen and verify all generator nodes are available.
Fail the master controller by pulling the fuse for the power to the controller. Refer to the generator drawing for the name and location of the fuse.
View the HMI diagnostics screen and verify that the master generator node has failed and that the master has been transferred to a different generator controller.
Continue to fail generators until only one generator is left communicating. Confirm that it is now the master.
Reinstall the fuse for the previous master controller to reapply power to the controller.
View the HMI diagnostics screen and verify that the previous master node has returned.
Continue until all generators are communicating and Gen1 is once again the master.

Initial

 @Lonly@this Time

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27.0 Sequence of Operations

Test all sequence of operations for proper functionality.

Functional Sequence of Operations

A. Automatic/Standby Mode

1. The utility main breaker is closed serving utility power to the generator/load bus.
2. The generator breaker is open.
3. The automation is standing by to act in response to a utility failure.

B. Emergency Mode

1. Utility Failure
 - a. Utility protective relaying senses utility voltage or frequency out of tolerance.
 - b. The utility main breaker is opened.
 - c. A run request is sent to the generator.
 - d. When the generator is up to voltage and frequency it is closed to the bus.
 - e. The system is now in Emergency Mode.
2. Utility Restoration and Exit from Emergency Mode
 - a. Utility protective relaying senses utility voltage and frequency within tolerance.
 - b. Following an adjustable time delay (which can be abbreviated by the operator) to assure that the utility power source is stable, the generator is passively synchronized and paralleled to the utility source by closing the utility main breaker.
 - c. The generator is soft ramp unloaded until the utility source is nominally serving the entire system load.
 - d. The generator breaker is opened.
 - e. The generator is allowed to run for its programmed cool down period.
 - f. The system is now back in Automatic/Standby Mode.

C. Storm Avoidance Mode (Closed Transfer to Emergency Mode)

1. Entry
 - a. The operator selects Storm Avoidance Mode ON position on the OVERVIEW SCREEN or places the System Mode Selector Switch into the Closed Xfer to Emergency position.
 - b. A run request is sent to the generator, after the adjustable (0-30 second) pre-start signal.
 - c. After generator is up to rated voltage and frequency, and after completion of the warm-up time, the generator is synchronized and paralleled to the utility source by closing the generator main breaker.
 - d. The generator is soft ramp loaded until the generator is serving nominally the entire load on the bus and the utility main breaker is opened.
 - e. The system is now running in Emergency Mode.
2. Exit from Storm Avoidance Mode (Closed Transfer to Emergency Mode)
 - a. The operator selects the OFF position Storm Avoidance Mode or removes the System Mode Selector Switch from Transfer to Emergency position and returns it to the Auto position.
 - b. Following an adjustable time delay (which can be abbreviated by the operator), the generator is passively synchronized and paralleled to the utility source by closing the utility main breaker.
 - c. The generator is soft ramp unloaded until the utility source is nominally serving the entire system load.
 - d. The generator breaker is opened.
 - e. The generator is allowed to run for their programmed cool down period.
 - f. The system is now back in Automatic/Standby Mode.

D. DSG Mode (Load Management BaseLoad)

1. Entry
 - a. Select one of the modes of operation: (DSG mode corresponds to Item 4. Toggle switch should remain in BaseLoad / Export position. Since DSG mode can also be accessed remotely via PGE communications, the Remote DSG Mode Switch should always be enabled, unless Owner wants it to be blocked.)
 - 1) Import Limit - The user places the Import/Export toggle switch in the Import position and places the Base Load/Utility Tracking toggle switch in the Utility Tracking position. The user sets the Utility Import Set point to the desired amount of kW that they want to import through the Utility Circuit Breaker during Load Management Mode.
 - 2) Export Limit - The user places the Import/Export toggle switch in the Export position and places the Base Load/Utility Tracking toggle switch in the Utility Tracking position. The user sets the Utility Export Set point to the desired amount of kW that they want to export through the Utility Circuit Breaker during Load Management Mode.
 - 3) Base Load Import - The user places the Import/Export toggle switch in the Import position and places the Base Load/Utility Tracking toggle switch in the Base Load position. The user sets the Base Load Set point to the desired amount of kW that they want the generator to assume during Load Management Mode. The controls will not allow the generator plant to export kW through the Utility Circuit Breaker and will always maintain a nominal amount of Utility kW imported through the Utility Circuit Breaker.
 - 4) DSG Mode (Base Load Export) - The user places the Import/Export toggle switch in the Export position and places the Base Load/Utility Tracking toggle switch in the Base Load position. The user or PGE communications sets the Base Load Set point to the desired amount of kW that they want the generator to assume during DSG (Load Management Mode). The controls will allow the generator to export kW through the Utility Circuit Breaker.
 - b. Alarm horn/strobe is activated (0-30 seconds adjustable) and then the generator is commanded to start via remote DSG signal through PGE communications or Facility Operator's manual selection.
 - c. The generator is synchronized and paralleled to the bus at no load after completion of the warm-up time.
 - d. When the generator is on the bus it is soft ramp loaded until the generator is serving nominally the required amount of the load on the bus to meet the mode of operation selected.
 - e. The generator output is dynamically adjusted to maintain the set point to meet the mode of operation selected. If at any time the system is unable to maintain the setpoint then a "Set point Exceeded" alarm shall be sounded.

STARTUP TEST PROCEDURE



Generator Switchgear Products
Automatic Transfer Switches

- f. Should the utility fail at any time during Load Management operation, the utility protective relays shall cause the utility main to open (which is a single step "hard exit" out of DSG mode) thus placing the system in Emergency Mode until the Utility is restored (as described in Emergency Mode exit)
- g. Should a "Block DSG" signal occur from the SEL 351-7 (out 103) system will go directly and automatically into "Exit DSG" as described in the paragraph following, accompanied by an alarm.
2. Exit
 - a. User returns Master Mode Selector Switch to the Auto position, or PGE sends a signal to terminate DSG mode.
 - b. The generator is soft ramp unloaded until the utility source is nominally serving the entire system load and the generator main breaker is opened.
 - c. The generator is allowed to run for its programmed cool down period. If a utility outage occurs during this period, the system will enter Emergency Mode.
 - d. The system is now back in Automatic/Standby Mode.
- E. No Load Test Mode
 1. Entrance into No Load Test Mode
 - a. The No Load Test Switch is placed in the ON position.
 - b. The generator is started.
 - c. The generator comes up to voltage and frequency and remain running disconnected from the bus.
 - d. The system is now in No Load Test Mode.
 2. Exit from No Load Test Mode.
 - a. The No Load Test Switch is placed in the OFF position.
 - b. The generator is allowed to run for their programmed cool down period.
 - c. The system is now back in Automatic/Standby Mode.

Load Shed Control (Embedded But Not Used Per One Genset System)

The System Controls shall include a Load Shed Control function to control the loads served by the generator plant. The Load Shed Control shall have one Essential Load Shed Priority Level for each generator in the system plus one Non-Essential Load Shed Priority Level (which is always shed in the Emergency Mode of operation). The Load Shed Control shall control each of the distribution circuit breakers that are shown on the drawings. Distribution circuit breakers to be controlled shall be electrically operated. Each electrically operated distribution circuit breaker shall be field selectable to be assigned to any of the available Load Shed Priority Levels. Provide the following controls for each Essential Load Shed

Priority Level:

1. Shed Delay Timer, adjustable from 0 to 1024 seconds
2. Add Delay Timer, adjustable from 0 to 1024 seconds
3. Load Shed Override Selector (shed/auto/add)
4. Status indicators to show whether the Priority Level is Added or Shed
5. Provide the following controls for each Non-Essential Load Shed Priority
6. Load Shed Override Selector (shed/auto/add)
7. Status indicators to show whether the Priority Level is Added or Shed

Additionally, the Load Shed Controls shall have:

1. Load Shed Control Switch (On/Off)
2. User-settable Load Shed % (as a function of on-line generator capacity)
3. User-settable Load Shed Time Delay
4. User-settable Load Add % (as a function of on-line generator capacity)
5. User-settable Load Add Time Delay
6. User-settable Bus Under frequency Set point
7. User-settable Bus Under frequency time delay
8. Bus Under frequency Reset Pushbutton
9. Bus Under frequency indicator

Conditional Load Shed: Upon entrance into Emergency Mode of operation, the Load Shed Control shall shed all Essential and Non-Essential loads. As generators come to the bus, Essential Priority Level loads shall be added conditionally based on the number of generators on line. When the first generator comes to the bus, Priority Level 1 loads shall be added; Second generator, priority 2, etc. After a time delay that allows all operational generators to come to the bus, Load Shed Mode shall shift to Load Sensitive Mode. Load Sensitive Load Shed - After all generators have been given sufficient time to come to the bus, load shed shall shift to "Load Sensitive" mode. The system shall compare current generator on-line capacity (in kW) to current load requirements. If surplus capacity is greater than the calculated Load Add setpoint, after the Load Add Time Delay the next Load Shed Priority will be added. This calculation will continue until all Sheddable Loads are added, or until surplus capacity is less than the calculated Load Add setpoint. If surplus capacity is less than the calculated Load Shed setpoint, after the Load Shed Time Delay the next Load Shed Priority will be shed. This calculation will continue until all Sheddable Loads are shed, or until surplus capacity is greater than the calculated Load Shed setpoint. The Load Shed Control, in its automatic shedding and adding of loads, shall not override any manual load shed/add operation. Should the load bus frequency fall below the user selected bus underfrequency setpoint for a period longer than the bus underfrequency time delay, then all Priority Level loads shall be shed and load addition shall not resume until the operator has depressed the Bus Underfrequency Reset button. The bus underfrequency protection shall override any manual load add operation.

All Sequence of Operations tested and passed.

Initial

VW

But not load shed

STARTUP TEST PROCEDURE



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28.0 Testing Generator Demand

This test will require that the generators be loaded with either building load or load banks or a combination.

		Initial
28.1	Using the Gen Demand Control screen, set the generator priority for each generator.	N/A
28.2	Using the Gen Demand Control screen ,set the remove and add setpoints.	
28.3	Using the Gen Demand Control screen, set the Generator Demand Control switch to ON.	
28.4	Using the System Control screen, set the Generator Load Test switch to ON.	
28.5	Bring Gens on line.	
28.6	Reduce building load to a value less then needed for all available generators.	
28.7	After time delay the highest priority generator should go off line and into cooldown.	
28.8	Reduce load further to a value less then needed for all the currently available gen.	
28.9	Repeat until only the priority 1 generator is taking load.	
28.10	Restore loads in reverse order and verify that the generators reestablish themselves on line.	

29.0 Testing Load shed

This test will require that the generators be loaded with either building load or load banks or a combination.

		Initial
29.1	On the Load Shed Control screen set the Load Shed Control switch to ON.	N/A
29.2	Simulate Utility failure or Test with Load Mode.	
29.3	Bring Generators On Line.	
29.4	Using the Load Shed Control screen set the load shed remove % and add % setpoints.	
29.5	Take all generators off Line until the available load exceed the available generator power capabilities.	
29.6	After time delay the highest priority Load breakers should open and remove the Non Essential Loads.	
29.7	Continue to take generators Off Line and observe the non essential load are shed.	
29.8	Repeat until only the priority 1 generator is taking load.	
29.9	Restore loads in reverse order and verify that the generators reestablish themselves on line.	

STARTUP TEST PROCEDURE



Generator Switchgear Products
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Level 2 Startup Test Complete

Certified By: _____

Date Finished: _____

System	Initial	Date
Set Region and System Time, Daylight Savings if required		
Remote System Tested and Operational		
Reset Energy Parameters (kWh, kVARh, etc)		
Reset System Alarms and Alarm Logs		
Zip Protective Relay & Programmable Device Settings files into a single .Zip file		

	Initial	Date
Verify equality of all GAP programs.		
Zip all WSET Files into a single .ZIP file		
Zip all GAP Programs into a single .ZIP file		

	Initial	Date
ZIP HMI Program into a single .ZIP file		

Project Maintenance

Gather and Return the following files to the ISO Project Manager:

	Initial	Date
GAP Program .ZIP file		
WSET Program .ZIP file		
HMI Program .ZIP file		
Protective Relay & Programmable Device Settings .ZIP file		
Red Line Drawings		
Startup Checklist		

STARTUP TEST PROCEDURE



Generator Switchgear Products
Automatic Transfer Switches

Customer Acceptance Signoff

Project Number 36368
Project Name WES CCSD Intertie #1

Customer Representative and ISO Representative agree that the commissioning of subject system has been completed satisfactorily. The system has been demonstrated, and the customer has been trained on how to use their system. Any open issues should be listed below.

Open Issues:

Customer Representative:

ISO Representative:

Signature / Date

Signature / Date

Please Print

Please Print

STARTUP TEST PROCEDURE

L – MCC SUBMITTAL AND O&M

TRANSMITTAL OF CONTRACTOR'S SUBMITTAL

PROJECT:

CCSD #1 Intertie #2 Diversion Project A – P111895
Diversion Structure, Diversion Pipeline

GC Submittal No: 161 REV.NO: 0

WES Submittal No: I2PS - 161 REV.NO: 0

Spec Section No: 16442

(COVER ONLY ONE SECTION WITH EACH SUBMITTAL TRANSMITTAL)

CONTRACTOR: McClure and Sons, Inc.

15714 Country Club Drive, Mill Creek, WA 98012

TRANSMITTAL RECORD	DATE SENT	DATE REC'D	DATE REQ'D
Contractor to WES	9/18/12	9/18/12	
WES to Design Engineer	N/A	N/A	
Design Engineer to WES	N/A	N/A	
WES to Contractor	9/19/12		10/3/12

THE FOLLOWING ITEMS ARE HEREBY SUBMITTED FOR YOUR REVIEW AND ACTION:

LEGEND: **A)** Approved as Submitted **B)** Approved as Noted **C)** Disapproved Revise & Resubmit **D)** Rejected Incomplete Resubmit **E)** Eng Review Not Req'd

Item NO.	QTY	Spec Section & Para	DESCRIPTION	(A)	(B)	(C)	(D)	(E)
1	1	16442-1.3-B	Motor Control Equipment O&M		X			
2								
3								
4								
5								
6								
7								

Remarks:

Response:

1. Remove HDR project number on cover sheet.
2. Provide "Category" and corresponding number on tabbed sections, table of contents, and in bookmarks in electronic copy per the format under specification section 01300 1.5.
3. Label CD with project name.

Date: **09/19/2012**

Response By: **Sean Willows, URS**

CONTRACTOR'S CERTIFICATION:

CHECK ONE OF THE FOLLOWING:

- Submittal contains no deviations to requirements specified or shown.
- Submittal contains deviations to requirements specified or shown as noted and justified in the letter attached to this transmittal sheet.

Contractor hereby certifies that (i) Contractor has complied with the requirements of Contract Documents in preparation, review, and submission of designated Submittal and (ii) the Submittal is complete and in accordance with the Contract Documents and requirements of laws and regulations and governing agencies.

Submitted By: Joe Aal
McClure and Sons, Inc.

Corrections or comments made on contractor's shop drawings during this review do not relieve the contractor from compliance with contract drawings and specifications. This submittal has been reviewed for conformance with the design concept and general compliance with the contract documents only. Contractor is responsible for confirming and correlating all quantities and dimensions; fabrication processes and techniques; coordinating work with other trades; and satisfactory and safe performance of the work.

Reviewed By: N/A
Engineer, HDR

Returned By: Matt House
WES CM



**Intertie 2 Diversion Project A Pump Station
Milwaukie, OR
~~HDR Project No. 007504\101112~~**

Operation & Maintenance Manual

General Order
LPO0007343
Volume 1 of 1

Equipment:

16442 Motor Control Centers

PLATT ELEC SPLY INC CLACKAMAS OR PO# 2522178

TEAM ELECTRIC

Date: 08/24/2012

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Intertie 2 Diversion
GO # LPO0007343
Operation & Maintenance Manual
Table of Contents

VOLUME	DESCRIPTION
1	Contact Sheet
1	16442 Motor Control Centers
	Equipment Summary
	Operational Procedures
	Preventative Maintenance
	Parts List
	Wiring Diagrams
	Shop Drawings
	Safety
	Documentation



Contact Information

Visit our Web Site www.eatonelectrical.com view the on-line catalog, pricing, document support, distributor directory, news and events.

For warranty support877-ETNCARE

**For a general directory
of Eaton Electrical products(800) 525-2000**

**For on-site field service,
commissioning & maintenance.....(800) 498-2678**



16442 Motor Control Centers



Add "Category"
labels per 01300
1.5



TAB

Equipment Summary
Operational Procedures

Preventative Maintenance
Parts Lists
Wiring Diagrams
Shop Drawings
Safety
Documentation

Intertie 2 Diversion

GO # LPO0007343

**Motor Control Centers
Table of Contents**

DESCRIPTION

FREEDOM 2100 MCC INSTALLATION AND MAINTENANCE MANUAL
NEMA CONTACTORS & STARTERS (FREEDOM)
F FRAME BREAKER INSTALLATION INSTRUCTIONS
F FRAME HMCP I.L.
FLYGHT MINICAS II RELAY
NEMA Standards Publication, PB 1.1, Panelboards
Instruction Manual for DT Transformer
MOTOR CONTROL CENTER TYPE F2100 RENEWAL PARTS



Equipment Summary



EQUIPMENT SUMMARY SHEET

Clackamas County Service District No. 1
Intertie 2 Diversion Project A – Pump Station

ELECTRICAL

Equipment Name: Freedom Motor Control Center

Equipment Number: MCC-1

Exact Part or Model Number of the Supplied Equipment:

Process Area in Which the Equipment is Installed:

Steve Lachy Sept. 13, 2012
Preparer's Signature and Date



Operational Procedures

Freedom 2100 Motor Control Center Installation and Maintenance Manual



Contents

Part	Description	Page
1	General Information	2
2	Receiving, Handling, and Storage	4
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9	Unit Installation and Adjustment.	22
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This electrical control equipment is designed to be installed, operated, and maintained by adequately trained workmen. These instructions do not cover all details, variations, or combinations of the equipment, its storage, delivery, installation, check-out, safe operation, or maintenance. Care must be exercised to comply with local, state, and national regulations, as well as safety practices, for this class of equipment. The maximum short circuit capability of the equipment should not be exceeded by connection to a source with higher capacity. If maintenance or troubleshooting assistance is required, contact your nearest Eaton sales office.

Part 1. General Information

The Motor Control Center

The Eaton Freedom 2100 Motor Control Center may be joined to existing Five Star, Series 2100, and Advantage installations using the splice bar kits common to both. Units designed for the Freedom 2100 can be mounted in Five Star Series and Series 2100 sections, but the opposite is not recommended, because Five Star and Series 2100 units may lack terminal blocks and sufficient interrupting capacity. The Freedom 2100 MCC may be joined to existing Eaton Freedom Unitrol and F10 Unitrol MCC's with a special splice bar kit, but units are not interchangeable.

Control Center Nomenclature

The numbers shown in parentheses in the following text refer to the balloon legends in Figure 2.

The Eaton Freedom 2100 Motor Control Center consists of one or more totally enclosed, dead front, free standing structural assemblies 90 inches high which are compartmentalized to house individual control units. (2) With control units mounted in the front side only, the structure may be 16 or 21 inches deep. For mounting units back-to-back, the structure is 21 inches deep. Steel covers (7) enclose the structure at the top, sides and at the rear of front-mounted-only structures.

A vertical bus system installed in each vertical section is connected to the horizontal bus to feed the individual control units. The vertical bus is isolated by a full height barrier. (6) An optional labyrinth barrier provides both isolation and insulation. An automatic shutter is included with the labyrinth barrier system to cover the stab openings for each control unit.

At the top of each section, a door provides ready access to the top horizontal wireway (11) and ground bus. The horizontal wireway is isolated from the bus systems by steel barriers which can be removed for installation and maintenance operations. Adequate space is provided for control wiring and top cable entry.

At the bottom of each section, a door (18) provides ready access to the bottom horizontal wireway, and neutral bus (if provided). The bottom of each section is completely open to provide unrestricted bottom entry of cable and conduit. Channel sills may be installed across the bottom of the control center if specified, and an optional bottom plate may also be specified.

A vertical wireway 8 inches deep, extending the full 90 inch height of the control center is located to the right of each unit compartment. This wireway is covered by two hinged doors (15) and contains cable supports to secure wire bundle and cables. The vertical wireway joins the horizontal wireway at the top and bottom to provide unobstructed space for interwiring.

Each vertical section provides space to mount up to six controller units (2) with a minimum height of 12 inches, in increments of six inches, for a total of 72 inches of usable space. Controllers through NEMA Size 5 are drawout type (except reduced-voltage starters). These drawout unit assemblies are a completely self-contained package consisting of a steel enclosure, operating handle and electrical components. The drawout assembly slides into this compartment on guide rails (11) to provide easy withdrawal and reinsertion and to ensure precise alignment of the unit stabs with the vertical bus. Each drawout unit is held in place by a single quarter-turn latch (4) which can only be gaged when the unit stabs are fully mated with the vertical bus. Each unit has a separate door, (1) held closed by a minimum of two quarter-turn fasteners.

The operating handle on the controller unit (3) moves vertically. In the ON or TRIPPED positions, the handle interlocks with the unit door to prevent its opening. In this position, authorized personnel can open the door by turning the defeater mechanism screw. (21) With the unit door open and the operating handle in the ON position, another interlock to the divider pan prevents removal of the unit. This same interlock prevents insertion of the unit unless the handle mechanism is in the OFF position. To ensure that units are not energized accidentally or by unauthorized personnel, the handle mechanism can be padlocked in the OFF position. Space for a minimum of three padlocks is provided on each handle. The device panel (5) is mounted on the drawout unit. It will accommodate up to six pilot devices. The overload reset button is mounted on the unit door.



Figure 1. Nameplate

Ratings

Each Freedom 2100 Motor Control Center has a rating nameplate attached to the door of the top horizontal wireway of the primary section. See **Figure 1** and **Figure 2**. This nameplate shows the general order number under which the motor control center was built and its continuous electrical ratings, in terms of incoming line voltage, phases, and frequency, and ampere ratings of the horizontal bus and the vertical bus for each section. In addition, this nameplate shows the passive short-circuit (withstand) rating of the horizontal and vertical bus system. The active short-circuit (interrupting) ratings of the main and unit short-circuit protective devices are shown on labels attached to the inside of each unit. Before installing a motor control center, calculate and record the fault current available at the incoming line terminals. Verify that the short-circuit with standard short-circuit interrupting ratings of the units in the motor control center are appropriate for the fault current available.

Qualified Personnel

Individuals who install, operate, or maintain MCCs must be trained and authorized to operate the equipment associated with the installation and maintenance of an MCC, as well as the operation of the equipment that receives its power from controller units in the MCC. Such individuals must be trained in the proper procedures with respect to disconnecting and locking OFF power to the MCC and wearing personal protective equipment, which includes arc flash, insulating, and shielding materials, and also use insulated tools and test equipment, following established safety procedures as outlined in the National Electrical Safety Code (ANSI C2) and Electrical Equipment Maintenance (NFPA 70E).

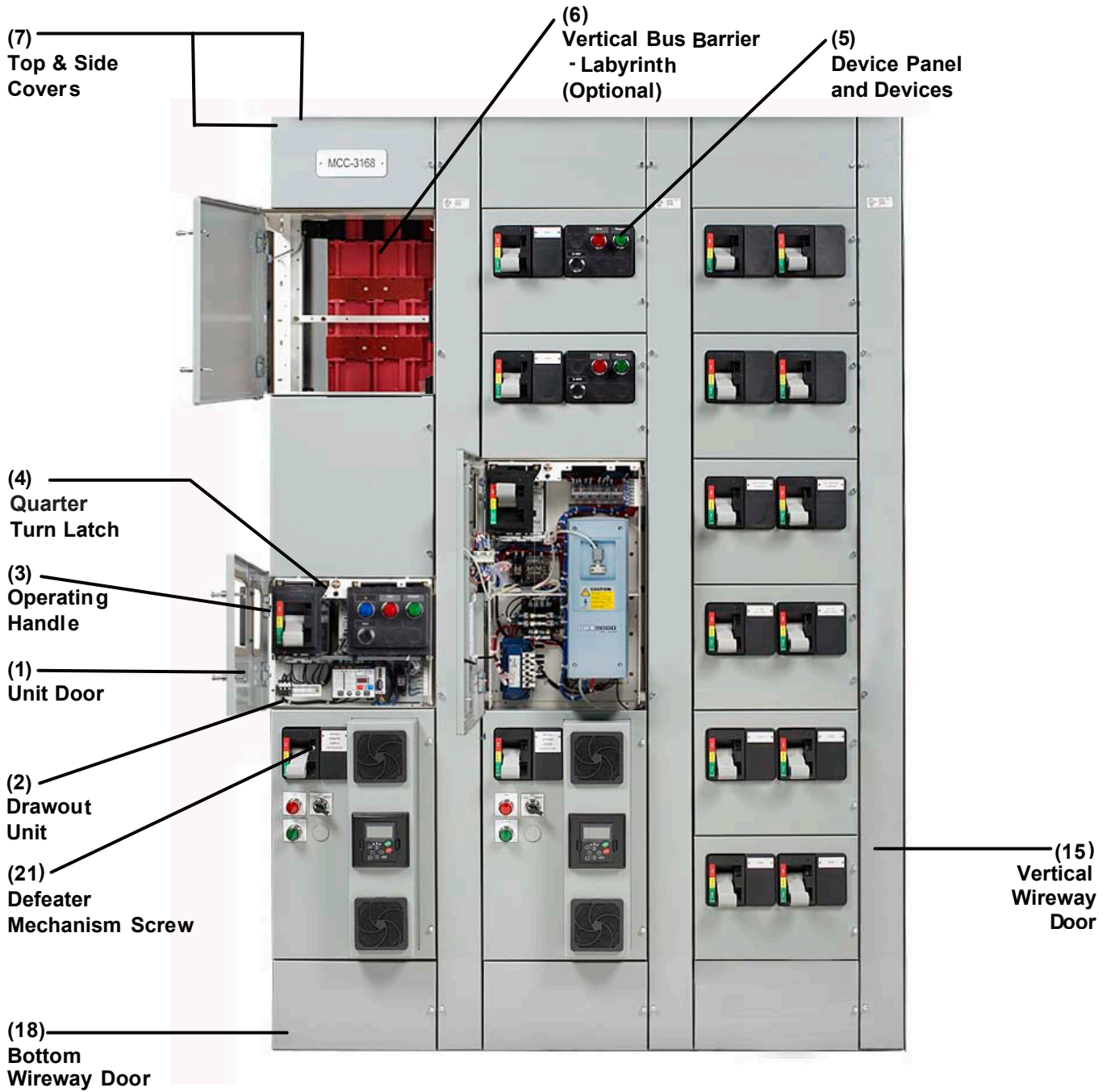


Figure 2. Motor Control Center Nomenclature

Part 2. Receiving, Handling, and Storage

⚠ WARNING

MCC - HEAVY EQUIPMENT STATEMENT

THIS MCC CAN WEIGH IN EXCESS OF 2,000 POUNDS. REFER TO SHIPPING MANIFESTS FOR EXACT WEIGHT OF EQUIPMENT. TO PREVENT SERIOUS INJURY OR DEATH, OR EQUIPMENT DAMAGE, FROM UNINTENDED MOVEMENT OF EQUIPMENT DURING TRANSPORT, INSTALLATION OR ANY OTHER OPERATIONS, ENSURE THAT (1) ONLY MATERIAL HANDLING EQUIPMENT OF ADEQUATE CAPACITY AND RATING FOR THE LOAD INVOLVED IS USED; (2) ONLY QUALIFIED PERSONNEL ARE INVOLVED; AND (3) ALL LIFTING/BRACING SHIPPING LABELS AND MARKINGS INSTRUCTIONS SHIPPED WITH THE MCC MUST BE FOLLOWED.

Receiving

Before and after unloading the motor control center, inspect each section and unit exterior for evidence of damage that may have been incurred during shipment. If there is any indication that the control center has been mishandled or shipped on its back or side, remove the drawout units and make a complete inspection of the internal structure, bus bars, insulators, and unit components for possible hidden damage. Report any damage found to the carrier at once.

Handling

The following guidelines are provided to help avoid personal injury and equipment damage during handling, and to facilitate moving the motor control center at the job site.

General Hints

1. Handle the motor control center with care to avoid damage to components and to the enclosure or its paint finish.
2. Keep the motor control center in an upright position.
3. Ensure that the moving means has the capacity to handle the weight of the motor control center.
4. The control center should remain secured to the shipping skid until the motor control center is in its final location.
5. Exercise care during any movement and placement operations to prevent falling or unintentional rolling or tipping.
6. Lifting angles for handling by overhead crane are bolted to the top of each shipping section. Handling by overhead crane is preferable, but when crane facilities are not available, the motor control center can be positioned with a fork-lift truck or by using rollers under the shipping skid.

Overhead Crane

1. See **Figure 3** for recommended lifting configuration.
2. Select or adjust the rigging lengths to compensate for any unequal weight distribution, and to maintain the motor control center in an upright position.
3. To reduce tension on the rigging and the compressive load on the lifting angles, do not allow the angle between the lifting cables and vertical to exceed 45 degrees. Use slings with safety hooks or shackles. **Do not pass ropes or cables through lifting angle holes.**

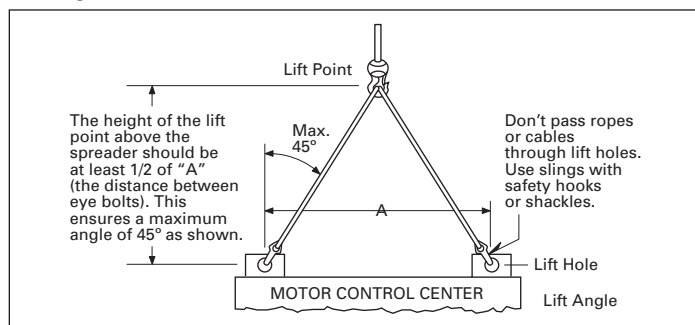


Figure 3. Correct Use of Lifting Angle

4. After removing the lifting angles, replace the mounting hardware to prevent the entrance of dirt, etc.

Fork-lift truck

Motor control centers are normally top and front heavy. Balance the load carefully, and steady, as necessary, while moving. Always use a **safety strap when handling with a fork-lift.**

Rollers

Rod or pipe rollers, with the aid of pinch bars, provide a simple method of moving the motor control center on one floor level, if there is no significant incline. Roll the motor control center slowly, and steady the load to prevent tipping.

Storage

When an motor control center cannot be installed and placed into operation immediately upon receipt, take steps to prevent damage by condensation or harsh environmental conditions. If the motor control center cannot be installed in its final location, store it in a clean, dry, ventilated building, heated to prevent condensation, and protected from dirt, dust, water, and mechanical damage. When storage conditions are less than ideal, install temporary electrical heating, typically in the form of light bulbs, totaling 150 watts per section, hung in the vertical wireway, or by applying power to self-contained space heaters that the motor control center may be equipped with. Remove all loose packing and flammable materials before energizing any of the heating elements.

Part 3. Installing Control Center Sections

General

Freedom FlashGard motor control centers (MCCs) are designed for installation in accordance with both the National Electrical Code® (NEC®), NFPA 70, and the National Electrical Safety Code (NESC), ANSI C2.

⚠ CAUTION

IF WORK IS INVOLVED IN CONNECTING THE CONTROL CENTER WITH EXISTING EQUIPMENT, ENSURE THAT INCOMING POWER IS DISCONNECTED BEFORE WORK BEGINS. DISCONNECTING MEANS SHOULD BE LOCKED OUT AND/OR TAGGED OUT OF SERVICE. WHERE IT IS NOT FEASIBLE TO DE-ENERGIZE THE SYSTEM, THE FOLLOWING PRECAUTIONS SHOULD BE TAKEN:

- A. Persons working near exposed parts that are or may be energized should be instructed and should use practices (including appropriate personal protective equipment, which includes arc flash, insulating, and shielding materials, and insulated tools and test equipment in accordance with the NFPA 70E).
- B. Persons working on exposed parts that are or may be energized should, in addition, be qualified persons who have been trained to work on energized circuits.

Installation

1. Before any installation work begins, consult all drawings furnished by Eaton, as well as all applicable contract drawings for the installation. Give particular attention to the physical location of units in the control center and their relation to existing or planned conduit, busways, etc. Provide for future conduit entrance prior to control center installation.
 2. Locate the control center in the area shown on the building floor plans. If in a wet location or outside of the building, protect the control center from water entering or accumulation within the enclosure. Recommended clearances or working spaces are as follows:
 - a. Clearance from walls (where not rear accessible)—a minimum of 1/2 inch for indoor and 6 inches for outdoor or wet locations.
 - b. Clearance from front of MCC (working space)—minimum of 3 feet for control centers without exposed live parts. See NEC 110-13.
- Note:** This working space should not be used for storage and should have adequate lighting.
3. Since MCCs are assembled at the factory on smooth and level surfaces to ensure correct alignment of all parts, MCCs should be securely mounted on a level surface. The foundation furnished by the purchaser must be true and level, or the bottom frames must be shimmed to support the entire base in a true plane. It is recommended that leveled channel sills under both the front and rear of the control center be used to provide this level base. Drill and tap the channel sills for mounting bolts in accordance with the applicable floor plan drawing and then either install the MCC level with, or on top of, the finished floor. If sills are grouted in concrete, the mounting bolts should be screwed in place and remain until the concrete has hardened.

4. For bottom entry, position the MCC so that the conduit stubs or floor openings are located in the shaded areas shown on the MCC floor plan drawings (refer to **page 29** and **page 30** for floor plan dimensions). The shaded areas represent the open space available for conduit entry through the bottom of each section. A shaded area may be restricted if large controllers or auto-transformers are mounted in the bottom of the sections. If optional bottom plates are supplied, the plates may be removed and drilled for conduit entry.
5. Install the MCC in its final position, progressively leveling each section and bolting the frames together if they are separated. If necessary, secure the MCC to walls or other supporting surfaces. Do not depend on wooden plugs driven into holes in masonry, concrete, plaster, or similar materials. See NEC 110-13.
6. If two or more shipping sections are to be joined into an integral assembly or a shipping section is to be joined to an existing section, refer to paragraphs below before proceeding with the installation.
7. Ground and bond the MCC as follows:
 - a. MCCs used as service equipment for a grounded system or as an incoming line section for a separately derived, previously grounded system:
 1. Run a grounding electrode conductor (ground wire) having a size in accordance with NEC 250-94 from the grounding electrode to the MCC ground bus or ground terminal provided. See also NEC 250-92(A) and 92(B).
 2. If the system is grounded at any point ahead of the MCC, the grounded conductor must be run to the MCC in accordance with NEC 250, and connected to the ground bus terminal.
 3. Do not make any connections to ground on the load side of any neutral disconnecting line or any sensor used for ground-fault protection. Do not connect outgoing grounding conductors to the neutral.
 - b. MCCs used as service equipment for an ungrounded system or as an incoming line section for a separately derived, previously ungrounded system:
 1. Run a grounding electrode conductor (ground wire) having a size in accordance with NEC 250-94 from the grounding electrode to the MCC ground bus terminal. See NEC 250-92(A) and 92(B).
 - c. MCCs not used as service equipment nor as an incoming line section for a separately derived system, and used on either a grounded or ungrounded system:
 1. Ground the MCC ground bus by means of equipment grounding conductors having a size in accordance with NEC 250-95 or by bonding to the raceway enclosing the main supply conductors in accordance with NEC 250-92(B).
8. When all wiring and adjustments are complete, close all unit and wireway doors.
9. In damp indoor locations, shield the MCC to prevent moisture and water from entering and accumulating.
10. Unless the MCC has been designed for unusual service conditions, it should not be located where it will be exposed to ambient temperatures above 40°C (104°F), corrosive or explosive fumes, dust, vapors, dripping or standing water, abnormal vibration, shock, or tilting.

Joining Compatible Sections

If two more shipping sections are to be joined into an integral assembly, or a section added to an existing installation, splicing of horizontal bus, ground bus, neutral bus, and joining of the adjacent vertical sections must be planned with the installation.

1. Remove the side sheets from adjacent vertical sections to be joined. (These sheets will have been removed from factory-assembled sections.)
2. The horizontal bus splice plates and connection hardware will be shipped with the MCC attached to one end of shipping section. Refer to **Figure 4**.
3. This method provides the most convenient access to the bolts, and eliminates the need to remove the horizontal bus barriers in that structure. Should the existing bus be oxidized, sand lightly with a fine aluminum oxide paper.

⚠ CAUTION

DO NOT USE EMERY CLOTH OR ANY ABRASIVE CONTAINING METAL.

4. Remove the upper horizontal wireway door from the structure on the right side of the left-hand (LH) section, and remove the two-piece wireway barrier to provide access to the ends of the bus in that section.
5. Move the section into place, aligning the upright structural channels and bottom channels. Alignment of the section with floor sills and foundation provisions will be facilitated by removing the bottom horizontal wireway doors. Using the "U" type frame clamps provided, clamp adjacent front upright channels together at the top, bottom, and approximate center of the vertical structure. "U" clamp placements must be placed 4 inches (101.6 mm) above or below the drawout unit—1/4 turn latch and unit interlock feature on the cover control module; see details on **page 30** bottom left-hand corner. This operation will be facilitated by removing the vertical wireway doors from the left-hand structure and one or more drawout units from the right-hand structure. See **Part 9, page 22**.
6. If rear access is available, "U" clamps should also be used to clamp the rear upright channels together. In front-mounted-only structures, this will require removal of the adjacent back sheets. In a back-to-back-mounted structure, remove the vertical wireway doors and one or more drawout units as above.
7. Secure the sections to the floor sills or mounting bolts as provided for the installation.
8. Bolt the horizontal bus splice plates to the bus in the left-hand structure, torquing all bus splice bolts to 360 pound-inches (30 pound-feet). See **Figure 5**.
9. Replace all units, bus barriers, and doors.

Joining Incompatible Sections

Joining a Freedom MCC to other equipment, such as Type W and 11-300 control centers, will usually involve a transition section installed between the two varieties of equipment. This transition section will be detailed on drawings provided by Eaton and the applicable contract drawings. If provided separately, it should be installed first. Review the overall installation task to determine whether the transition section should be attached to the existing equipment or to the Freedom FlashGard section, before it is moved into place, and select the sequence that will provide best access to bus splicing and joining of the structures.

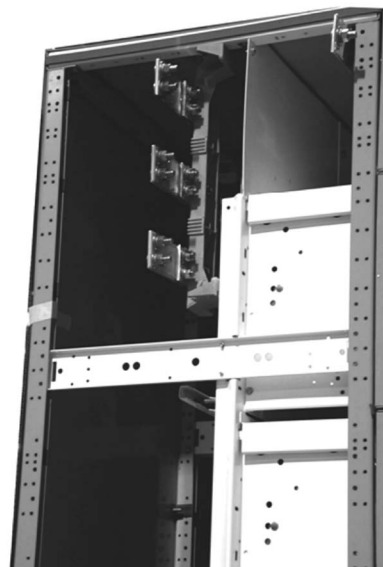


Figure 4. Splice Plates Attached to Right-Hand Section



Figure 5. Access to Left-Hand Splice Plate Connections

Splice Plates

Each splice plate kit consists of short pieces of bus bar the same width as the main horizontal bus of the MCC the kit is shipped with, four bolts per phase, and appropriate quantities of related hardware. For a single bus bar per phase, the hardware is used as shown in **Figure 6** for either 16- or 21-inch deep enclosures. Each splice plate is punched with rectangular holes to accept a square shank carriage bolt that will not rotate as the nut is tightened.

Where the MCC is built with two horizontal bus bars per phase, the splice plates are installed as shown in **Figure 7**. The top edge of **Figure 7** through **Figure 10** represents the back side of the MCC. The top portion of each of these figures applies to 21-inch deep enclosures and the lower portion to 16-inch deep enclosures. Note that for all but the single-bar per phase (**Figure 6**) installation, the 16-inch deep enclosures require the use of a nut plate that is mounted with the same carriage bolt used to attach the horizontal bus bars to the channel-shaped insulators. Install these nut plates before mounting the splice plates. Tighten the splice plate bolts with a driving torque of 360 pound-inches (30 pound-feet).

Type 3R Enclosures

Where the MCC is supplied in a Type 3R enclosure for an outdoor application, apply roof splice caps at each shipping block junction to maintain the enclosure integrity.

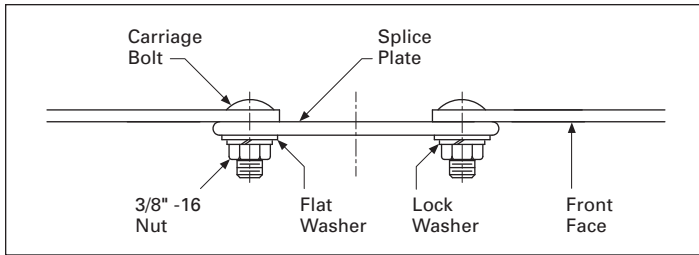


Figure 6. Single-Bar Splice Kit

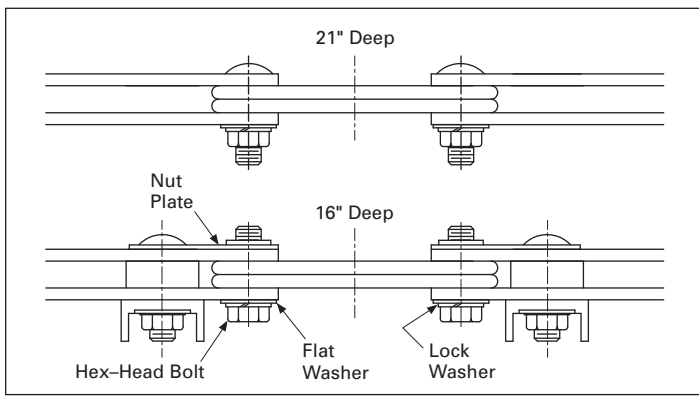


Figure 7. Double-Bar Splice Kit

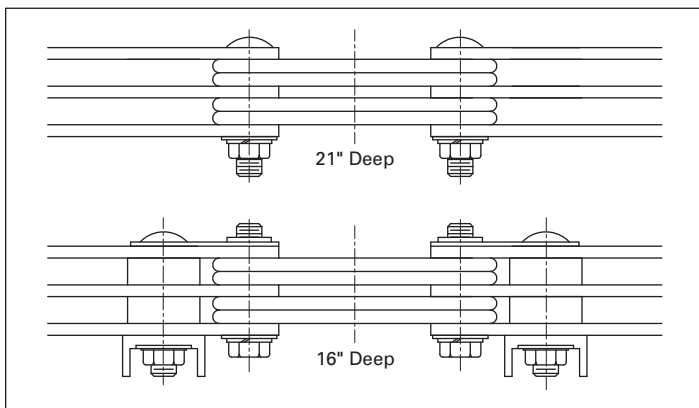


Figure 8. Triple-Bar Splice Kit

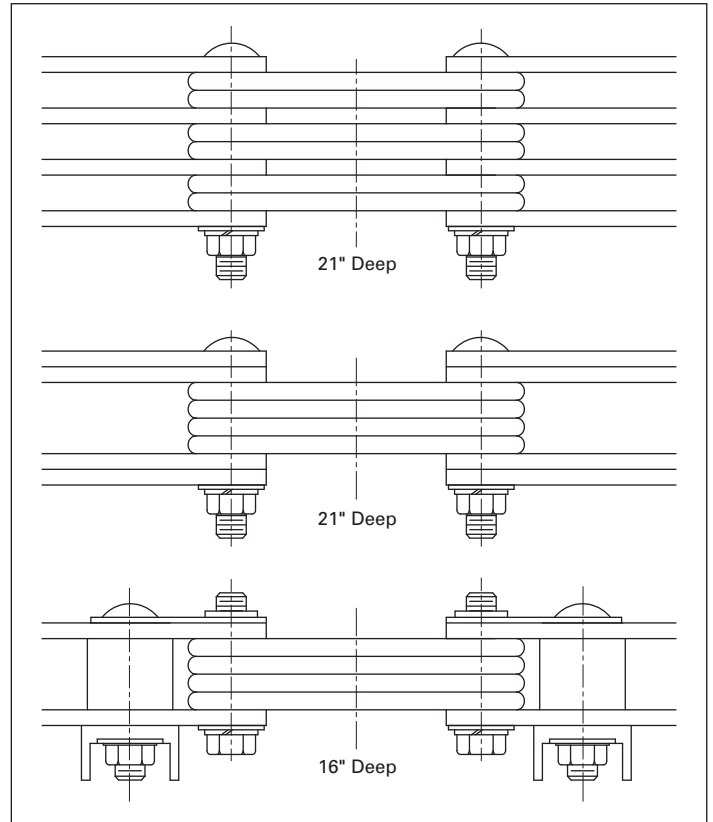


Figure 9. Quadruple-Bar Splice Kits

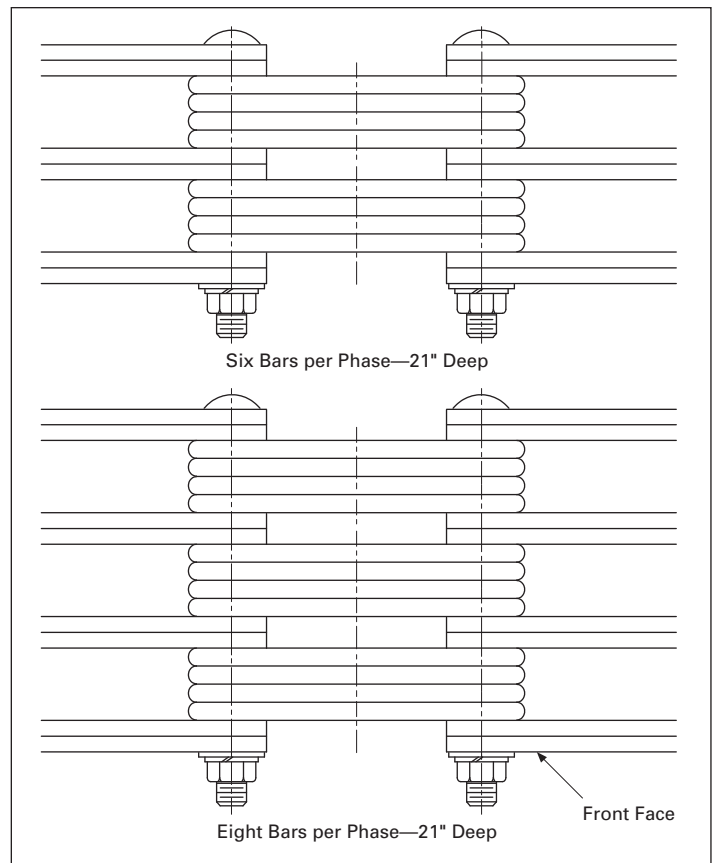


Figure 10. Six- and Eight-Bar Splice Kits

**Joining to a Freedom FlashGard, Freedom Unitrol,
or F10 Unitrol**

Consult the assembly instruction supplied with every Freedom MCC set up for splice to Freedom FlashGard, Freedom Unitrol, or F10 Unitrol.

⚠ WARNING

**SPECIFIC SAFETY NOTE FOR INSTALLING AND REMOVING MCC UNITS—
RECOMMEND THE USE OF NEW ACCESSORY.**

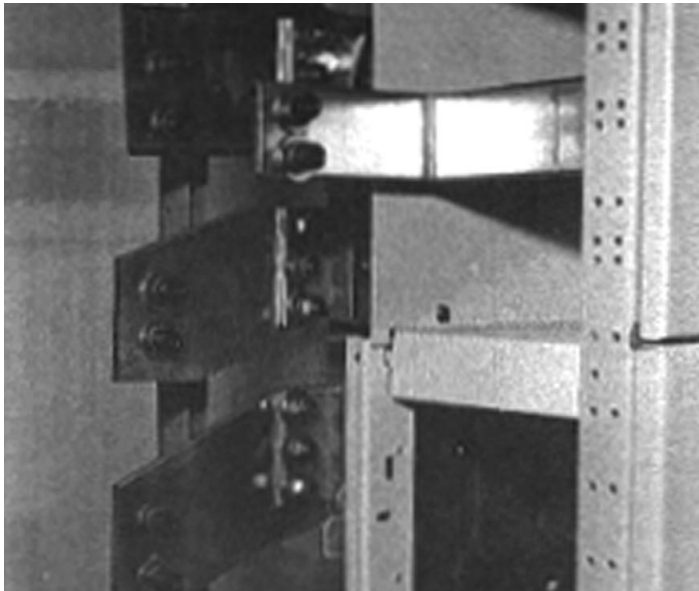


Figure 11. Splice Plates Attached to Freedom 2100 Horizontal Bus and Ground Bus at Top

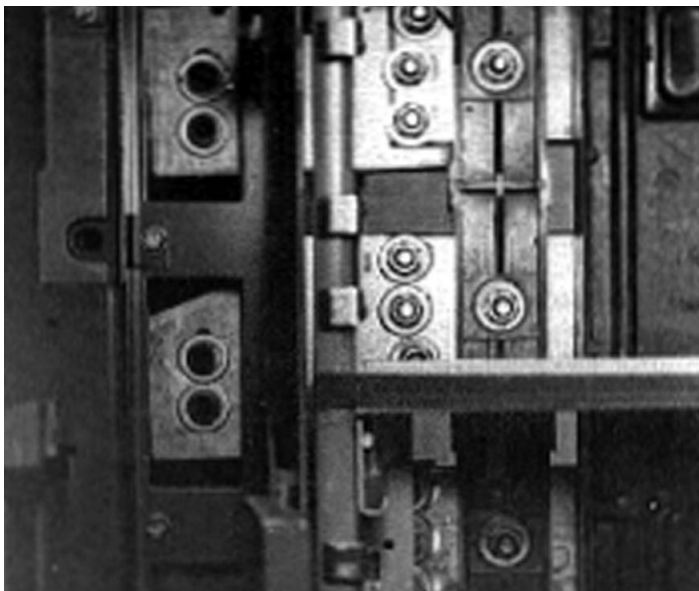


Figure 12. Horizontal Bus Splice Freedom Unitrol on Left, Freedom 2100 on Right

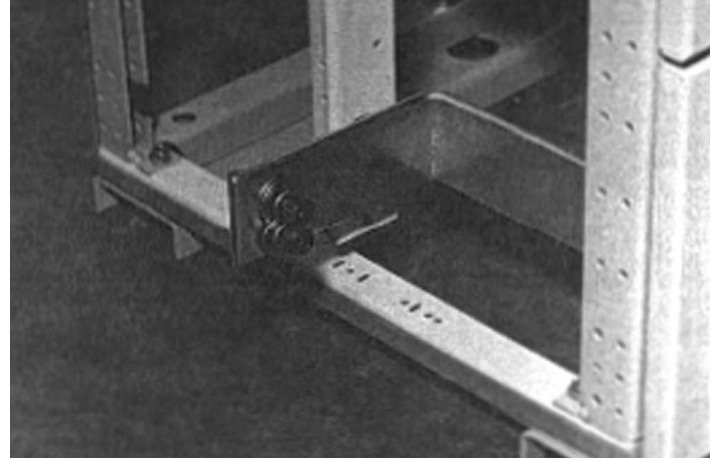


Figure 13. Splice Plate Attached to Freedom FlashGard Ground Bus at Bottom



Figure 14. Splice Plate Attached to Freedom FlashGard Neutral Bus

Part 4. Installing Conduit and Wiring

Conduit

Install conduit in such a manner as to prevent water from entering and accumulating in the conduit or the enclosure. Eliminate sags in conduit. Have the conduit enter the motor control center (MCC) in the areas designated for conduit entry on the plan views. See **page 29** and **page 30** of this booklet and outline drawings shipped with the MCC. Keeping conduit within the shaded areas shown in the plan views will avoid cable interference with structural members and live bus. See **Part 12**.

Wiring

Install the line and load conductors sized in accordance with the NEC. **Use copper wire only for control terminations. Use copper wire only for power terminations unless they are marked "CU/AL."** Use conductors with a temperature rating of 167°F (75°C) or higher, but regardless of the insulation temperature rating, select the wire size on the basis of 167°F (75°C) wire ampacity. Using a higher temperature wire ampacity table often results in a smaller cross-section of copper available for carrying heat away from terminals.

Install insulated wire and cable at a temperature sufficiently warm to prevent the insulation from cracking or splitting.

When more than one conduit is run from a common source or to a common load, be sure to have each conduit carry conductors from each phase and the same number of conductors per phase. If the phase conductors are not distributed uniformly, eddy currents will be generated in the steel between the conduits.

Locate conductors within the MCC to avoid physical damage and to avoid overheating. Secure incoming power lines in a manner adequate to withstand the forces that will act to separate the conductors under short-circuit conditions. Use the cable ties furnished in both horizontal and vertical wireways to support the load and interconnection wire. Use a shielded communications cable inside of flexible metal conduit to protect very low voltage signals transmitted to or from a computer or programmable controller.

Lugs furnished with the MCC and its components are for Class B and Class C stranding. Verify the compatibility of wire size, type, and stranding with the lugs furnished. Where they are not compatible, change the wire or lugs accordingly. If crimp lugs are used, crimp with the tools recommended by the manufacturer.

Use care in stripping insulation to avoid nicking or ringing the metal. All field wiring to control units should be made in accordance with the wiring drawings that are furnished with the control center. Load and control wiring can be brought in through the upper and/or lower horizontal wireways. Determine the type of wiring installed in the control center (NEMA Type B or C) and proceed per the following appropriate paragraph.

The phase sequence of the power circuit load terminals (top-to-bottom: T1, T2, T3) in units mounted on the rear side of the MCC is opposite to that of the load terminals in units mounted on the front side of a back-to-back MCC. To obtain the same direction of rotation for a motor connected to a rear-mounted unit as for one connected to a front-mounted unit, re-label the terminals in the rear-mounted unit: T3, T2, T1, and wire accordingly. Refer to the warning sticker supplied with rear-side units. When making power connections to the starter terminals, be sure to leave sufficient slack in the wires so that the unit can be withdrawn to the detent position for maintenance. See **Table 8**.

NEMA Type B Wiring

Each control unit is factory assembled with devices inter-wired within the unit. In addition, all control wiring is carried to unit terminal blocks mounted on the right-hand side of the unit. See **Figure 15**. Bring the field wiring of control wires from a horizontal wireway into the vertical wireway on the right-hand side of the applicable control unit and terminate them at the unit terminal blocks.

Bring load wiring from the vertical wireway, under the bottom right-hand side of the unit, to terminations within the unit. If optional load terminals are provided, terminate load wires to load terminals located adjacent to the vertical wireway. To gain access to these terminals, place tool between right-hand wrapper side and wireway post as shown in **Figure 15a**.

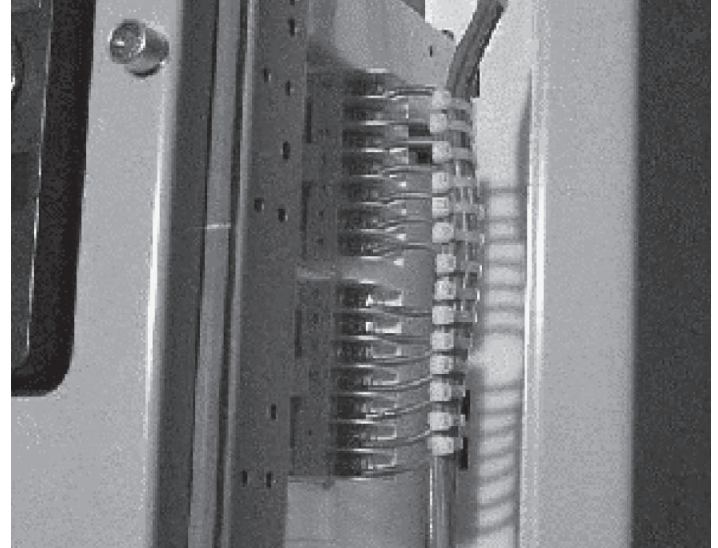


Figure 15. Unit Terminal Blocks



Figure 15a. Pull-Apart Terminal Blocks

Engaging Pull-apart Terminal Blocks

The male portion of the pull-apart terminal block is located in a plastic bag tied to the pivot rod inside the unit. This terminal block can be wired outside of the vertical wireway. To engage the terminal block, align the fingers of the male connector with the slot at the back of the female portion of the terminal block. Then rotate the male portion forward and to the left into the female portion of the terminal block. Each male portion of the pull-apart terminal block has two cavities adjacent to the center terminal screw to accept the blade of an electrician's screwdriver used to cam the block into and out of engagement. Each male portion also has a rear slot that can engage the edge of the unit frame where it can be mounted for ease in troubleshooting.

NEMA Type C Wiring

Each control unit is factory assembled with devices inter-wired within the unit. In addition, all control wiring is carried to unit terminal blocks on the side of the unit and from these unit blocks, along with load wiring through Size 3, to master terminal blocks located at the top or bottom of the structure. See **Figure 16**. Master terminal blocks can be either fixed or drawout mounted. In the drawout design, the terminal blocks are rack mounted to permit withdrawal of the entire assembly for ease of wiring during installation and maintenance. Bring field wiring from the horizontal wireway to the master terminal blocks except for load wiring larger than Size 3. These latter load wires should be carried into the vertical wireway and under the bottom right-hand side of the unit to terminations within the unit.



Figure 16. Master Terminal Block

Part 5. Incoming Line Connections

Overcurrent Protection

All ungrounded conductors in a motor control center (MCC) installation require some form of overcurrent protection in order to comply with Section 240-20 of the NEC. Such overcurrent protection for the incoming lines to the MCC is in the form of fuses or a circuit breaker located at the transformer secondary that supplies the MCC. The conductors from the transformer secondary constitute the feeder to the MCC, and the "10-foot rule" and the "25-foot rule" of NEC, 240-21 apply. These latter exceptions to the general rule allow the disconnect means and overcurrent protection to be located in the MCC, provided the feeder taps from the transformer are sufficiently short and other requirements are met.

A circuit breaker or a circuit interrupter combined with fuses controlling the power to the entire MCC may provide the overcurrent protection required as described above or may be a supplementary disconnect (isolation) means. See **Figure 17**, **Figure 18**, and **Figure 19**.

When the MCC has a main disconnect, bring the incoming lines (the feeders) to the line terminals of the circuit breaker or circuit interrupter. The load side of the circuit breaker or the load side of the fuses associated with the circuit interrupter has already been connected to the MCC bus bar distribution system. In the case of main disconnects rated 400A or less, this load connection is made by stab connections to vertical bus bars that connect to the horizontal bus distribution system. See **Figure 17**.

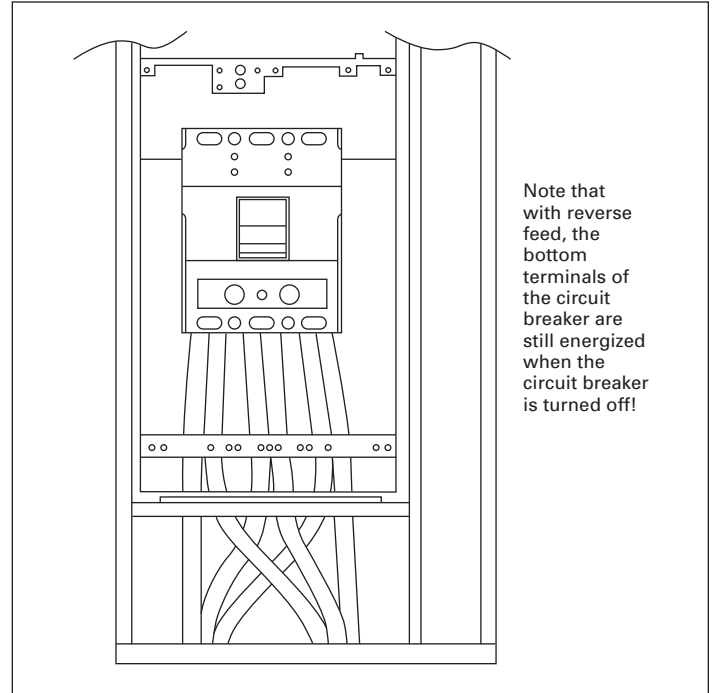
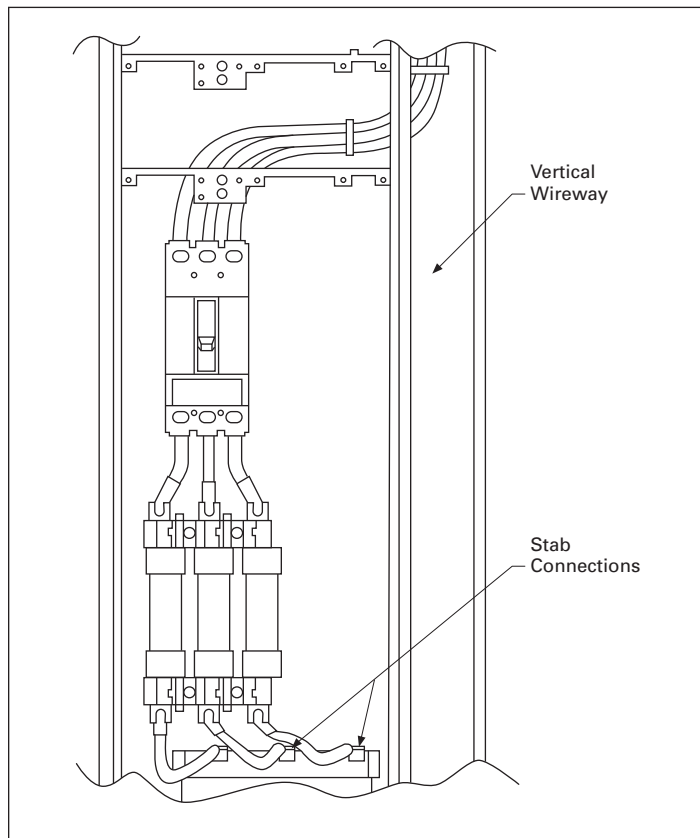


Figure 18. Main Circuit Breaker with Reverse Feed



**Figure 17. Main Disconnect with Stab Load Connections
Overcurrent Protection to be Located in the MCC, Provided the
Feeder Taps from the Transformer are Sufficiently Short and
Other Requirements are Met**

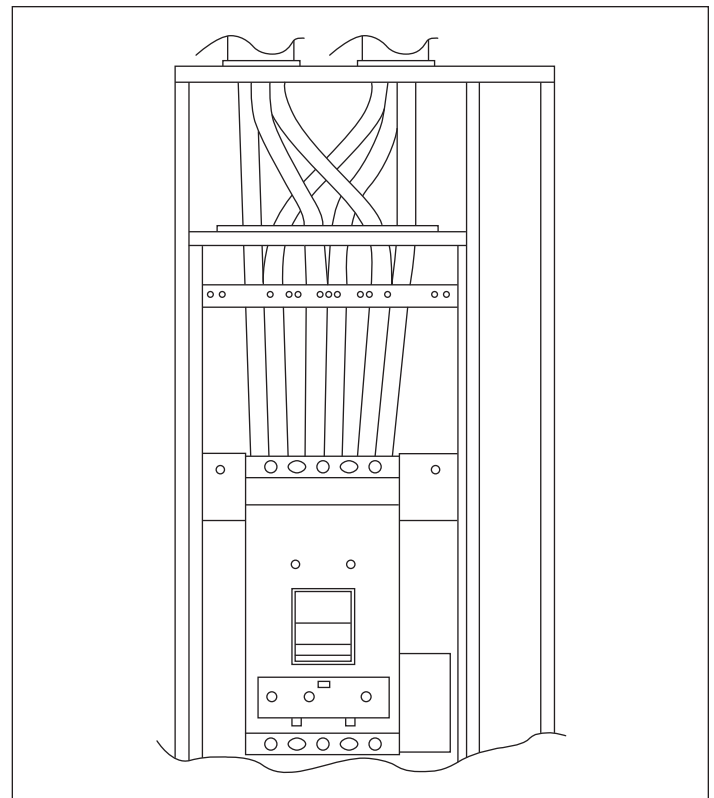


Figure 19. Main Circuit Breaker

Incoming Line Lugs

Where the overcurrent protection for the MCC is at a remote location, the MCC feeder lines are connected to incoming line lugs attached to the bus bar distribution system. See **Figure 20**. For high-ampere rated horizontal bus bar systems, the incoming line lugs are mounted on vertical risers that connect to the horizontal bus bars. See **Figure 21**.

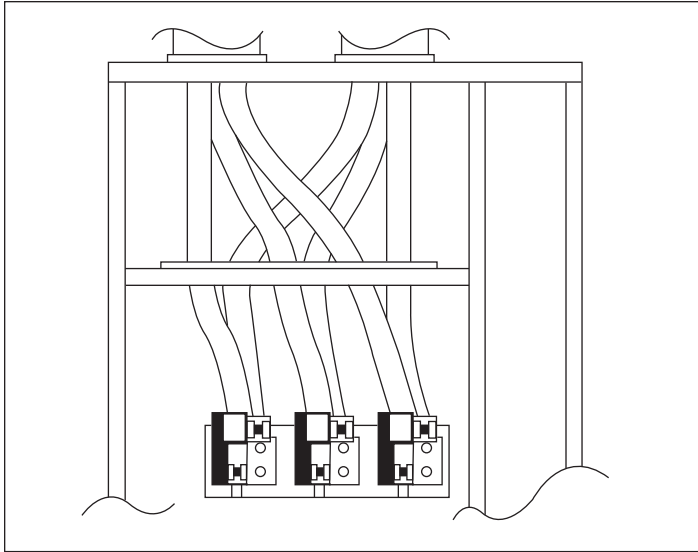


Figure 20. Incoming Line Lug Connections

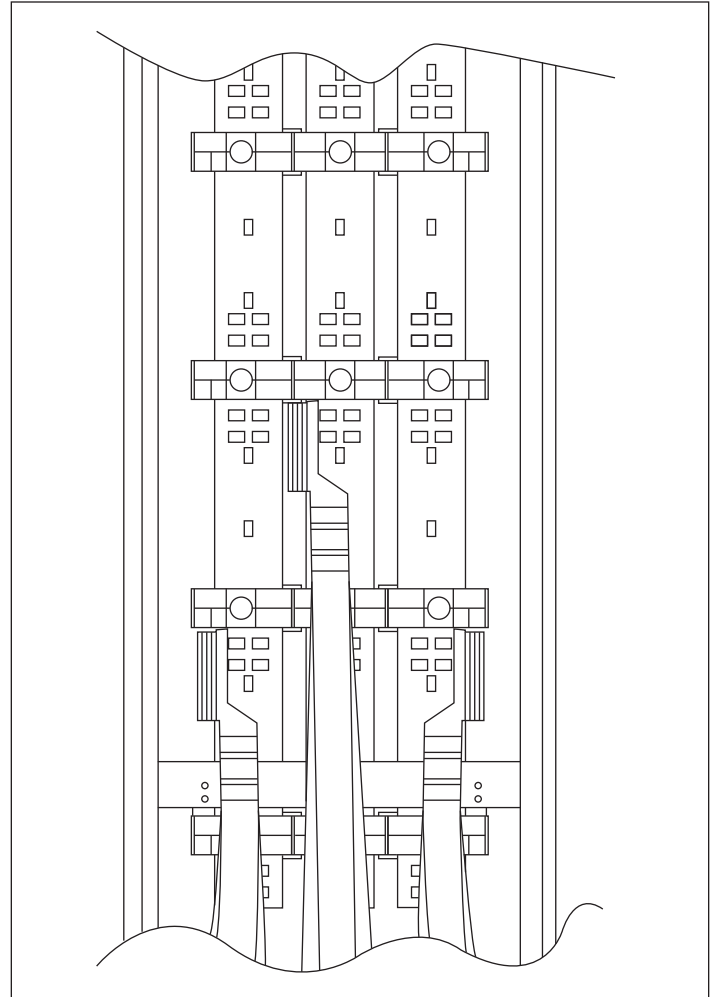


Figure 21. Incoming Line Compartment, 2000A

Short-circuit Bracing

All incoming lines to either incoming line lugs or to main disconnects must be braced to withstand the mechanical forces created by a high fault current. With the remainder of a Freedom 2100 MCC rated for not less than 65,000A (rms symmetrical), the installing electrician needs to anchor the cables at the incoming line connections sufficiently and tighten the lugs correctly.

Each incoming line compartment is equipped with two-piece sheet steel brackets that form a cable bracing support bracket that is approximately 9 inches from the conduit entry point, for both top- and bottom-feed applications. Use the bracket and appropriate lashing material to tie the cables securely together if bundled or to hold apart when they are required to be separated. See **Figure 22**, which shows the two-part mounting/bracing bracket, in a top entry incoming lug configuration.

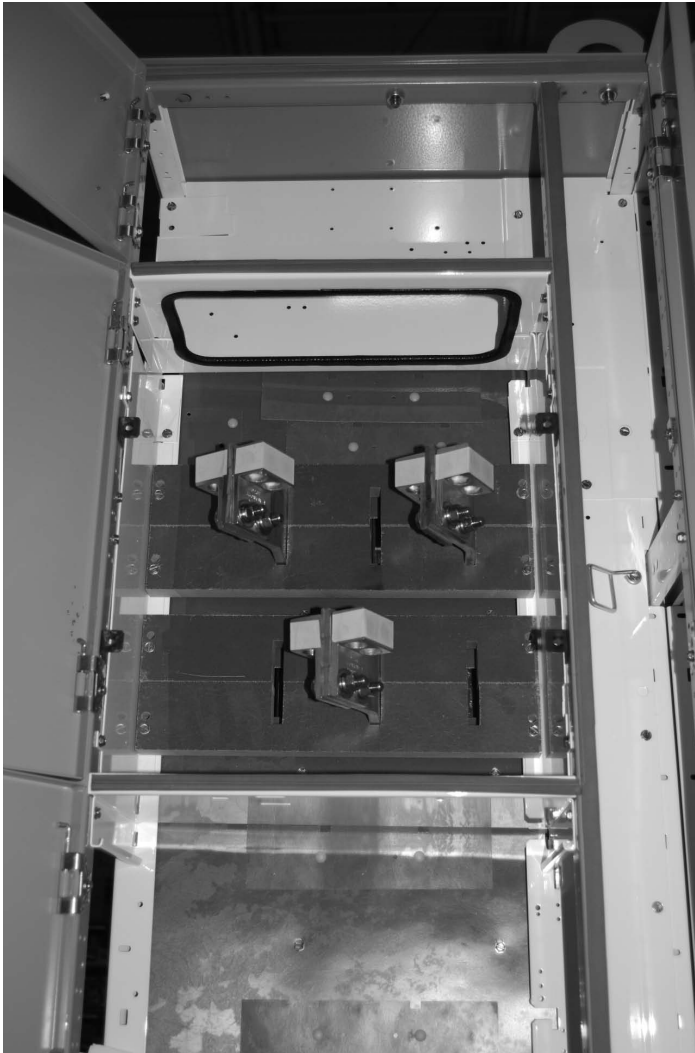


Figure 22. Incoming Line Compartment Showing Two-Piece Support Bracket, with Opening for Cables

Making Connection

⚠ CAUTION

ALL INCOMING LINE COMPARTMENTS PRESENT AN OBVIOUS HAZARD WHEN THE DOOR IS OPENED OR COVERS ARE REMOVED WITH POWER ON. WHEN WORKING IN THIS AREA, THE INCOMING FEEDER SHOULD BE DE-ENERGIZED.

Before beginning work on incoming line connections, refer to all drawings furnished by Eaton, as well as all applicable contract drawings for the particular installation.

Depending on the location, size, and type of the incoming arrangement, remove one or more horizontal and vertical wireway doors, and selected units to provide complete access. See **Part 9, page 22** for unit removal instructions.

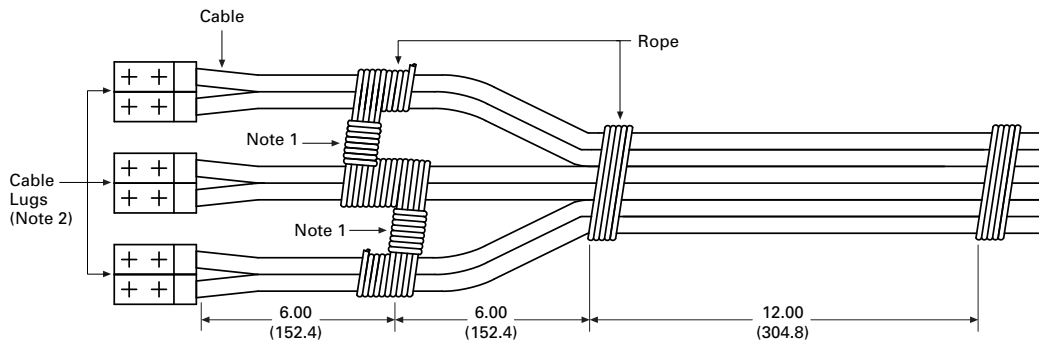
For top entry, the top cover plates are easily removed for drilling or punching operations.

MCC with a Magnum or a main lug only incoming line (Figure 21) section—cable bracing/lashing for top- and bottom-feed arrangements

1. All cable must be terminated with two-hole mounted compression or mechanical set-screw type lugs.
2. All non-current-limiting circuit breakers rated above 42 kA and with circuits rated for 800A and below require cable lashing per **Figure 23**.
3. Circuit breaker rated 42 kA and below require no cable lashing.
4. No cable lashing is required for current-limiting circuit breakers.
5. No cable lashing is required for circuits using more than four (4) cables of 500 kcmil or larger size wire per phase, regardless of short circuit rating.

Rope Requirements:

- 3/8" diameter
- Nylon, twisted
- Size = #12
- 3 strand
- Tensile strength = 3340 lbs (1515 kg)
- Working load = 278 lbs (126 kg)



Instructions:

1. Route cable as close together as possible.
2. Wrap rope around the cable 6 in (152.4 mm) from lugs (see Note 1).
3. The second wrap is to be applied 6 in (152.4 mm) from the first wrap.
4. After the second wrap, the cables should be wrapped at 12 in (304.8 mm) increments to the entry or exit point of the switchgear.
5. Verify that each set contains 5 loops and that all ropes are pulled as tight as possible.

Note 1: The goal is to bundle all cables together in one bundle, but near the lug landings, so the bundles may need to separate. In this case, the rope between cables should be wrapped to provide support.

Note 2: The center pole cable lugs are shown in-line with outer poles; **Figure 21** shows lugs with center pole offset either leading or lagging outer poles, depending on top or bottom feed cables. The six-inch dimension shown in these arrangements is from the closed lug, which is the center pole for top entry and outer poles for bottom entry as shown in **Figure 21**.

Figure 23. Cable Lashing Installation Instructions

Part 6. Overcurrent protection devices

Device Selection

Articles 240 and 430 of the NEC contain the rules for selecting fuses, circuit breakers, and overload relays by type and by voltage and ampere rating. Follow these rules for feeder circuits, and the instructions attached to the inside of the left-most vertical wireway door, for motor branch circuits. Select and install overload relay current elements (heaters) based on the motor service factor and full-load current. Ambient-compensated overload relays are used in motor control centers (MCCs) to offset the temperature gradient that occurs from top to bottom in a loaded vertical section.

Heaters must be installed in the starter overload relay assemblies before the starter is energized.

C306 Thermal Overload Relays (Figure 24)

C306 overload relays are provided on Freedom starters. Four sizes are available for overload protection up to 114A. Features include:

- Selectable manual or automatic reset operation
- Interchangeable heater packs adjustable $\pm 24\%$ to match motor FLA and calibrated for use with 1.0 and 1.15 service factor motors. Heater packs for 32A overload relay will mount in 75A overload relay—useful in derating applications such as jogging
- Class 10 or 20 heater packs (Figure 24). Use Class 10 heaters with fusible or thermal-magnetic breaker disconnects only
- Bimetallic, ambient-compensated operated. Trip-free mechanism
- Electrically isolated NO and NC contacts (pull RESET button to test)
- Overload trip indication
- Single-phase protection
- UL listed, CSA certified, and NEMA compliant

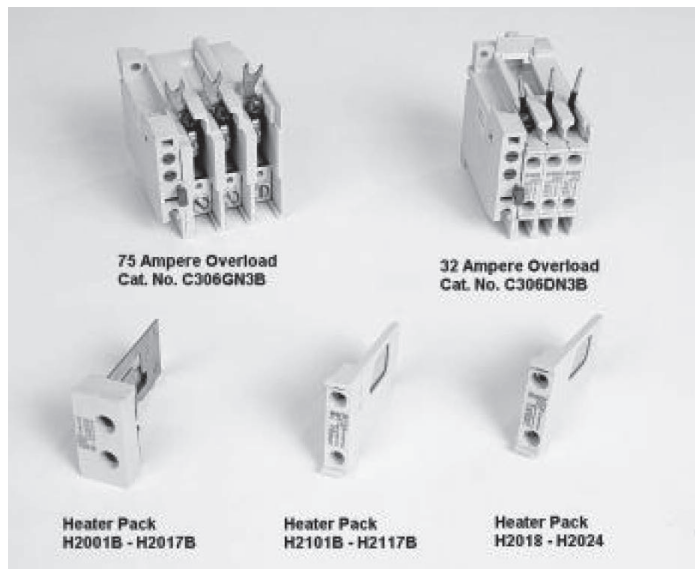


Figure 24. C306 Thermal Overload Relay and Heater Pack

C306 Overload Relay Setting

FLA Dial Adjustment—For motors having a 1.15 service factor, rotate the FLA adjustment dial to correspond to the motor’s FLA rating. Estimate the dial position when the motor FLA falls between two letter values as shown in Figure 25.

For motors having a 1.0 service factor, rotate the FLA dial one-half position counterclockwise (CCW).

Manual/Automatic Reset—The overload relay is factory set “M” for manual reset operation as shown in Figure 25. For automatic reset operation, turn the reset adjustment dial to the “A” position. Automatic reset is not intended for two-wire devices.

Test For Trip Indication—To test overload relay for trip indication when in manual reset, pull out the blue reset button. An orange flag will appear indicating that the device has tripped. Push reset button to reset.

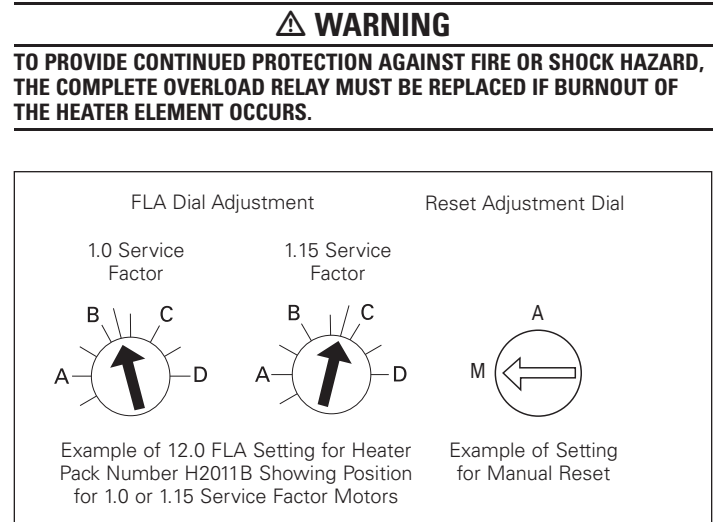


Figure 25. Overload Relay Settings

Current Transformers

When current transformers are used with overload relays, the current through the overload relay heater is related to the motor full-load by the inverse of the current transformer ratio.

WARNING

DO NOT EVER REMOVE HEATERS FROM SIZE 5 AND LARGER STARTERS TO CHECK UNIT OPERATION. THESE STARTERS USE CURRENT TRANSFORMERS TO DROP THE CURRENT TO THE RANGE OF THE SIZE 1 OVERLOAD RELAY. OPERATION WITH HEATERS REMOVED WILL NOT INTERRUPT VOLTAGE TO THE MOTOR AND WILL GENERATE DANGEROUS VOLTAGES IN THE OPEN SECONDARY OF THE CURRENT TRANSFORMER.

Motor Circuit Protector (HMCP)

After installation of the control center, each MCP must be adjusted to actual motor full-load amperes (FLA) so that it will trip at any current that exceeds starting inrush. This setting provides low-level fault protection. The first half-cycle inrush will vary with the motor characteristics. Motors with locked-rotor currents of 6 times motor full-load amperes will usually require an instantaneous magnetic setting of 7 to 11 times motor full-load amperes to prevent tripping when starting.

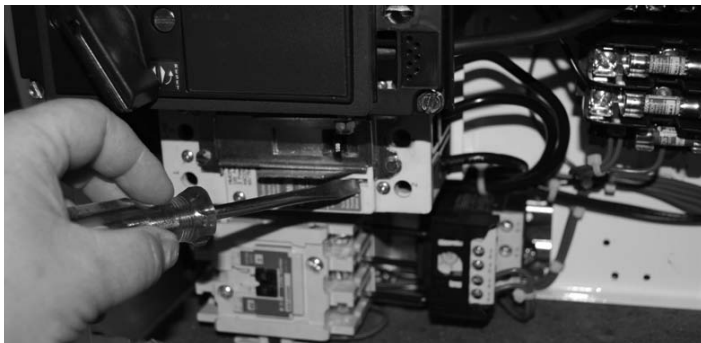


Figure 26. HMCP Magnetic Adjustment

A cam to accept a small narrow-blade electrician's screwdriver is near the lower left corner and around that are eight lettered adjustment points, calibrated in trip amperes. See **Figure 26**. Adjustment should never exceed 13 times FLA, which is in accordance with NEC requirements for magnetic-trip-only breakers. **Adjustment should be made as follows:**

1. Obtain FLA from motor nameplate.
2. Multiply FLA by 13.
3. Set the cam to the highest trip setting that does not exceed the calculated figure of Item 2. This is the maximum setting that should be used.
4. Depress and turn the screwdriver adjustment counterclockwise one setting at a time, until the breaker trips in starting and then adjust upward one setting position. This will ensure that the circuit will open instantly on any current above the motor inrush, usually 7 to 11 times FLA.

The PUSH-TO-TRIP button checks the tripping function and is used to periodically exercise the breaker operating mechanism. The button is designed to be operated by using a small screwdriver.

Once the breaker has tripped, apply force when moving the unit operating handle from the TRIPPED to the RESET position, which is slightly passed the OFF position

Freedom 2100 MCCs are supplied with Type HMCP motor circuit protectors having an interrupting rating to match the short-circuit withstand rating of the bus bar system. For HMCPs in 225, 400, and 600A frame sizes, the magnetic-trip adjustment is set for each pole. A three-pole HMCP has three trip settings to adjust. Place all three poles at the same setting.

Current Limiters for Use with Type HMCP and FD Breakers

The addition of the current limiter provides interrupting capacity above the range handled by the HMCP in motor starters or by FD thermal-magnetic feeder breakers.

Each HMCP or FD breaker rated up to 150A has its own current limiter to provide coordinated protection against faults up to 100,000A, rms symmetrical.

Built-in trip indicators in each phase immediately show when a fault has blown the current limiter and tripped the circuit breaker. This provides protection against single phasing. **After interrupting a fault, the current limiter will require replacement.** After the fault has been cleared, the current limiter is replaced by the removal of three screws. The breaker can then be reset to provide for subsequent high overcurrent protection.

Type HMCP and FD Circuit Breakers with Terminal End Covers

Circuit breakers installed in units connected to 600V distribution systems require a terminal end cap to be installed on the line side. Replace the terminal end cap when replacing circuit breakers in such units.

Part 7. Overload Relay Heater Selection

Heater Selection and Installation

Heaters should be selected on the basis of the actual full load current and service factor as shown on the motor nameplate or in the motor manufacturer's published literature.

When motor and overload relay are in the same ambient and the service factor of the motor is 1.15 to 1.25, select heaters and set **FLA** adjustment dial from the heater application table.

If the service factor of the motor is 1.0, or there is no service factor shown, rotate the FLA adjustment dial counterclockwise one-half (1/2) position.

The conductors attached to the terminals of an overload relay act as a heat sink and are a consideration in establishing the current rating of each heater element. To prevent nuisance tripping, which will occur if undersized conductors are used, select the wire size as if the conductors had an insulation temperature rating of 167°F (75°C), even if the conductors actually used have a temperature rating higher than 167°F (75°C).

Protect heater and starter against short circuits by providing branch circuit protection in accordance with the National Electrical Code.

Note: Before installing heater packs, refer to the motor nameplate for **FLA** (full load amps) and service factor (1.5 or 1.0). Select the heater pack from the proper table on this page.

To install:

Heater Pack
Mounting Screw

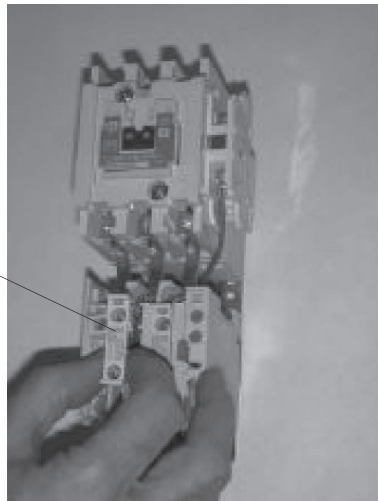


Figure 27. Heater Pack

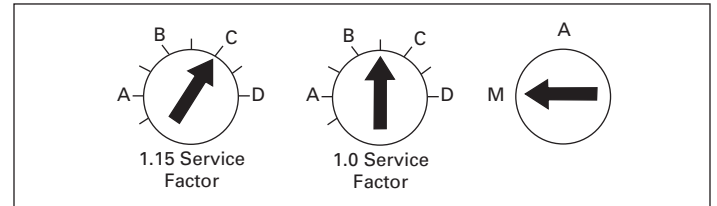
- Insert three (3) identically numbered heater packs into the overload relay with an FLA rating that includes the motor nameplate FLA (full load amps).
- Tighten the heater pack mounting screws securely per recommended torque values listed below.

Heater Pack Numbers	Recommended Torque
H2001B thru H2017B	9 lb-in (1 Nm)
H2018 thru H2024	24-30 lb-in (2.7-3.4 Nm)

- Adjust the FLA adjustment dial to the motor nameplate FLA (full load amps).

The overload is now set for 1.15 service factor.

- If the motor nameplate is 1.0 service factor, rotate the FLA adjustment dial counterclockwise one-half (1/2) position.
- The overload is factory set for **M (MANUAL)** reset operation. If automatic reset is required, turn the reset adjustment dial to **A (AUTO)**. Automatic reset is not intended for two-wire control devices.



To Remove Heater Packs

Loosen two (2) heater pack mounting screws and remove heater pack from overload relay.

Overload Relay Setting

This bimetallic ambient-compensated overload relay is adjustable within the FLA range of the heater pack. Each heater pack is marked with its FLA ratings. With proper heater selection, the overload relay will ultimately trip at 125% FLA for a 1.15 service factor motor and at 115% FLA for a 1.0 service factor motor.

Heater Selection/installation

Select the appropriate heater pack number that corresponds to the motor FLA rating for your application. Insert each heater into the overload relay and tighten heater mounting screws securely per table below.

Note: A total of three individual heaters must be installed in order for the overload relay to work properly.

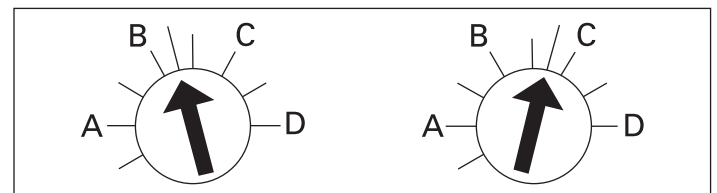
Heater Pack Numbers	Torque
H2001B thru H2017B	9 lb-in
H2018 thru H2024	24-30 lb-in

FLA Dial Adjustment

For motors having a 1.15 service factor, rotate the FLA adjustment dial to correspond to the motor's FLA rating. Estimate the dial position when the motor FLA falls between two letter values as shown in the example. For motors having 1.0 service factor, rotate the FLA dial one-half (1/2) position counterclockwise (CCW).

FLA
ADJUSTMENT 1.0
DIAL SERVICE
 FACTOR

Example of a 12.0 FLA setting for a heater pack number H2011B showing position for 1.0 or 1.15 service factor motor.

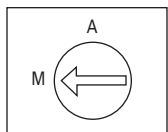


Manual/automatic Reset

The overload relay is factory set at “M” for manual reset operation as shown in the illustration. For automatic reset operation, turn the reset adjustment dial to the “A” position. Automatic reset is not intended for two-wire control devices.

RESET
ADJUSTMENT
DIAL

Example of
setting for
manual reset.



Test for Trip Indication

To test overload relay for trip indication when in manual reset, pull out the blue Reset button. An orange flag will appear indicating that the device has tripped. Push Reset button in to reset.

For more information, go to www.1800oldunit.com or call 1-800-OLD-UNIT.

Table 1. NEMA Size 0 and 1 Heater Pack Selection Table

Motor FLA Rating FLA Dial Positions				Size F Standard Trip Class 20
A	B	C	D	
0.254	0.306	0.359	0.411	H2001B
0.375	0.452	0.530	0.607	H2002B
0.560	0.676	0.791	0.907	H2003B
0.814	0.983	1.15	1.32	H2004B
1.20	1.45	1.71	1.96	H2005B
1.79	2.16	2.53	2.90	H2006B
2.15	2.60	3.04	3.49	H2007B
3.23	3.90	4.56	5.23	H2008B
4.55	5.50	6.45	7.40	H2009B
6.75	8.17	9.58	11.0	H2010B
9.14	10.8	12.4	14.0	H2011B
14.0	16.9	19.9	22.8	H2012B
18.7	22.7	26.7	30.7	H2013B ①
23.5	28.5	33.5	—	H2014B ①

① After the above referenced settings have been made, rotate the FLA dial one position clockwise for these heaters (see table). If less than one position is available, rotate dial maximum. This does not apply when these heaters are used with adapter base. Catalog No. C306TB1. Exception: does not apply to AN16DN0.

Note: For maximum ratings, see table below. Use 75°C copper conductors only. Maximum wire size—8 AWG.

NEMA Size	Amperes	Size	Amperes
0	18	—	—
1	27	F	32

Table 2. NEMA Size 2 Heater Pack Selection Table

Motor FLA Rating ① FLA Dial Positions				Size J and K Standard Trip Class 20
A	B	C	D	
3.23	3.90	4.56	5.23	H2008B
4.55	5.50	6.45	7.40	H2009B
6.75	8.17	9.58	11.0	H2010B
9.14	10.8	12.4	14.0	H2011B
14.0	16.9	19.9	22.8	H2012B
18.7	22.7	26.7	30.7	H2013B
23.5	28.5	33.5	38.5	H2014B
29.0	34.0	39.1	44.1	H2015B
39.6	45.5	51.5	57.4	H2016B ②
53.9	60.9	67.9	74.9	H2017B ②

① For motor FLA values not listed, turn the dial clockwise for higher or counterclockwise for lower ratings.

② After the above reference settings have been made, rotate the FLA dial one position clockwise for these heaters (see table). If less than one position is available, rotate dial to maximum. This note does not apply when these heaters are used with adapter base. Catalog No. C306TB1.

Note: For maximum ratings, see table below. Use 167°F (75°C) copper conductors only. Maximum wire size—3 AWG.

NEMA Size	Amperes	Size	Amperes
2	45	J	60
—	—	K	73

Table 3. NEMA Size 3 and 4 Heater Pack Selection Table

Motor FLA Rating ① FLA Dial Positions				Size N Standard Trip Class 20
A	B	C	D	
18.0	20.2	22.3	24.5	H2018
24.6	27.6	30.5	33.4	H2019
33.5	37.5	41.5	45.6	H2020
45.7	51.2	56.7	62.1	H2021
62.2	69.7	77.1	84.6	H2022
84.7	94.9	105.0	115.0	H2023
106.0	118.0	131.0	144.0	H2024

① For motor FLA values not listed, turn the dial clockwise for higher or counterclockwise for lower ratings.

Note: For maximum ratings, see table below. Minimum wire size—6 AWG.

NEMA Size	Amperes	Size	Amperes
3	90	N	14
4	135	—	—

⚠ WARNING

TO PROVIDE CONTINUED PROTECTION AGAINST FIRE OR SHOCK HAZARD, THE COMPLETE OVERLOAD RELAY MUST BE REPLACED IF BURNOUT OF THE HEATER ELEMENT OCCURS.

Table 4. NEMA Size 5 Heater Pack Selection Table

Motor FLA Rating ^① FLA Dial Positions				Standard Trip Class 20
A	B	C	D	
34	41	48	54	H2003B
49	59	69	79	H2004B
72	87	103	118	H2005B
107	130	152	174	H2006B
129	156	182	209	H2007B
194	234	274	—	H2008B

① FLA rating marked on heater pack multiplied by a transformation ratio. For motor FLA values not listed, turn the dial clockwise for higher or counterclockwise for lower ratings.

Note: For maximum ratings, see table below. Minimum wire size—2 AWG.

NEMA Size	Amperes
5	270

Table 5. NEMA Size 6 Heater Pack Selection Table

Motor FLA Rating ^① FLA Dial Positions				Standard Trip Class 20
A	B	C	D	
144	174	205	235	H2005B
215	259	304	348	H2006B
258	312	365	419	H2007B
388	468	547	—	H2008B

① FLA rating marked on heater pack multiplied by a transformation ratio. For motor FLA values not listed, turn the dial clockwise for higher or counterclockwise for lower ratings.

Note: For maximum ratings, see table below.

NEMA Size	Amperes
6	540

Table 6. Magnetic Reduced-Voltage Starter Classes F600, F700, F890 with C306 Thermal Overload Relay

Starter Type	Class	Multiply Actual Motor Full Load Current by Factor Below and Refer to Adjusted Full Load Current Column in Tables	Quantity of Heaters Required per Starter
Autotransformer	F600	1	3
Part-winding	F700	0.5	6
Star-delta	F800	0.575	3

Part 8. Inspection Prior to Energizing

1. Before energizing the motor control center (MCC), conduct a thorough inspection to make certain that all foreign materials, such as tools, scraps of wire, and other debris, are removed from all units and the structure. Remove any accumulation of dust and dirt with a vacuum cleaner.
2. All circuit connections are tightened at time of assembly by power-driven tools with controlled torque. However, the vibrations experienced in transit may loosen some of these connections. Check at least 10% of the total connections for a tight connection. **Should this spot-check reveal some loose connections, it will be necessary to check all connection points.** The connections to be checked include bus hardware, circuit breaker and switch terminals, contactor and relay terminals, and terminal blocks. Always check the incoming line connections. Tighten to the torque values shown in **Table 7**.
3. Remove all blocks or other temporary holding means used for shipment from all component devices in the MCC interior.
4. Check the enclosure to see that it has not been damaged so as to reduce electrical spacings.
5. Compare all circuits for agreement with the wiring diagrams that accompany the MCC. Be sure that each motor is connected to its intended starter.
6. Make certain that field wiring is clear of live busses and physically secured to withstand the effects of fault current.
7. Check to determine that all grounding connections are made properly.
8. Check all devices for damage. Make all necessary repairs or replacements, prior to energizing.
9. Manually exercise all switches, circuit breakers, and other operating mechanisms to make certain that they are properly aligned and operate freely.
10. Test any ground-fault protection systems that were furnished.
11. Set any adjustable current and voltage trip mechanisms to the proper values.
12. Ensure that overload relay heater elements are installed and selected to the full-load current shown on the nameplate of each motor.
13. Install power circuit fuses in the fusible switches in accordance with NEC application requirements. Make sure that fuses are completely inserted in the clips provided. Do not attempt to defeat the rejection feature on the fuse clip, when provided.
14. Do not operate a current transformer with its secondary circuit open. Ensure current transformer is connected to a load, or a secondary shorting bar is installed.

15. To prevent possible damage to equipment or injury to personnel, check to ensure that all parts and barriers that may have been removed during wiring and installation have been properly reinstalled.
16. Conduct an electrical insulation resistance test to make sure that the MCC and field wiring are free from short circuits and grounds. Do this test phase-to-phase, phase-to-ground, and phase-to-neutral, with the switches or circuit breakers opened.
17. If the MCC contains a labyrinth vertical bus barrier system, verify the operation of the automatic shutters. See **Part 9** for adjustments of this mechanism.
18. Install covers, close doors, and make certain that no wires are pinched and that all enclosure parts are properly aligned and tightened.
19. Turn all circuit breakers and fusible switches to the OFF position before energizing the bus.

Table 7. Driving Torque

Description	lb-in
Control Wiring	
Coil leads	8 lb-in
Relays	8 lb-in
Pushbuttons	8 lb-in
Control fuse blocks	8 lb-in
Auxiliary contacts	8 lb-in
Control Wiring Terminal Blocks	
Side-mounted lug/compression	9 lb-in
Rail-mounted lug type	12 lb-in
Rail-mounted compression type	18 lb-in

Table 8. Power Wiring: Starters

For Freedom Starters with C306 overload & Freedom Contactors	Tightening Torque		Conductors
	Wire size (AWG)	Torque (lb-in)	
Size 1 Contactor	20 lb-in		Use 75°C copper conductors
Size 2 Contactor	Wire size (AWG)		
	14–10	35	
	8	40	
	6–4	45	
	3–2	50	
Size 3 and Freedom Compact Size 4 (CN15MN)	Wire size (AWG)		
	Torque (lb-in)		
	Slotted head screw		
	8	40	
	6–4	45	
	3–1/0	50	
	Socket head screw		
	Socket size (in)		
Torque (lb-in)			
3/16	120		
1/4	200		
5/16	250		
Size 4	275 lb-in		
Size 5	500 lb-in		
Starter with C440 Solid State overload	Wire size (AWG)		
	Torque (lb-in)		
	NEMA 1 & 2	23	
NEMA 1 & 2	12-10	23	
	8-6	28	
NEMA 3	6-1	28	

Table 9. Fused Switches

Description	lb-in
30A fuse assembly	25 lb-in
60A fuse assembly	50 lb-in
100A fuse assembly	50 lb-in
200A fuse assembly	300 lb-in
400A fuse assembly	300 lb-in
600A fuse assembly	300 lb-in

Breakers—Refer to torque values on breaker case.

Table 10. Incoming Line Lugs

Description	lb-in
#2/0–350 MCM	360 lb-in
#2/0–650 MCM	360 lb-in
#2/0–750 MCM	500 lb-in
500–1000 MCM	600 lb-in

Table 11. Bus Bolts

Description	lb-in
All	276 lb-in (23 lb-ft)

Part 9. Unit Installation and Adjustment

Door Removal and Installation

All doors on the control center are mounted on pin hinges to facilitate removal for installation and maintenance operations. With the operating handle on the OFF position, rotate the quarter-turn latches, open the door, remove the hinge pins as shown in Figure 28, partially close the door and lift it from the structure. Reverse this procedure for installation.

Unit Removal and Installation

After opening and/or removing the unit door, the control unit is exposed. With a screwdriver, push in on the latch at the top center of the unit and rotate $\frac{1}{4}$ turn counterclockwise.

⚠ CAUTION

UNITS 18" OR MORE HIGH HAVE A RETAINING BRACE AT THE LOWER EDGE OF EACH SIDE OF THE UNIT FRAME TO ADD STABILITY IN SHIPPING. THE SHIPPING BRACES MAY BE RETAINED OR REMOVED AFTER INSTALLATION; UNSCREW PRIOR TO UNIT WITHDRAWAL.

Pull-apart terminal blocks in the vertical wireway must be disengaged (see Figure 29 and page 9) and wiring from the unit to other units, to master terminal blocks or to load devices must be disconnected before the unit is removed. Grasp the unit as shown in Figure 30 and pull it outward. The first inch of travel pulls the stabs free from the vertical bus, and the grounding clip on the side of the unit frame is also disengaged.

To replace a control unit, position the mounting points on the unit frame with the mating guide rails. Slide the unit inward until all four mounting points are engaged, then move it inward with a quick push. This movement easily overcomes the compression of the stabs as they engage the vertical bus. With the unit in its correct position, the quarter-turn latch is easily engaged by pushing inward and rotating $\frac{1}{4}$ turn clockwise.



Figure 28. Hinge Pin Removal



Figure 29. Disengaging Pull-Apart Terminal Blocks

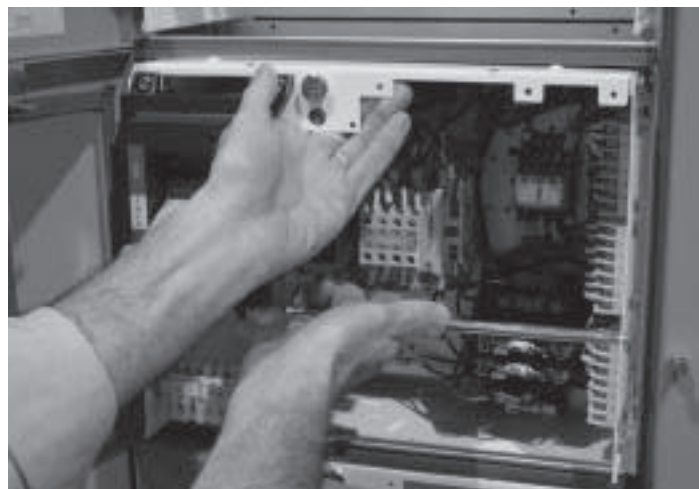


Figure 30. Withdrawing a Unit

Detent Position

For maintenance and test purposes, the unit can be partially withdrawn (approximately 1 ½ inches) until the stabs are free of the bus. In this position, the quarter-turn latch can be rotated clockwise to engage the detent position slot; this will secure the unit to ensure the stabs remain disengaged during maintenance. See Figure 31. The latch can be padlocked in this position.

Operating Handle Linkage Adjustment

Movement of the operating handle in the vertical plane should not be restricted by the handle cavity at either the top or bottom of its travel. Should restriction occur, eliminate it adjusting the length of the operating linkage as shown in Figure 32. Depending on the type of primary disconnect device contained in the control unit, it may be necessary to lengthen or shorten the linkage.

Automatic Shutter Travel Adjustment

When the optional labyrinth vertical bus barrier is installed in the control center, a shutter is provided to automatically cover the stab openings when a control unit is withdrawn. The shutter is opened by engagement of the left-hand side of the control unit with the shutter arm linkage attached to the left-hand vertical structural members. When the unit is withdrawn free of the linkage, a spring automatically moves the shutter to its closed position. See Figure 33 and Figure 4.

With the control unit removed, the shutter should completely cover the stab openings. If it does not cover the openings, use an adjustable wrench to bend the link arm to the right until the shutter covers the stab openings.

If, on re-insertion of the control unit, interference is felt between the stab assembly at the rear of the unit and the shutter, the engagement of the control unit with the shutter arm linkage is insufficient to fully open the shutter. Use an adjustable wrench to bend the linkage arm inward toward the unit to increase its engagement with the unit. An inward bend of approximately ¼ inch will provide sufficient additional shutter travel.

Installing Pilot Devices

The device panel can accommodate up to six pilot devices such as oil-tight pushbuttons, indicating lights, selector switches and miniature meters. If unused space is available and the addition of other devices is desired, observe the following procedure.

After opening the unit door, loosen the two screws at the top of the device panel. Slide the panel ½ inch left to permit it to swing down for access. See Figure 34. With the peen end of a ball-peen hammer or with a drift or chisel, remove the desired knockout.



Figure 31. Unit Locked in Detent Position



Figure 32. Operating Handle Linkage Adjustment



Figure 33. Shutter Arm Linkage

⚠ CAUTION

BRACE THE PANEL SOLIDLY TO AVOID BREAKING THE HINGE PINTS. USE A KNIFE OR SMALL FILE TO REMOVE REMAINING PLASTID BURRS. INSTALL AND WIRE THE NEW DEVICE AND RE-ATTACH THE TOP OF THE DEVICE PANEL TO THE UNIT.

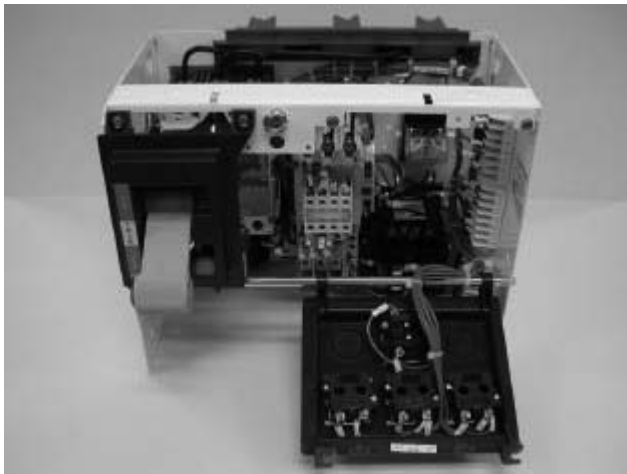


Figure 34. Unit Device Panel

Installing a New Unit

It is recommended that a new unit be installed in a unit space at the top of a vertical compartment or directly below an existing unit. Material provided with the new unit by the factory includes: A divider pan with integral guide rails, a unit door, hinges, catches and hardware. Observe the following sequence of operations for installation.

1. Remove the existing blank door .
2. Position the new unit door over the open space to ensure the hinges and latches are aligned. If the spaces differ, the hinges and latches on the structure must be re-located to match the unit door hinges and latches. Mount the door, using the hinge pins provided.
3. Install the new divider pan in the notches provided in the rear barrier so that it is aligned with the bottom of the new door. Attach the pan to the vertical structure channels with one thread-forming screw on each side.
4. Remove from the vertical bus barrier the flat plate which covers the stab holes that will align with the stabs on the new unit. If an optional labyrinth vertical bus barrier is in place, install an automatic shutter over the stab cutouts. Follow the instruction sheet provided with the shutter kit.

Part 10. Maintenance

Preventive Maintenance

Preventive maintenance should be a program, a scheduled periodic action that begins with the installation of the equipment. At that time, specific manufacturer's instruction literature should be consulted, then stored for future reference. Follow-up maintenance should be at regular intervals, as frequently as the severity of duty justifies. Time intervals of one week, or one month, or one year may be appropriate, depending on the duty. It is also desirable to establish specific check lists for each control, as well as a logbook to record the history of incidents. A supply of renewal parts should be obtained and stored.

This control equipment is designed to be installed, operated, and maintained by adequately trained workmen. These instructions do not cover all details, variations, or combinations of the equipment, its storage, delivery, installation, check-out, safe operation, or maintenance. Care must be exercised to comply with local, state, and national regulations, as well as safety practices, for this class of equipment.

Authorized personnel may open a unit door of a motor control center (MCC) while the starter unit is energized. This is accomplished by defeating the mechanical interlock between the operating mechanism and the unit door. A clockwise quarter turn of the slotted head screw located above the operating handle will allow the door to open. See **Figure 355**.

When servicing and adjusting the electrical equipment, refer to the applicable drawings covering the specific motor control center MCC and any other related interconnection drawings. Follow any instructions that may be given for each device. A list of instruction leaflets covering standard components is shown on page 31 of this manual. Any of these leaflets may be obtained by contacting your nearest Eaton representative.

General Guidelines—The whole purpose of maintaining electrical equipment can be summarized in two rules:

1. Keep those portions conducting that are intended to be conducting.
2. Keep those portions insulated that are intended to be insulated.

Good conduction requires clean, tight joints, free of contaminants such as dirt and oxides.

Good insulation requires the absence of carbon tracking and the absence of contaminants, such as salt and dust that become hygroscopic and provide an unintended circuit between points of opposite polarity.



Figure 35. Defeater Mechanism

⚠ CAUTION

MAINTENANCE OF THE CONTROL COMPONENTS REQUIRES THAT ALL POWER TO THESE COMPONENTS BE TURNED OFF BY OPENING THE BRANCH CIRCUIT DISCONNECT MEANS AND WITHDRAWING THE UNIT TO THE DETENT POSITION (SEE FIGURE 31) OR REMOVING THE UNIT ENTIRELY FROM THE MCC. WHEN UNITS ARE FULLY INSERTED INTO THE MCC, THE LINE SIDE OF EACH DISCONNECT IS ENERGIZED. DO NOT WORK ON FIXED UNITS UNLESS THE MAIN DISCONNECT FOR THE MCC IS OFF.

When working on portions of a branch circuit remote from the MCC, lock the disconnect means for that circuit in the OFF position. To positively lock the operating mechanism in the OFF position, a metal locking bar recessed in the handle may be extended and padlocked with from one to three padlocks. See Figure 36.



Figure 36. Locking Out a Disconnect

With the door open and the disconnect device OFF, the operating handle is mechanically interlocked to prevent inadvertently being pushed ON. To defeat this interlock, the bar on the top of the mechanism should be pushed in slightly, allowing the handle to move upward to the ON position.

⚠ WARNING

IF FULLY INSERTED, THE POWER AND CONTROL CIRCUITS WILL BE ENERGIZED. PADLOCKING TO PREVENT THIS HANDLE MOVEMENT MAY BE ACCOMPLISHED BY THE SAME METHOD AS DESCRIBED ABOVE.

Separate control sources of power must also be disconnected. If control power is used during maintenance, take steps to prevent feedback of a hazardous voltage through a control transformer. Be alert to power factor correction capacitors that may be charged. Discharge them before working on any part of the associated power circuit.

Cleaning. Soot, smoke, or stained areas (other than inside arc chutes), or other unusual deposits, should be investigated and the source determined before cleaning is undertaken. Vacuum or wipe clean all exposed surfaces of the control component and the inside of its enclosure. Equipment may be blown clean with compressed air that is dry and free from oil. (Be alert to built-in oilers in factory compressed air lines!) If air blowing techniques are used, remove arc covers from contactors and seal openings to control circuit contacts

that are present. It is essential that the foreign debris be removed from the control center, not merely rearranged. Control equipment should be clean and dry. Remove dust and dirt inside and outside the cabinet without using liquid cleaner. Remove foreign material from the outside top and inside bottom of the enclosure, including hardware and debris, so that future examination will reveal any parts that have fallen off or dropped onto the equipment. If there are liquids spread inside, determine the source and correct by sealing conduit, adding space heaters, or other action as applicable.

Mechanical Checks. Tighten all electrical connections. Look for signs of overheated joints, charred insulation, discolored terminals, and the like. Mechanically clean to a bright finish (don't use emery paper) or replace those terminations that have become discolored. Determine the cause of the loose joint and correct. Be particularly careful with aluminum wire connections. Aluminum wire is best terminated with a crimp type lug that is attached to the control component. When screw type lugs (marked CU/AL) are used with aluminum wire, the joint should be checked for tightness every 200 operations of the device.

Wires and cables should be examined to eliminate any chafing against metal edges caused by vibration, that could progress to an insulation failure. Any temporary wiring should be removed or permanently secured and diagrams marked accordingly.

The intended movement of mechanical parts, such as the armature and contacts of electromechanical contactors, and mechanical interlocks should be checked for freedom of motion and functional operation.

Wrap-up. Check all indicating lamps, mechanical flags, doors, latches, and similar auxiliaries and repair, if required.

Log changes and observations into record book before returning equipment into service. Do not remove any labels or nameplates. Restore any that are damaged.

Contact Wear and Replacement

Contactors are subject to both mechanical and electrical wear during their operation. In most cases, mechanical wear is insignificant. The erosion of the contacts is due to electrical wear. During arcing, material from each contact is vaporized and blown away from the useful contacting surface.

A critical examination of the appearance of the contact surfaces and a measurement of the remaining contact over-travel will give the user the information required to get the maximum contact life.

Over-travel Measurement

Contact life has ended when the over-travel of the contacts has been reduced to 0.02 inch.

Over-travel of the contact assembly is that part of the stroke that the moving contacts would travel after touching the fixed contacts if they were not blocked from movement by the fixed contacts.

A method of measuring over-travel is as follows:

- A. Place a 0.02-inch feeler gauge between the armature and magnet, with the armature held tightly against the magnet.
- B. Check continually in each phase, i.e., determine if circuit from terminal-to-terminal for each pole is open under these conditions.
- C. If there is continuity through all phases, the remaining over-travel is sufficient. If there is not continuity through all phases, replace all stationary and moving contacts plus moving contact over-travel springs. After replacing parts, manually operate contactor to be sure binding does not occur.

Table 12. Contactor Troubleshooting Chart

Defect	Cause	Remedy
Short contact life	Low contact force	Adjust over-travel, replace contacts, and replace contact springs as required to correct contact force.
	Contact bounce on opening or closing	Correct improper voltage applied to coil. Correct any mechanical defects or misalignment.
	Abrasive dust on contacts	Do not use emery cloth to dress contacts.
	Load current is too high	Reduce load. Use larger contactor.
	Jogging cycle is too severe	Reduce jogging cycle. Check factory for more durable contact material. Use larger contactor.
Overheating	Load current too high	Install arc box.
	Loose connections	Replace broken or eroded insulating parts, arc horns, and grid plates. Clean or replace insulating parts having a heavy coating of foreign conducting material.
	Over-travel and/or contact force too low	Remove contaminating materials that may have accumulated on arc horns and steel-grid plates.
	Ambient temperature is too high	Reduce load. Provide better ventilation. Relocate starter. Use larger contactor.
	Line and/or load cables are too small	Install terminal block and run larger conductors between contactor and terminal block.
Welding of contacts	Over-travel and/or contact force is too low	Adjust over-travel, replace contacts, and replace contact springs as required to correct contact force.
	Magnet armature stalls or hesitates at contact touch point	Correct low voltage at coil terminals as coil draws inrush current.
	Contactors drop open to contact-touch position because of voltage dip	Maintain voltage at coil terminals. Install low voltage protective device, sometimes called "Brownout Protector."
	Excessive contact bounce on closing	Correct coil overvoltage condition.

Maintenance of Motor Controllers after a Fault

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In a motor branch circuit that has been properly installed, coordinated, and in service prior to the fault, opening of the branch-circuit short-circuit protective device (fuse, circuit breaker, motor short-circuit protector, and so on) indicates a fault condition in excess of operating overload. This fault condition must be corrected and the necessary repair or replacements made before re-energizing the branch circuit.

It is recommended that the following general procedures be observed by qualified personnel in the inspection and repair of the motor controller involved in the fault.

Procedure

CAUTION

ALL INSPECTIONS AND TESTS ARE TO BE MADE ON CONTROLLERS AND EQUIPMENT THAT ARE DE-ENERGIZED, DISCONNECTED, AND ISOLATED SO THAT ACCIDENTAL CONTACT CANNOT BE MADE WITH LIVE PARTS AND SO THAT ALL PLANT SAFETY PROCEDURES WILL BE OBSERVED.

Enclosure. Substantial damage to the unit door or frame, such as deformation, displacement of parts, or burning, requires replacement of the entire unit.

Circuit Breaker. Examine the unit interior and the circuit breaker for evidence of possible damage. If evidence of damage is not apparent, the breaker may be reset and turned ON. If it is suspected that the circuit breaker has opened several short-circuit faults or if signs of circuit breaker deterioration appear within the enclosure, the circuit breaker should be replaced.

Disconnect Switch. The external operating handle of the disconnect switch must be capable of opening the switch. If the handle fails to open the switch or if visual inspection after opening indicates deterioration beyond normal wear and tear, such as overheating, contact blade, or jaw pitting, insulation breakage or charring, the switch must be replaced.

Fuse Holders. Deterioration of fuse holders or their insulating mounts requires their replacement.

Terminals and Internal Conductors. Indications of arcing damage and/or overheating, such as discoloration and melting of insulation, require the replacement of damaged parts.

Contactors. Contacts showing heat damage, displacement of metal, or loss of adequate wear allowance require replacement of the contacts and the contact springs. If deterioration extends beyond the contacts, such as binding in the guides or evidence of insulation damage, the damaged parts or the entire contactor must be replaced.

Overload Relays. If burnout of the current element of an overload relay has occurred, the complete overload relay must be replaced. Any indication that an arc has struck and/or any indication of burning of the insulation of the overload relay also requires replacement of the overload relay.

If there is no visual indication of damage that would require replacement of the overload relay, the relay must be electrically or mechanically tripped to verify the proper functioning of the overload relay contact(s).

Return to Service. Before returning the controller to service, checks must be made for the tightness of electrical connections and for the absence of short circuits, grounds, and leakage.

All equipment enclosures must be closed and secured before the branch circuit is energized.

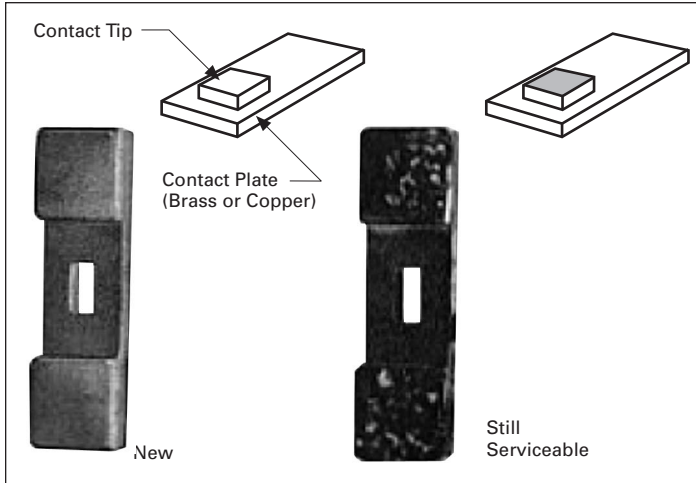


Figure 37. Normal Service Wear

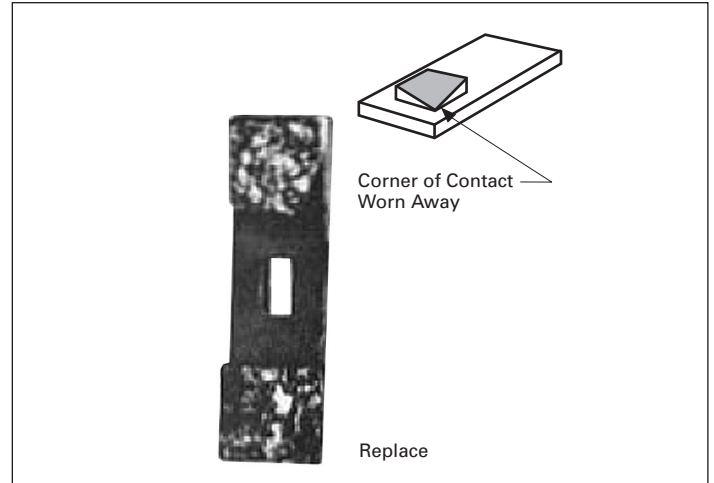


Figure 38. End of Service Life

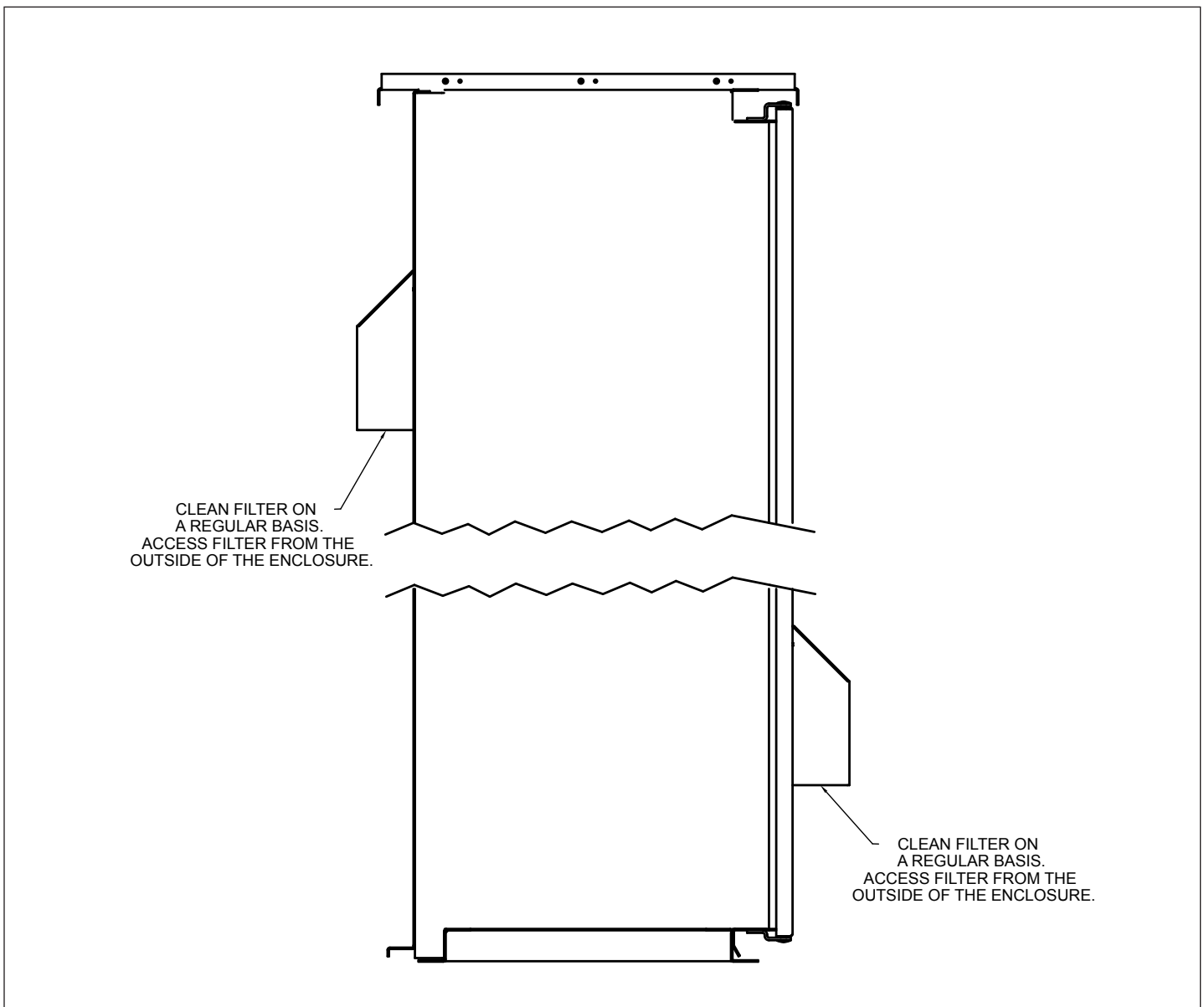


Figure 39. NEMA 3R MCC -All Filters Require Cleaning on Regular Basis

Table 13. Renewal Contact Kits, Coils, and Overload Relays

Description	Coil Suffix	Part Number				
		NEMA Size 1 Series B1	NEMA Size 2 Series B1	NEMA Size 3	NEMA Size 4	NEMA Size 5 Series B1
Renewal Parts Pub.		22177	22177	20426	20428	20429
Contact Kits						
2-Pole		6-65	6-65-7	6-43-5	6-44	6-45
3-Pole		6-65-2	6-65-8	6-43-6	6-44-2	6-45-2
4-Pole		6-65-9	6-65-15	—	—	—
5-Pole		6-65-10	6-65-16	—	—	—
Magnet Coils						
120V 60 Hz or 110V 50 Hz	A	9-2703-1	9-2703-1	9-2756-1	9-1891-1	9-1891-1
240V 60 Hz or 220V 50 Hz	B	9-2703-2	9-2703-2	9-2756-2	9-1891-2	9-1891-2
480V 60 Hz or 440V 50 Hz	C	9-2703-3	9-2703-3	9-2756-3	9-1891-3	9-1891-3
600V 60 Hz or 550V 50 Hz	D	9-2703-4	9-2703-4	9-2756-4	9-1891-4	9-1891-4
208V 60 Hz	E	9-2703-9	9-2703-9	9-2756-5	9-1891-13	9-1891-13
277V 60 Hz	H	9-2703-7	9-2703-7	9-2756-9	9-1891-26	9-1891-26
208/240V 60 Hz	J	—	—	—	—	—
240V 50 Hz	K	9-2703-14	9-2703-14	9-2756-13	9-1891-20	9-1891-20
380–415V 50 Hz	L	9-2703-8	9-2703-8	—	—	—
380V 50 Hz	L	—	—	9-2756-12	9-1891-14	9-1891-14
415V 50 Hz	M	—	—	9-2756-8	9-1891-21	9-1891-21
550V 50 Hz	N	—	—	9-2756-14	9-1891-8	9-1891-8
Overload Relays For replacement on existing starters three-pole— ambient-compensated bimetallic		C306GN3B	C306GN3B	C306KN3	C306NN3	C306DN3B

Table 14. Starter Type

Description	Unit Catalog Number Designation (Class)		
	Disconnect Means		
	Fusible	Circuit Breaker	Circuit Breaker with Current Limiter
Full voltage, non-reversing	F204	F206	F207
Full voltage, reversing	F214	F216	F217
Reduced voltage, autotransformer type	F604	F606	F607
Reduced voltage, part-winding type	F704	F706	F707
Reduced voltage, closed transition star-delta	F894	F896	F897
Full voltage, non-reversing, two-speed, two windings	F954	F956	F957
Full voltage, non-reversing, two-speed, one winding	F944	F946	F947

Part 11. Plan Views

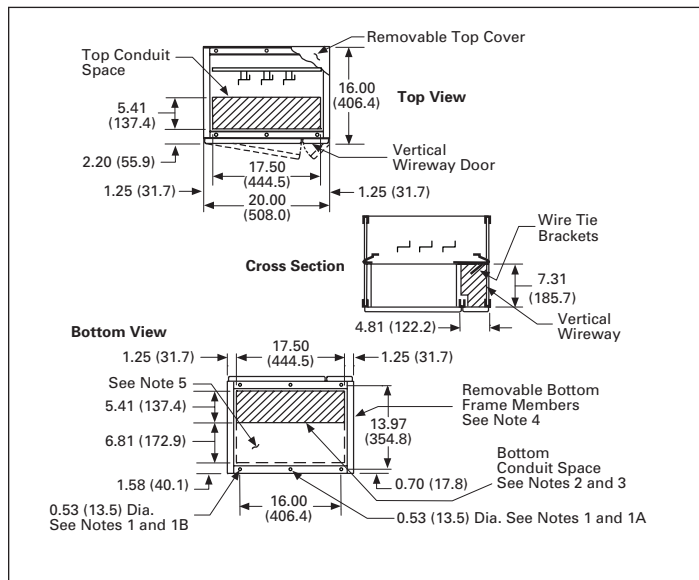


Figure 40. 20 Inches Wide, 16 Inches Deep, Front Mounted Only (4710A30)

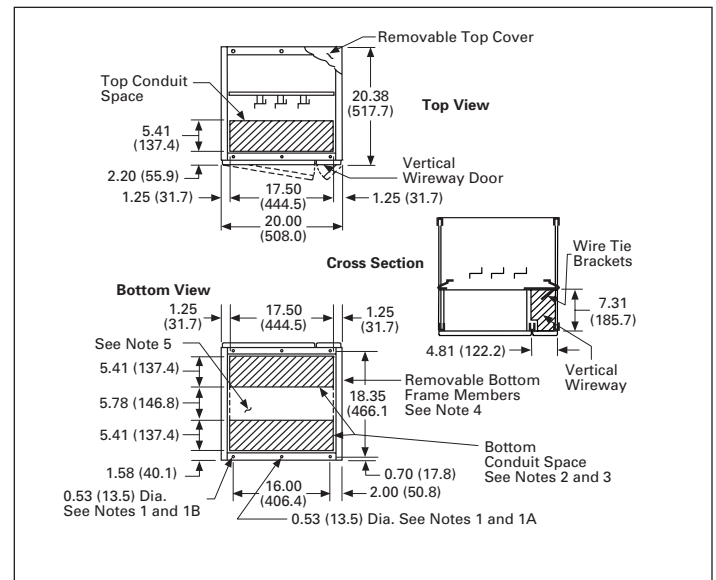


Figure 42. 20 Inches Wide, 21 Inches Deep, Front Mounted Only (4710A31)

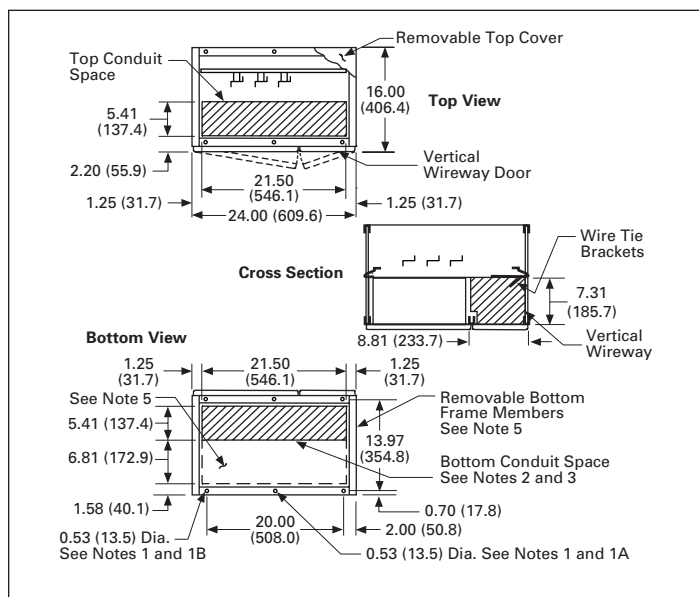


Figure 41. 24 Inches Wide, 16 Inches Deep, Front Mounted Only (4710A33)

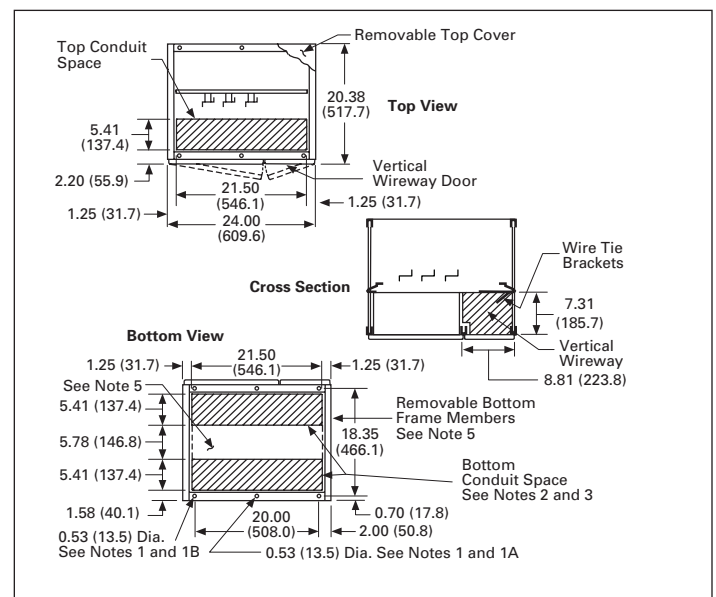


Figure 43. 24 Inches Wide, 21 Inches Deep, Front Mounted Only (4710A34)

Notes:

1. Minimum length of anchor bolt is 2.00 (50.8) (0.38-16 grade 5 torqued at 31 lb-ft).
 - A. For non-seismic, mount with two center bolts per enclosure.
 - B. For seismic, mount with minimum four corner bolts per enclosure.
2. Recommended maximum conduit height above floor line is 3.50 inches (88.9 mm).
3. Maximum conduit space with channel sills is 17.50 x 9.73 inches (444.5 x 247.1 mm).
4. For multiple structure assemblies, either one or both of these members is removed to provide maximum unrestricted conduit space at the bottom of the MCC.
5. This conduit space is not recommended when a neutral bus and/or a space heater is required. Otherwise this space is available for conduit. See **Figure 4646** for vertical dimensions.

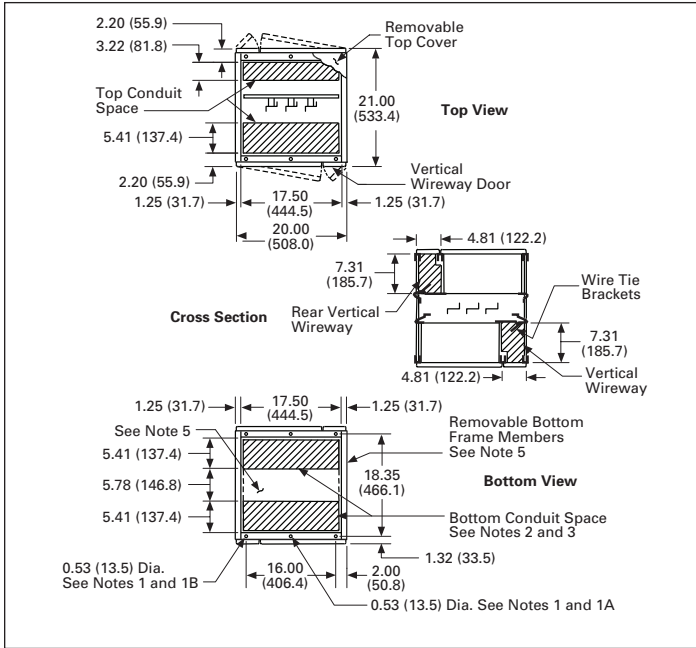


Figure 44. 20 Inches Wide, 21 Inches Deep, Front and Rear Mounted (4710A32)

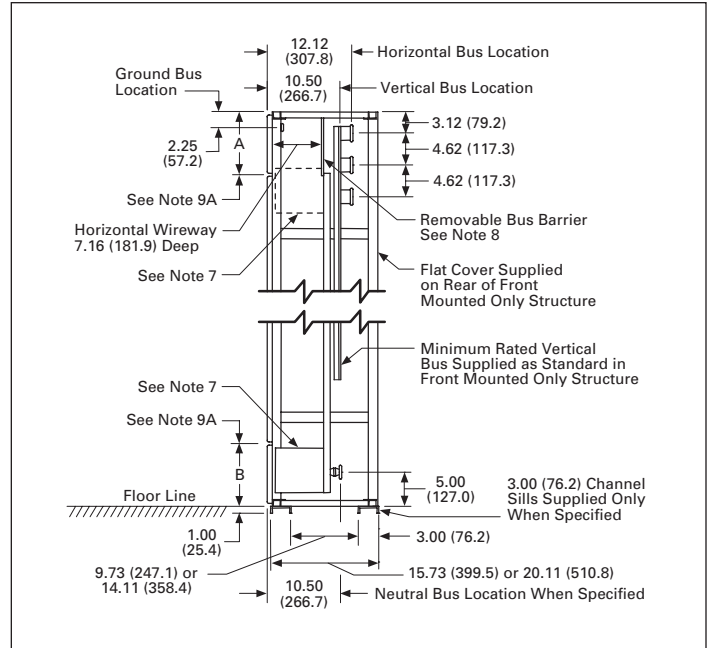


Figure 46. Side View A

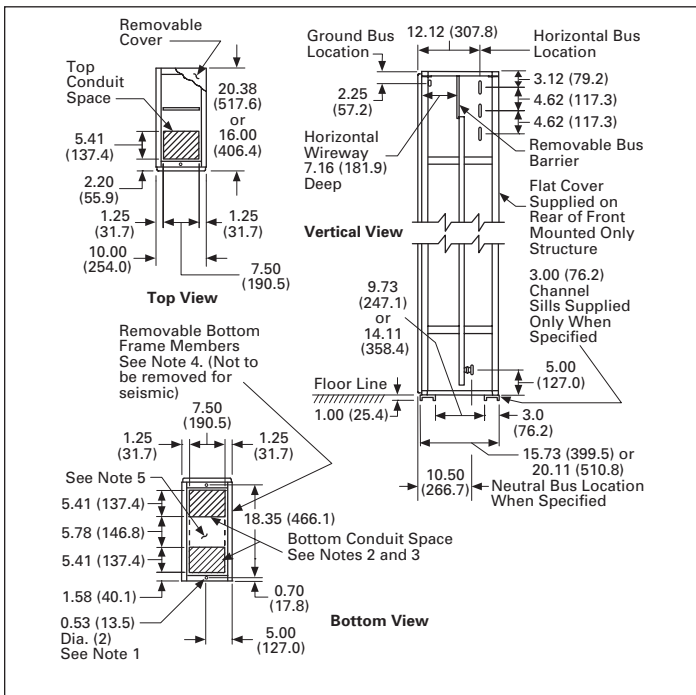


Figure 45. 10 Inches Wide, 16 or 21 Inches Deep, Transition Structure (4710A35/6)

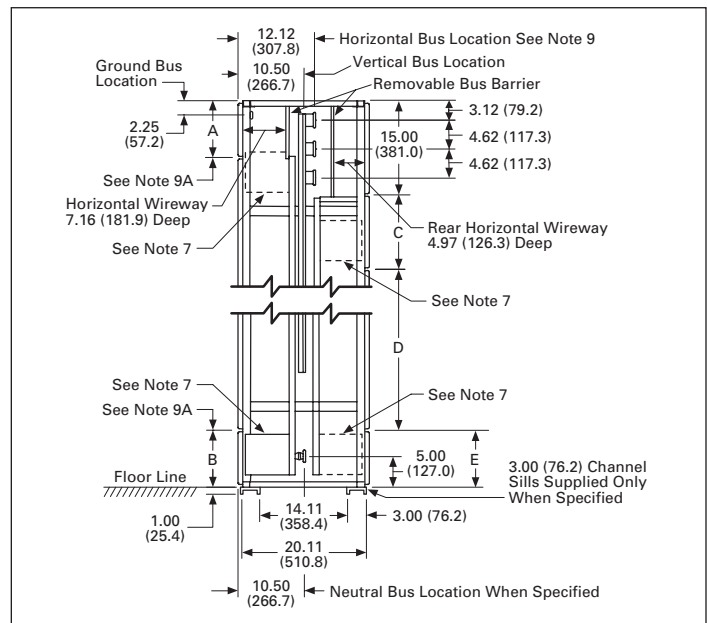


Figure 47. Side View B

Notes:

1. Minimum length of anchor bolt is 2.00 (50.8) (0.38-16 grade 5 torqued at 31 lb-ft).
 - A. For non-seismic, mount with two center bolts per enclosure.
 - B. For seismic, mount with minimum four corner bolts per enclosure.
2. Recommended maximum conduit height above floor line is 3.50 inches (88.9 mm).
3. Maximum conduit space with channel sills is 17.50 x 9.73 inches (444.5 x 247.1 mm).
4. For multiple structure assemblies, either one or both of these members is removed to provide maximum unrestricted conduit space at the bottom of the MCC.

5. This conduit space is not recommended when a neutral bus and/or a space heater is required. Otherwise, this space is available for conduit. See **Figure 4747** for vertical dimensions.
7. Master Terminal Block (MTB) assembly is furnished for Type C wiring only when location not specified. MTB supplied at the bottom.
8. Rear horizontal bus barrier not supplied with front mounted only structure.
9. Standard structure arrangement:
 - A. In front
 - Without MTB: A and B = 9.00 (228.6 mm)
 - With MTB at bottom: A and B = 9.00 (228.6 mm)
 - With MTB at top: A and B = 3.00 (76.2 mm)
 - B. In rear
 - Without MTB: C = 0, D = 72 (1828.8 mm), E = 3.00 (76.2 mm)
 - With MTB at bottom: C = 0, D = 66.00 (1676.4 mm), E = 9.00 (228.6 mm)"
 - With MTB at top: C = 12, D = 60 (1524.0 mm), E = 3.00 (76.2 mm)

Part 12. Related Instructional Leaflets

Publication	Publication No.
Starters	
Size 5, Non-Reversing and Reversing, vacuum	IL17087
Contactors	
Size 5, Non-Reversing and Reversing, vacuum	IL16999
Size 5, Non-Reversing and Reversing, vacuum	IL17088
Circuit Breakers	
Magnum DS	I.B. 2C12060H08
RotoTract Remote Racking Operating Manual	IL0430001E
Series C, F-Frame	IL01219018E
Series C, F-Frame	IL29C101
Series C, J-Frame	IL01204004E
Series C, J-Frame	IL29C103
Series C, K-Frame	IL29C104C
Series C, L-Frame	IL01207002E
Series C, L-Frame	IL29C105
Series C, N-Frame	IL01209003E
Series C, N-Frame	IL29C106
Series C, R-Frame	IL29C613B
Series C, R-Frame	IL29C107
Series G, EG-Frame	IL29C515C
Series G, JG-Frame	IL01207009E
Series G, LG-Frame	IL01207001E
Transfer Switches	IL14477

Eaton Corporation
Electrical Sector
1111 Superior Ave.
Cleveland, OH 44114
United States
877-ETN-CARE (877-386-2273)
Eaton.com

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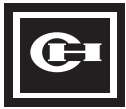


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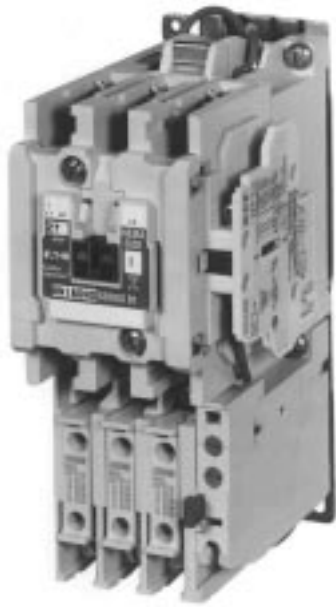
EATON



February 2, 1998
Supersedes TIP AN16, AN56, CN15, CN55
Pages 1-20, Dated 1/1/94

ECN01, ECN02, ECN05, ECN06, ECN07
AN16, AN56, CN15 & CN55
Sizes 00-9, 600V Max.
Non-Reversing & Reversing
NEMA Type Enclosures 1, 3R, 4X & 12
Details On UL & cUL Listing and CSA Certified
Included In This TIP

NEMA Contactors & Starters (Freedom)



SIZE 1
NON-REVERSING STARTER



SIZE 3
NON-REVERSING STARTER

DESIGN CHARACTERISTICS

- **Overload Relays** — Bimetallic Ambient Compensated

Features include:

- Selectable Manual or Automatic Reset operation.
- Interchangeable Heater Packs $\pm 24\%$ to match motor FLA and calibrated for 1.0 and 1.15 service factors.
- Heater packs for Size 00-0 overload relays will mount in larger Size 1 and 2 overload relays — useful in derating applications such as jogging.
- Single phase protection — Class 20 or 10 trip time.
- Electrically isolated NO - NC contacts (pull RESET button to test).
- Visual trip indication
- Integral load lugs allows field wiring prior to heater pack installation.
- NEMA Sizes 5-9 use Current Transformer with 32 Amp overload. Size 5 uses 300:5 CT, Size 6 uses 600:5 CT, Size 7 uses 1000:5 CT, Size 8 uses 1500:5 CT, and Size 9 uses 3000:5 CT.

- **Magnet Coil** — Encapsulated dual voltage/frequency — color coded and permanently marked with voltage, frequency and part number.

A two-piece spring latch contactor design makes coil removal or replacement fast and simple for Sizes 00-2.

The NEMA Size 3-5 features a quick change coil assembly which makes coil removal and replacement fast and simple.

Coil terminals are located on top for easy accessibility. The Size 00 and 0 contactor magnet coils have three terminals, permitting either top or diagonal wiring — European or U. S. style starters can be replaced without changing wiring layout.

The NEMA Sizes 6-8 features a special DC feeder group for coil feeding. This system allows AC or DC applied voltage, low noise and low inrush and holding consumption.

The NEMA Size 9 coil is 110V dc/120V ac (Rectified). AC or DC magnet coils.

- **Contacts** — Long life twin break contacts provide excellent conductivity and superior resistance to welding and arc erosion. Generously sized for low resistance resulting in extended life.



NEMA, Contactors & Starters, (Freedom)

DESIGN CHARACTERISTICS (Continued)

- **Terminals** — Size 00 through 1 ± screw type with captive, backed-out self-lifting pressure plates. Finger proof covers, to reduce electrical shock, are available. Size 2-9:
Control: Back-out saddle clamp with ± screws
Power: Box lugs, pressure type
- **Mounting Position** — Sizes 00-5: Horizontal or vertical on upright panel. Sizes 6-8: 25° from vertical maximum. Size 9: Vertical only.
- **Connections** — Straight through wiring — Line lugs at top, load lugs at bottom.
- **Standards** —
UL listed (Size 00-8):
Open — File #E1491, Guide #NLDX
Enclosed — File #E19224, Guide #NLDX
UL listed (Size 9):
Open and Enclosed — File #E19224, Guide #NLDX
Except Size 9 Reverser Not UL Listed.
cUL listed (Size 00-8):
Enclosed — File #E19224, Guide #NLDX
CSA certified — (Size 00-8):
Open — File #LR353, Class #3211-04
Designed to meet or exceed NEMA standards.
- **Ambient Temperature** — -5°C to + 65°C
- **Enclosures** — Open or NEMA 1, 3R, 4X, and 12 enclosed. Snap-on cover control kits Size 00-4 NEMA 1; flange mount all other enclosure types.
- **Construction** — Designed specifically for use in applications requiring NEMA ratings. Starters meet or exceed NEMA standards ICS 2-1988.
- **Mechanical/Electrical Life** — Designed to 30 million mechanical operations at maximum HP ratings for Sizes 00 & 0, 10 million for Sizes 1 & 2, 5 million for Sizes 3-8. Designed to 3 million electrical operations for Sizes 00-3 and 500 thousand for Sizes 4-8. Size 9 mechanical life in excess of 24K operations and electrical life AC-3 (N/A); AC-4 in excess of 50 operations.
- **Wiring** — Wired for separate or common control.
- **Holding Circuit Interlock** — NEMA Starters Sizes 0-3 are supplied with 1 NO auxiliary contact mounted on the right hand side. On Size 00, interlock occupies 4th power pole position — no increase in width. Sizes 4 and 5 have NO interlock on left side, Sizes 6 and 7 have a 2NO/2NC auxiliary mounted on top between arc-chutes and Size 8 has NO/NC auxiliary on left side and a NO on the right. Size 9 supplied with 2 auxiliary contacts. Each with 1 NO & 1 NC.
- **Mounting** — Supplied with steel mounting plate as standard.

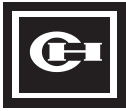
OPTIONAL FEATURES

- **Auxiliary Contacts** — Open type starters will accept up to 8 NO or NC auxiliary contacts (4 for Size 8) — includes holding circuit interlock. Enclosed contactors and starters will accept up to 4 NO or NC auxiliary contacts up to Size 1 in NEMA 1 enclosures. For larger sizes and other NEMA type enclosures, up to 8 NO or NC auxiliary contacts can be added.
- **Mechanical Interlock & Reversing Kits** — Available for field assembly of reversing contactors/starters up to Size 7.
- **Timer** — Two types — Side mounted five function Solid-State timer with timing ranges up to 5 minutes for use with open or enclosed starters/contactors, and top mounted pneumatic timers convertible from OFF to ON delay with timing ranges up to 3 minutes for use with open starters/contactors. Sizes 00-5 only.
- **Transient Suppressor Kit** — Limit high voltage transients produced in the control circuit when power is removed from the coil. For Sizes 00 through 2 there are three separate panel-mounted suppressors for use on 120, 240 or 480 volt coils. For Sizes 3 through 5 there is one separate side mounted suppressor for use on 120 volt coils.
- **Control Circuit Fuse Block** — Sizes 00-2 panel mounted and Sizes 3-5 side mounted fuse holder for control circuit protection. Uses Class CC rejection type fuses, 30 ampere, 600 volt ac maximum.
- **Locking Cover for Overload Relay** — Snaps over top of overload relays to prevent accidental turning of trip or reset adjustments.
- **Branch Circuit Fuse Block Kits** — Sizes 00 through 2, 3-pole, top-mounted. Provide short circuit protection for branch circuits.
- **Phase Monitor Relays** — Designed to monitor phase voltage unbalance, incorrect phase sequence and line undervoltage of a 3 phase system. Sizes 00-5 only.
- **Cover Controls for Enclosures** — Numerous push-buttons, selector switches and indicating lights are available either factory installed or as kits to be installed by others. These local control devices are available for NEMA 1, 3R, 4X and 12 enclosures.
- **Other Options for Enclosures** — Many other optional features such as meters, terminal strips, relays timers, control power transformers, fuse blocks and other accessories are available for installation in enclosed contactors and starters.

DESCRIPTION

Non-Reversing Starters

Line voltage magnetic starters are used for starting polyphase squirrel cage motors when full starting torque and the resulting inrush current are acceptable. These starters also provide protection to the motor against running or stalled overcurrents.



NEMA, Contactors & Starters, (Freedom)

The "Freedom Series" starters feature a compact space saving design using state-of-the-art technology and the latest in high strength, impact and temperature resistant insulating materials.

Reversing Starters

Three phase, full voltage magnetic starters are used primarily for reversing of polyphase squirrel cage motors. They consist of two contactors and a single overload relay assembled together. The contactors are mechanically and electrically interlocked to prevent line shorts and energization of both contactors simultaneously.



SIZE 1
REVERSING
STARTER



SIZE 0
REVERSING
STARTER

GENERAL

Magnet Coil — Magnet coils are encapsulated dual voltage/frequency coils which are color coded and permanently marked with voltage, frequency and part number. Coil terminals are located on top for easy accessibility.

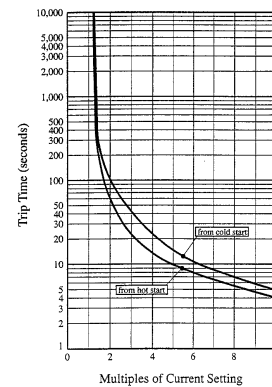
Overload and Heater Packs — Overload relays used on "Freedom Series" starters come in four sizes — 32 amperes, 75 amperes, 105 amperes and 144 amperes. They can be attached directly to contactors (panel mount or common mounting plate) or, with a panel mounting adapter, as a stand alone panel mounted 32 ampere or 75 ampere overload relay. The panel mounting adapter also provides a terminal block for line side wiring to the stand alone overload relay. Sizes 5-9 use 32 amps with CT's.

The overload relay houses an adjustable, trip-free mechanism and provides mounting for three heater packs. The mechanism is bimetallic with ambient compensated operation. Single phase protection is built in. The reset mechanism can be set for AUTO or MANUAL operation. It has $\pm 24\%$ adjustability to match motor full load ampere rating with calibration for 1.0 or 1.15 service factor motors. Two isolated contacts, one NC and one NO can be tested by pulling the RESET button. The NC and NO contacts are rated B600 and C600 (refer to Ratings tables on Page 8) respectively. Like the contactor, the overload relay has "finger proof" terminals to reduce the possibility of electrical shock.

Tamper proof overload relay adjustment locking covers snap over the top of overload relays to prevent accidental turning of trip or reset adjustments. Consult the Industrial Control Catalog for information on the variety of covers available.

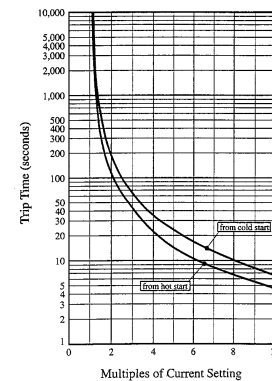
Visual trip indication is provided on all overload relays. The indicator window is located on the lower right-hand corner of the switch unit, just below the reset button. Upon an overload trip (or by pulling up on the reset button), a fluorescent orange indicating flag will appear in the window. Trip indication is only present when using Manual Reset.

CLASS 10
TYPE C306
OVERLOAD
RELAY



TRIP CURVE
TYPE C306 BIMETALLIC COMPENSATED
OVERLOAD RELAY 25°C OPEN RATING

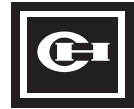
CLASS 20
TYPE C306
OVERLOAD
RELAY



TRIP CURVE
TYPE C306 BIMETALLIC COMPENSATED
OVERLOAD RELAY 25°C OPEN RATING

The heater packs are securely held in the overload relay by two captive screws. Three Class 20 (Class 10 optional) heater packs are installed in the overload relay. The 32 ampere heater packs will mount in the 75 ampere overload relay for applications where the contactor is derated such as for jogging.

The overload relay is adjustable within the FLA range of the heater pack and will ultimately trip at 125% motor current. After the heater packs are selected and installed in the overload relay, the FLA adjustment dial should be rotated to the dial position corresponding to the motor FLA.



NEMA, Contactors & Starters, (Freedom)

Diagram	Heater Pack Selection Table ①				
	Motor FLA Rating				Heater Pack Number
	FLA Dial Positions				
A	B	C	D		
18.0	20.2	22.3	24.5	H2018-3	
24.6	27.6	30.5	33.4	H2019-3	
33.5	37.5	41.5	45.6	H2020-3	
45.7	51.2	56.7	62.1	H2021-3	
62.2	69.7	77.1	84.6	H2022-3	
84.7	95.0	105.0	115.0	H2023-3	
106.0	118.0	131.0	144.0	H2024-3	

① Example of Heater Pack Selection Table only. Refer to catalog for complete table.

For example, if the FLA rating is 75.2 amperes, heater packs number H2022-3 should be selected from the above listed Heater Pack Selection Table. For a 1.15 service factor motor the FLA adjustment dial should be set at the location shown in the above diagram by interpolating between the B position of 69.7 amperes and the C position of 77.1 amperes. If a 1.0 service factor motor would be involved, the dial should be rotated counterclockwise one graduation (one half position) to the dotted location in the diagram.

Power Poles — Power poles are available for the Sizes 00, 0, 1 and 2 contactors and starters only. The 00 & 0 power pole is rated 12 amps (20 amp thermal) and the 1 & 2 is rated the same as the basic devices.

A maximum of two power poles can be used per contactor or starter. They cannot be field or factory installed. The power poles have been designed to accept mechanical interlocks and side mounted auxiliary contacts.

General Auxiliary Contacts Information — Auxiliary contact blocks are designed for snap-on installation — fast, easy installation (no tools required). Side mounted contact blocks are available in 8 different circuit configurations — top mounted contact blocks are offered in 21 different combinations. Enclosed type starters will accept side-mounted auxiliaries only when mounted in standard enclosures. In larger enclosures, top mounted contacts can be added.

All auxiliary contacts are of the bifurcated design with parallel circuit paths. This redundant path provides very high reliability.

For rating information, refer to the “Auxiliary Contact Ratings” table in this publication on Page 8.



Side Auxiliary Contacts — All starters are supplied as standard with one normally open (1 NO) auxiliary contact for use as a holding circuit contact. Reversing starters have in addition, one normally closed (1 NC) auxiliary contact for electrical interlocking purposes.

On Size 00, the holding contact occupies the 4th power pole position (no additional space required). Up to two additional contacts may be added to each side of a Size 00 starter. On Sizes 0-2, the NO holding contact is located on the right side of the contactor. Up to two additional contacts may be added to the left side.

On Sizes 3-5, the NO holding contact is a base contact (on the right on Size 3 and on the left on Sizes 4 & 5). Up to 2 additional contacts can be mounted on the base interlock. On the opposite side, up to 4 additional auxiliary contacts can be added.

On Sizes 6 & 7, there is 2NO/2NC contact block mounted on the top-left position. An additional 2NO/2NC block may be added to the top-right position. On Size 8, there is a NO/NC block on the left back and a NO on the right back. Additional NO/NC blocks may be added on the left and right front positions.

On Size 9, 2 auxiliary contacts are provided, each with 1 NO and 1 NC.

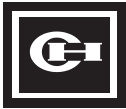
Top Auxiliary Contacts — Open type starters, Sizes 00-2, will accept top auxiliary contacts (up to four circuits possible). This allows a total of up to 8 extra auxiliaries on Size 00 (6 extra auxiliaries on Sizes 00-2).

Electronic Timer — The side mounted, five-function Electronic Timer attachment has a 1 NO - 1 NC relay output and is designed for easy installation to any Freedom Series starter. It is available in three different timing ranges from 0.3 to 300 seconds. Additional auxiliary contacts cannot be installed on same side of starter when timer is used. For Sizes 3-5 a separate mounting bracket is required.



ELECTRONIC
TIMER MODULE

- Timing Modes
 - ON DELAY - Timing begins when timer is energized.
 - OFF DELAY - Timing begins when timer is deenergized.
 - ONE SHOT - A single pulsed output occurs when timer is energized.



NEMA, Contactors & Starters, (Freedom)

- ON DELAY/OFF DELAY - Timer delay occurs on both energization and deenergization of timer.
- CYCLE MODE - Dual delay with external connections to the NC output contact, cycles ON and OFF continuously.

Delay mode is selectable with two switches on the face of the timer. The time is set by a serrated dial on the module face. Timer can also be mounted directly on 35 mm DIN rail.

• Specifications

- Repeat Accuracy – within $\pm 1\%$
- Setting Accuracy – $\pm 10\%$ of scale setting

Description	Maximum Current Rating, Amperes		
	Volts, ac		Volts, dc (Resistive)
	120	240	30
Make	30	15	5
Break	3	1.5	5
Continuous	3	1.5	5

Pneumatic Timer — The Pneumatic Timer attachment is designed for snap-on installation to top of any Size 00-2 starter (top mounted auxiliary contacts cannot be installed on device when timer is used). It is available in two ranges from 0.1 to 180 seconds. Timer unit has D.P.D.T. timed contacts – circuits in each pole must be the same polarity. Units are convertible from OFF to ON delay or vice-versa. Contacts are rated A600. Repeat accuracy is $\pm 10\%$.

PNEUMATIC TIMER ATTACHMENT

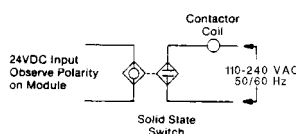


DC/AC Interface Module — The Interface Module is an optically isolated solid state switch which provides a means of operating ac coils with a 24 volt dc control signal. It acts as a space saving interposing relay which can switch a 110-240 volt, 50/60 Hz source to the contactor or starter coil.

The module may be directly attached to the coil terminals of any Freedom Series contactor or starter - Size 00-2. It also has provisions for DIN rail mounting.



INTERFACE MODULE



TYPICAL APPLICATION

DC Magnet Coils — Dc Magnet Coils are available either factory installed or as field conversion kits.

Transient Suppressor Kit — Sizes 00-2 device connects across terminals on any 120 V, 240 V or 480 V starter magnet coil and Sizes 3-5 side mounted device connects across terminals on a 120 volt starter magnet coil. Suppressors are designed to limit the high voltage transients produced in the circuit when power is removed from the coil.

TRANSIENT SUPPRESSOR KITS



FOR SIZES 00-2



FOR SIZES 3-5

Control Circuit Fuse Block — Size 00-2 panel mounted and Size 3-5 side mounted fuse holders, designed for control circuit protection or other similar low current requirements, have extractor type fuse caps.

The Class CC rejection type fuses (KTK-R) used in these holders are intended for use with equipment designated as being suitable for use on systems having high available fault currents.

If branch circuit protective device is 45 amperes or greater, C320FBR1 fuse kit may be required for control circuit protection per NEC 430-72.



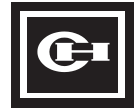
CONTROL
CIRCUIT
FUSE BLOCK

3-Pole Top Mounted Branch Circuit Fuse Block Kits —

Designed to save space and reduce installation time, these top mounted fuse block kits field mount to any Size 00-2 starter and provide short circuit protection for branch circuits. Available for Class H, R, G or T fuses rated 15 through 60 amperes and Class J fuses rated 15 through 100 amperes, 250 through 600 volts.

MOUNTED FUSE
BLOCK



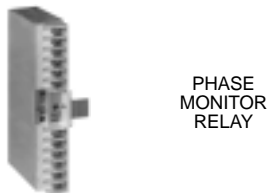


NEMA, Contactors & Starters, (Freedom)

Mechanical Interlock and Reversing Kits — These kits are available for field assembly of reversing starters using components. The Reversing Kits include a mechanical interlock, stabilizer bar and a pre-cut, trimmed and formed wire set. Auxiliary contacts are not supplied but can be ordered separately. The snap-fit mechanical interlock and stabilizer bar do not require tools for assembly. Installation instructions are included with the device.



Phase Monitor Relay — Phase Monitor Relays are designed to monitor phase voltage unbalance, incorrect phase sequence and line undervoltage of a 3 phase system.



Finger Protection Shields — Snap-on shields for both contactors and starters, reversing and non-reversing provides type IP20 Finger Protection. Prevents accidental contact with line load terminals.



Overload Locking Covers — Snap-on transparent or opaque plastic panel for covering access port to the overload relay trip setting dials. Helps prevent accidental or unauthorized changes to trip reset setting. Five varieties offers maximum application flexibility.



Short Circuit Protection — Fuses and Inverse-Time Circuit Breakers may be selected per Article 430, Part D of the National Electrical Code to protect motor branch circuits from fault conditions. If higher ratings or settings are required to start the motor, do not exceed the maximum as listed in Exception No. 2, Article 430-52.

ENCLOSURES

NEMA Definitions

Type	Definition
1	Enclosures are intended for indoor use primarily to provide a degree of protection against limited amounts of falling dirt.
3R	Enclosures are intended for outdoor use primarily to provide a degree of protection against rain, sleet, and damage from external ice formation.
4X	Enclosures are intended for indoor or outdoor use primarily to provide a degree of protection against corrosion, windblown dust and rain, splashing water, hose-directed water, and damage from external ice formation.
12	Enclosures are intended for indoor use primarily to provide a degree of protection against circulating dust, falling dirt, and dripping noncorrosive liquids.

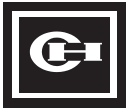


ENCLOSED STARTERS

Cover Control Kits for Enclosures — These kits are available for NEMA 1 enclosures in versions such as Start/Stop, Hand-Auto, Hand-Off-Auto, Test-Off-Auto — all available with and without pilot light options. For reversing applications, Forward-Stop-Reverse, Up-Stop-Down and Open-Stop-Close with and without pilot lights are available. For other NEMA types, these and other versions such as On-Off are available. The kits are complete with wires and instructions. Assembly is fast and easy, requiring only a screwdriver in most cases. NEMA 1 enclosures have removable blank plates or knockouts and NEMA 3R, 4X and 12 enclosures have removable hole plugs that cover the pre-punched holes.



ISLAND & 10250T TYPE COVER CONTROL WITH ACCOMPANYING ENCLOSURES



NEMA, Contactors & Starters, (Freedom)

REFERENCE DATA

NEMA AN16 Starters — High Fault Current Circuit Ratings — UL508

SCPD	Max Rating SCPD (A)	Cir Bkr Intrap Rating (KA)	Short Circuit Volt (V)	Withstand Current (KA)	Typical Disconnect
Size 00					
Data To Be Available Later					
Size 0					
Class R, J Fuse ①	60	100	600	100	C361
Mag Bkr — HMCP ①	30	100	480	100	HMCP
Thrm Mag — FDC ①	35	100	480	100	FDC
Size 1					
Class R, J Fuse ①	60	100	600	100	C361
Mag Bkr — HMCP ①	30	100	480	100	HMCP
Thrm Mag — FDC ①	90	100	480	100	FDC
Size 2					
Class R, J Fuse ①	100	100	600	100	C361
Mag Bkr — HMCP ①	50	100	480	100	HMCP
Thrm Mag — FDC ①	150	100	480	100	FDC
Size 3					
Class R, J Fuse ①	200	100	600	100	C361
Mag Bkr — HMCP ①	150	100	480	100	HMCP
Thrm Mag — FDC ①	150	100	480	100	FDC
Size 4					
Class R, J Fuse ①	400	100	600	100	400 A K SW
Mag Bkr — HMCP ①	150	100	480	100	HMCP
Thrm Mag — JDC ②	250	100	480	100	JDC
Size 5					
Class R, J Fuse ①	600	100	600	100	600 A K SW
Mag Bkr — HMCP ②	600	100	480	100	HMCP
Thrm Mag — KDC ②	400	100	480	100	FDC
Size 6					
Class L Fuse ①	1200	---	600	100	800 A K SW
Class L Fuse ①	1200	---	600	100	Mld Case N Fr
Thrm Mag — HLD ②	800	65	480	65	HLD

① UL File E39943 — Issue Date 2/15/89.

② UL File E47048 — Issue Date 11/23/87.

NOTE:

UL 508 STANDARD FAULT CURRENT RATINGS: All devices are UL Listed with fuses and inverse time circuit breakers to standard low level fault currents based on horsepower. All AN16 starters conform. Sizes 00-3 to 5kA. Sizes 4-5 to 10kA. Size 6 to 18kA. Size 7 to 30kA. Size 8 to 42kA and Size 9 to 85kA.

Electrical Data

NEMA Size	Frame Width	Ampere Rating, Continuous	Maximum Horsepower		
			Motor Voltage 60 Hz	1 φ	3 φ
00	45 mm	9	115	1/3	---
			200	---	1 1/2
			230	1	1 1/2
			460	---	2
0	45 mm	18	115	1	---
			200	---	3
			230	2	3
			460	---	5
1	65 mm	27	115	2	---
			200	---	7 1/2
			230	3	7 1/2
			460	---	10
2	65 mm	45	115	3	---
			200	---	10
			230	7 1/2	15
			460	---	25
3	90 mm	90	115	---	---
			200	---	25
			230	---	30
			460	---	50
4	180 mm	135	115	---	---
			200	---	40
			230	---	50
			460	---	100
5	180 mm	270	115	---	---
			200	---	75
			230	---	100
			460	---	200
6	220 mm	540	115	---	---
			200	---	150
			230	---	200
			460	---	400
7	280 mm	810	115	---	---
			200	---	200
			230	---	300
			460	---	600
8	334 mm	1215	115	---	---
			200	---	400
			230	---	450
			460	---	900
9	813 mm	2250	115	---	---
			200	---	---
			230	---	800
			460	---	1600
			575	---	1600



NEMA, Contactors & Starters, (Freedom)

Auxiliary Contact Ratings

NEMA Electrical Rating Designation	Volts	Amperes		
		Make	Break	Continuous
A600	120	60	6	10
	240	30	3	
	480	15	1.5	
	600	12	1.2	
B600	120	30	3	5
	240	15	1.5	
	480	7.5	0.75	
	600	6	0.60	
C600	120	15	1.5	2.5
	240	7.5	0.75	
	480	3.75	0.38	
	600	3.00	0.30	

Wire (75°C) Sizes — AWG or kcmil – Open and Enclosed

NEMA Size	Cu Only
Power Terminals — Contactors	
00	#12 – #16 Stranded, #12 – #14 Solid
0	#8 – #16 Stranded, #10 – #14 Solid
1	#8 – #14 Stranded or Solid
2	#3 – #14 (upper) and/or #6 – #14 (lower) Stranded or Solid ②
Power Terminals — Load (Overload Relay)	
Heater Pack Cat. Nos.	① Min. — Cu Only (Stranded or Solid)
H2001B-H2010B H2101B-H2110B	#14
H2011B & H2111B	#12
H2012B & H2112B	#10
H2013B-H2014B H2113B-H2114B	#8
H2015B & H2115B	#6
H2016B & H2116B	#4
H2017B & H2117B	#3
H2015A-H2017A H2114-H2117	#14-#2
Power Terminals – Line and Load	
3	#1/0 – #14 Al Cu
4	#3/0 – #8 Al Cu
5	750 kcmil – #2 or (2) 250 kcmil – #3/0 Al Cu
6	(2) 750 kcmil — #3/0 Al Cu
7	(3) 750 kcmil — #3/0 Al Cu
8	(4) 750 kcmil — #1/0 Al Cu
9	(8) 500 kcmil
Control Terminals — Cu Only	
All	#12 – #16 Stranded or #12 – #14 Solid

① Minimum per NEC.
Maximum Wire Size: Sizes 00 & 0 — #8 and Sizes 1 & 2 — #2.
② Two compartment box lug.

Torque Requirements — Line/Load and Heaters (in-lbs)

NEMA Size	AN16/56 Starters				
	Line Lug ④		Load Lug		Heater Packs in-lbs
	Torque in-lbs	Wire Range	Torque in-lbs	Wire Range	
00	7	③	20	③	9
0	15	③	20	③	9
1	20	③	35	#14-10	9
			40	#8	9
			45	#6-4	9
			50	#3	9
2	40 45 50	#14-8 #6-4 #3	35	#14-10	9
			40	#8	9
			45	#6-4	9
			50	#3	9
3	35 40 45 50	#14-10 #8 #6-4 #3-1/0	35	#14-10	24-30
			40	#8	24-30
			45	#6-4	24-30
			50	#3-1/0	24-30
4	200	③	200	③	24-30
5-7	550	③	550	③	9
8	500	③	500	③	9
9	400	4/0-500 MCM	400	4/0-500 MCM	9

③ See "Wire Sizes" Table adjacent.
④ For contactors this is "Line and Load Lug" data.

Plugging and Jogging Service Horsepower Rating

NEMA Size	200 Volts	230 Volts	460 Volts	575 Volts
Maximum horsepower where operation is interrupted more than 5 times per minute, or more than 10 times in a 10 minute period.				
00	---	1/2	1/2	1/2
0	1 1/2	1 1/2	2	2
1	3	3	5	5
2	7 1/2	10	15	15
3	15	20	30	30
4	25	30	60	60
5	60	75	150	150
6	125	150	300	300



NEMA, Contactors & Starters, (Freedom)

AC COIL DATA

NEMA Sizes	P.U. Volts		P.U.			Sealed			D.O. Volts		Mech. Max. Operation Rate Ops/Hour	P.U. Time mS	D.O. Time mS
	Cold	Hot	VAR	VA	Watts	VAR	VA	Watts	Cold	Hot			
00	74.0%	78%	64	80	49	7.1	7.5	2.4	45%	46%	10,800	12	12
0	74.0%	78%	78	100	65	9.2	10	3.1	45%	46%	10,800	12	12
1-2	74.0%	78%	210	230	95	27	28	7.8	49%	50%	7,200	20	14
3	72.0%	76%	374	390	112	48	49.8	13	50%	52%	7,200	14	11
4	72.5%	76%	1132	1158	240	96	100	27.2	54%	56%	4,800	28	14
5	75.0%	77%	1132	1158	240	96	100	27.2	63%	64%	4,800	25	13
6	75.0%	75%	516	890	798	---	11	10	①	①	2,400	100	150-1000 ②
7	75.0%	75%	868	1000	1345	11	25	20	①	①	1,200	100	150-1000
8	75.0%	75%	1262	2400	---	---	70	---	①	①	600	100	25-50
9	50.0%	65%	---	---	2100	---	---	350	40%	50%	---	18	20

① 20-30% of rated coil voltage.

② Adjustable drop out time.

DC COIL DATA

NEMA Sizes	Volts	P.U.			Sealed		D.O. Volts (Hot)	P.U. Time mS	D.O. Time mS	Max. Operation Rate Ops/Hour	Mech. Life Millions
		Amps	Watts	Volts (Hot)	Amps	Watts					
00/0	12	6.4	76.8	80%	0.28	3.36	60%	22	17	3,600	5
	24	3.2	76.8	80%	0.14	3.36	60%	22	17	3,600	5
	48	1.6	76.8	80%	0.07	3.36	60%	22	17	3,600	5
	120	0.64	76.8	80%	0.028	3.36	60%	22	17	3,600	5
1/2	12	15.4	126	68%	0.42	4.98	30%	21	12	3,600	2
	24	6.2	88.4	60%	0.21	4.96	29%	20	13	3,600	2
	48	2.9	76.2	56%	0.11	5.04	28%	20	14	3,600	2
	120	1.1	67.3	53%	0.041	4.87	29%	20	16	3,600	2
3	12	24	293	65%	0.40	4.84	23%	39	14	3,600	2
	24	12	288	61%	0.20	4.75	22%	38	14	3,600	2
	48	6.1	295	62%	0.097	4.67	22%	37	14	3,600	2
	120	2.5	298	61%	0.038	4.57	22%	37	16	3,600	2
4/5	24	18	400	67%	0.22	5.3	25%	53	14	2,400	2
	48	9.0	400	67%	0.11	5.2	25%	49	16	2,400	2
	120	3.3	450	65%	0.05	5.4	28%	56	19	2,400	2
	240	1.7	440	64%	0.02	4.9	26%	49	21	2,400	2
6	106	8.25	775	N/A	0.085	9	N/A	N/A	N/A	2,400	5
	214	4.09	775	N/A	0.042	9	N/A	N/A	N/A	2,400	5
	340	2.57	775	N/A	0.026	9	N/A	N/A	N/A	2,400	5
	430	2.03	775	N/A	0.021	9	N/A	N/A	N/A	2,400	5
7	106	13.92	1425	N/A	0.184	19.5	N/A	N/A	N/A	1,200	5 ③
	214	6.89	1425	N/A	0.091	19.5	N/A	N/A	N/A	1,200	5 ③
	340	4.34	1425	N/A	0.057	19.5	N/A	N/A	N/A	1,200	5 ③
	430	3.43	1425	N/A	0.045	19.5	N/A	N/A	N/A	1,200	5 ③
8	106	19.81	2100	N/A	0.566	60	N/A	N/A	N/A	600	5 ③
	214	9.81	2100	N/A	0.280	60	N/A	N/A	N/A	600	5 ③
	340	6.18	2100	N/A	0.176	60	N/A	N/A	N/A	600	5 ③
	430	4.88	2100	N/A	0.139	60	N/A	N/A	N/A	600	5 ③

③ Change armature, magnet and armature interlock after 1 x 10⁶ operations.

GENERAL COIL DATA

Coil Offering — Encapsulated — NEMA Sizes 00-9
(Except Size 6 is tape)

UL Insulation Rating — Encapsulated — Class 130 (B)
— 105 degree C temp. rise

Operational Limits — 85% to 110% of Rated Voltage

Coil Data Notes

P.U. = Pick up time is the average time taken from closing of the coil circuit to main contact touch.

D.O. = Drop out time is the average time taken from opening of the coil circuit to main contact separation.

Cold = Coil data with a cold coil.

Hot = Coil data with a hot coil.

All data is based on a standard contactor with no auxiliary devices and a 120 VAC or 24 VDC magnet coil. Coil data has a ±5% range depending on the application, therefore specific data may vary.

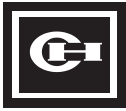


NEMA, Contactors & Starters, (Freedom)

RENEWAL PARTS

Magnet Coils					
Coil Volts and Hertz	Size 00 ①	Size 0 ①	Size 1-2	Size 3	Size 4-5
120/60 or 110/50	9-2823-1	9-2824-1	9-2703-1	9-2756-1	9-1891-1
240/60 or 220/50	9-2823-2	9-2824-2	9-2703-2	9-2756-2	9-1891-2
480/60 or 440/50	9-2823-3	9-2824-3	9-2703-3	9-2756-3	9-1891-3
600/60 or 550/50	9-2823-4	9-2824-4	9-2703-4	9-2756-4	9-1891-4
24/60 or 24/50	9-2823-18	9-2824-18	9-2703-16	9-2756-16	---
24/60	9-2823-7	9-2824-7	9-2703-6	9-2756-6	9-1891-15
48/60	9-2823-8	9-2824-8	9-2703-11	9-2756-15	---
208/60	9-2823-5	9-2824-5	9-2703-9	9-2756-5	9-1891-13
277/60	9-2823-12	9-2824-14	9-2703-7	9-2756-9	9-1891-26
24/50	9-2823-13	9-2824-13	9-2703-12	9-2756-11	9-1891-16
208-240/60	9-2823-17	9-2824-17	---	---	---
32/50	---	---	9-2703-10	9-2756-10	9-1891-27
48/50	9-2823-9	9-2824-9	9-2703-13	9-2756-7	9-1891-18
240/50	9-2823-11	9-2824-11	9-2703-14	9-2756-13	9-1891-20
380/50	---	---	---	9-2756-12	9-1891-14
415/50	---	---	---	9-2756-8	9-1891-21
380-415/50	9-2823-6	9-2824-6	9-2703-8	---	---
550/50	---	---	---	9-2756-14	9-1891-8
Coil Volts and Hertz		Size 6			
		Main Coil		Feeder Group	
120/60 or 110/50		9-3006		9-3007	
240/60 or 220/50		9-3006-2		9-3007-2	
480/60 or 440/50		9-3006-3		9-3007-3	
600/60 or 550/50		9-3006-4		9-3007-4	
218/60 or 200/50		9-3006-5		9-3007-5	
277/60 or 254/50		9-3006-6		9-3007-6	
415/60 or 380/50		9-3006-7		9-3007-7	
52/60 or 48/50		---		---	
110/50-60		---		---	
120/50-60		---		---	
208/50-60		---		---	
220/50-60		---		---	
240/50-60		---		---	
380/50-60		---		---	
415/50-60		---		---	
440/50-60		---		---	
480/50-60		---		---	
550/50-60		---		---	
600/60-50		---		---	
Coil Volts and Hertz		Size 7			
		Main Coil		Feeder Group	
120/60 or 110/50		9-2698		9-2705	
240/60 or 220/50		9-2698-2		9-2705-2	
480/60 or 440/50		9-2698-3		9-2705-3	
600/60 or 550/50		9-2698-4		9-2705-4	
415/60 or 380/50		9-2698-6		9-2705-6	
48/60 or 44/50		9-2698-8		9-2705-8	
208/50-60		9-2698-5		9-2705-5	

① These are the only renewal parts available. Series B1/C1 only.

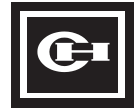


NEMA, Contactors & Starters, (Freedom)

RENEWAL PARTS

Magnet Coils (Continued)				
Coil Volts and Hertz	Size 8			
	Common Control		Separate Control	
	Main Coils	Feeder Group	Main Coils	Feeder Group
120/50-60 208/50-60 240/50-60 380/50-60 480/50-60 550/50-60 600/50-60	9-2654 9-2654-6 9-2654-2 9-2654-5 9-2654-3	9-2664 9-2664-6 9-2664-2 9-2664-5 9-2664-3	9-2654	9-2664
9-2654-10 9-2654-4	9-2664-10 9-2664-4			
Coil Volts and Hertz	Size 9			
	Common Control		Separate Control	
	5264C34G01		5264C34G01	
120/50-60				
Dc Coil Kits				
NEMA Contactor or Starter Size	Volts		Catalog Number	
00-0	12		C335KD3R1	
	24		KD3T1	
	48		KD3W1	
	120		KD3A1	
1-2	12		C335KD4R4	
	24		KD4T4	
	48		KD4W4	
	120		KD4A4	
3	12		C335KD5R1	
	24		KD5T1	
	48		KD5W1	
	120		KD5A1	
4-5	24		C335KA3T1	
	48		KA3W1	
	120		KA3A1	
	240		KA3B1	
Contact Kits				
Contactor or Starter NEMA Size	Part Numbers			
	2 Pole		3 Pole	
	1	6-65	6-65-2	
2	6-65-7	6-65-8		
3	6-43	6-43-2		
4	6-44	6-44-2		
5	6-45	6-45-2		
6 ①	---	6-648		
7	---	6-613		
8	---	6-571		
9	(2) — 5264C42G01	(3) — 5264C42G01		
Publications				
NEMA Size Starter	Publication Numbers			
1-2	22177			
3	20426			
4	20428			
5	20429			
6	23349			
7	20848			
8	20849			
9	IL 16978			

① Series B1 contactor, Series C1 starter.

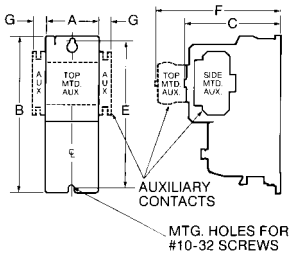


NEMA, Contactors & Starters, (Freedom)

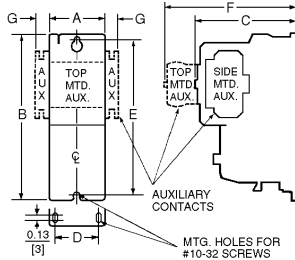
APPROXIMATE DIMENSIONS AND SHIPPING WEIGHTS

Do not use for construction.

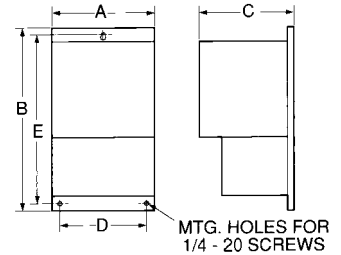
NON-REVERSING OPEN TYPE



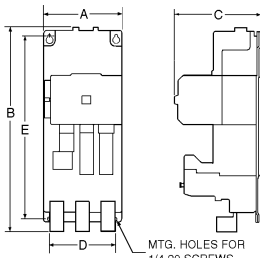
SIZE 00 & 0



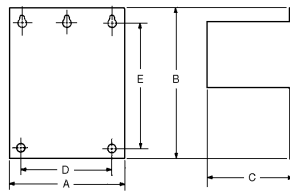
SIZE 1 & 2



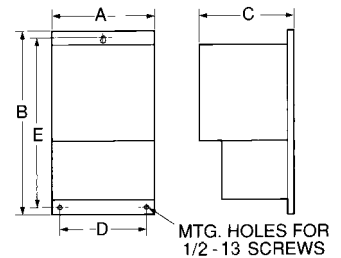
SIZE 3 & 4



SIZE 5

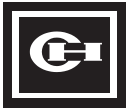


MOUNTING SCREWS — #1/2 - 13
SIZES 6 THROUGH 8



SIZE 9

NEMA Size	Dimensions in Inches [mm]							Shipping Weight Lbs.
	Wide A	High B	Deep C	Mounting		F	G	
				D	E			
00-0	1.80 [45.5]	6.60 [168]	3.52 [89.5]	---	6.07 [154]	4.90 [124.5]	0.54 [13.7]	2.2
1	2.56 [65]	7.08 [180]	4.44 [113]	2.00 [51]	6.63 [168]	5.80 [147.5]	0.54 [13.7]	4.5
2	2.56 [65]	8.08 [205]	4.44 [113]	2.00 [51]	7.63 [194]	5.80 [147.5]	0.54 [13.7]	4.7
3	4.08 [104]	11.35 [288]	5.94 [151]	3.00 [76]	10.81 [275]	---	---	11.
4	7.05 [179]	12.06 [306]	7.25 [184]	6.00 [152]	8.50 [216]	---	---	23.
5	7.00 [178]	17.77 [451]	7.76 [197]	6.00 [152]	16.00 [406]	---	---	36.
6	9.47 [241]	21.69 [551]	9.90 [251]	3.10 [79]	18.00 [457]	---	---	75.
7	15.13 [384]	29.13 [740]	12.64 [321]	13.25 [337]	21.25 [540]	---	---	120.
8	15.13 [384]	34.50 [876]	15.00 [381]	13.75 [337]	16.75 [425]	---	---	210.
9	33.00 [838]	30.00 [762]	12.94 [329]	30.75 [781]	8.00 [203]	---	---	315.

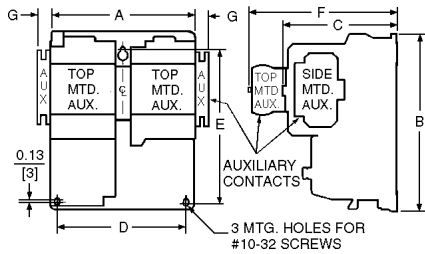


NEMA, Contactors & Starters, (Freedom)

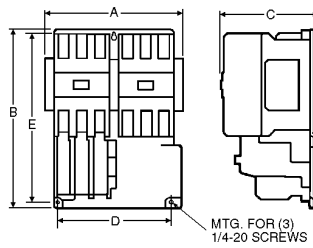
APPROXIMATE DIMENSIONS AND SHIPPING WEIGHTS (Continued)

Do not use for construction.

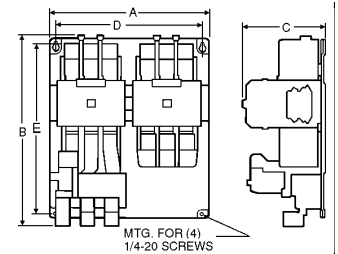
REVERSING OPEN TYPE



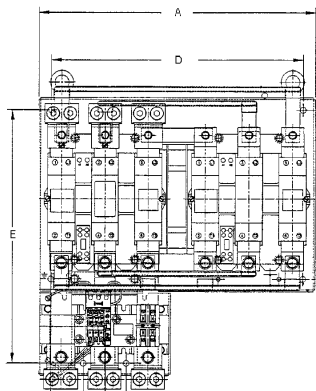
SIZE 00-2



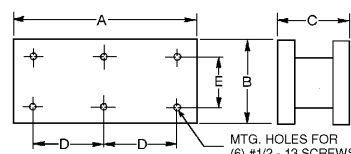
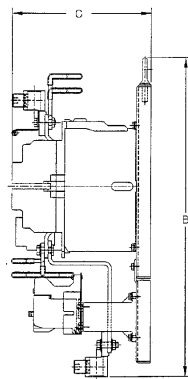
SIZE 3



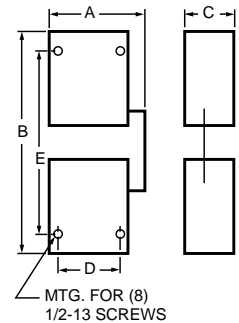
SIZE 4-5



SIZE 6



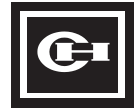
MOUNTING SCREWS #1/2 - 13
OPEN TYPE — SIZE 7-8 HORIZONTAL



SIZE 9
OPEN TYPE — VERTICAL

NEMA Size	Dimensions in Inches [mm]							Shipping Weight Lbs.
	Wide A	High B	Deep C	Mounting		F	G	
				D	E			
00-0	4.20 [106.5]	7.38 [187.5]	3.52 [89.5]	3.50 [89]	6.87 [174.5]	4.90 [124.5]	0.54 [13.7]	3.6
1	5.71 [145]	7.08 [180]	4.44 [113]	5.25 [133.5]	5.75 [146]	5.80 [147]	0.54 [13.7]	8.25
2	5.71 [145]	8.08 [205]	4.44 [113]	5.25 [133.5]	6.75 [171.5]	5.80 [147]	0.54 [13.7]	8.5
3	8.70 [221]	11.35 [288]	5.94 [151]	7.00 [178]	10.81 [275]	---	---	20.
4	14.68 [373]	12.06 [306]	7.25 [184]	13.50 [343]	8.50 [216]	---	---	49.
5	14.50 [368]	17.77 [451]	7.76 [197]	13.50 [343]	16.00 [406]	---	---	68.
6	19.77 [502]	22.63 [575]	9.90 [251]	18.00 [457]	18.00 [457]	---	---	130.
7	28.06 [713]	32.13 [816] ①	12.70 [322]	12.75 [324]	21.25 [540]	---	---	175.
8	30.38 [772]	41.50 [1054] ①	14.70 [373]	14.13 [359]	16.75 [425]	---	---	430.
9	33.00 [838]	63.12 [1603]	12.94 [329]	30.75 [781]	41.00 [1041]	---	---	640.

① Includes cross wiring overhang.



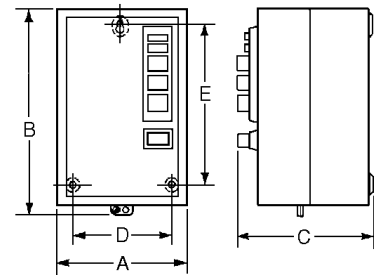
NEMA, Contactors & Starters, (Freedom)

APPROXIMATE DIMENSIONS AND SHIPPING WEIGHTS (Continued)

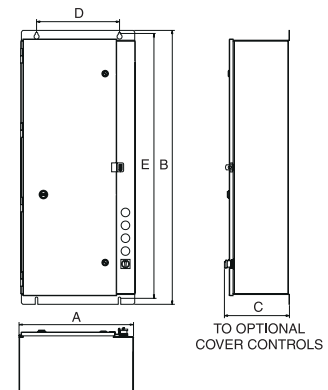
Do not use for construction.

NON-REVERSING & REVERSING CONTACTORS — ENCLOSED TYPE NEMA 1

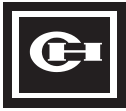
NEMA Size (poles)	Box No.	Dimensions in Inches [mm]					Ship Wt. Lbs.
		Wide A	High B	Deep C	Mounting		
					Wide D	High E	
NON-REVERSING CONTACTORS - without Control Power Transformers							
00 (2P, 3P, 4P)	1	5.62 [143]	10.09 [256]	5.71 [145]	4.50 [114]	8.00 [203]	5.25
00 (2P, 3P, 4P) with top adders	2	7.73 [196]	13.21 [336]	6.75 [172]	6.00 [152]	10.75 [273]	7.3
0 (2P, 3P, 4P)	1	5.62 [143]	10.09 [256]	5.71 [145]	4.50 [114]	8.00 [203]	5.25
0 (2P, 3P, 4P) with top adders	2	7.73 [196]	13.21 [336]	6.75 [172]	6.00 [152]	10.75 [273]	7.3
0 (5P)	2	7.73 [196]	13.21 [336]	6.75 [172]	6.00 [152]	10.75 [273]	7.3
1 (2P, 3P)	1	5.62 [143]	10.09 [256]	5.71 [145]	4.50 [114]	8.00 [203]	7.9
1 (2P, 3P) with top adders	3	12.65 [321]	14.40 [366]	7.31 [186]	9.75 [248]	11.25 [286]	11
1 (4P, 5P)	2	7.73 [196]	13.21 [336]	6.75 [172]	6.00 [152]	10.75 [273]	8.5
2 (2P, 3P, 4P, 5P)	2	7.73 [196]	13.21 [336]	6.75 [172]	6.00 [152]	10.75 [273]	8.5
3 (2P, 3P)	4	11.66 [296]	26.51 [673]	8.89 [226]	9.00 [229]	23.38 [594]	35
4 (2P, 3P)	4	11.66 [296]	26.51 [673]	8.89 [226]	9.00 [229]	23.38 [594]	47
5	10	20.00 [508]	47.85 [1215]	11.36 [289]	14.50 [368]	46.25 [1175]	113
6		Consult Cutler-Hammer for Availability					
7							
8							
9							
NON-REVERSING CONTACTORS - with Control Power Transformers							
00 (2P, 3P, 4P)	2	7.73 [196]	13.21 [336]	6.75 [172]	6.00 [152]	10.75 [273]	12
00 (2P, 3P, 4P, 5P) with top adders	3	12.65 [321]	14.40 [366]	7.31 [186]	9.75 [248]	11.25 [286]	15
0 (2P, 3P, 4P, 5P)	2	7.73 [196]	13.21 [336]	6.75 [172]	6.00 [152]	10.75 [273]	12
0 (2P, 3P, 4P, 5P) with top adders	3	12.65 [321]	14.40 [366]	7.31 [186]	9.75 [248]	11.25 [286]	15
1 (2P, 3P)	2	7.73 [196]	13.21 [336]	6.75 [172]	6.00 [152]	10.75 [273]	12.2
1 (2P, 3P) with top adders	3	12.65 [321]	14.40 [366]	7.31 [186]	9.75 [248]	11.25 [286]	12.5
1 (4P, 5P)	2	7.73 [196]	13.21 [336]	6.75 [172]	6.00 [152]	10.75 [273]	12.6
2 (2P, 3P, 4P, 5P)	2	7.73 [196]	13.21 [336]	6.75 [172]	6.00 [152]	10.75 [273]	12.8
3 (2P, 3P)	4	11.66 [296]	26.51 [673]	8.89 [226]	9.00 [229]	23.38 [594]	40
4 (2P, 3P)	4	11.66 [296]	26.51 [673]	8.89 [226]	9.00 [229]	23.38 [594]	52
5	10	20.00 [508]	47.85 [1215]	11.36 [289]	14.50 [368]	46.25 [1175]	120
6		Consult Cutler-Hammer for Availability					
7							
8							
9							
3 POLE REVERSING CONTACTORS - without Control Power Transformers							
00	2	7.73 [196]	13.21 [336]	6.75 [172]	6.00 [152]	10.75 [273]	7.8
0	2	7.73 [196]	13.21 [336]	6.75 [172]	6.00 [152]	10.75 [273]	8
1	3	12.65 [321]	14.40 [366]	7.31 [186]	9.75 [248]	11.25 [286]	11
2	3	12.65 [321]	14.40 [366]	7.31 [186]	9.75 [248]	11.25 [286]	12
3	4	11.66 [296]	26.51 [673]	8.89 [226]	9.00 [229]	23.38 [594]	67
4	4	11.66 [296]	26.51 [673]	8.89 [226]	9.00 [229]	23.38 [594]	154
5	10	20.00 [508]	47.85 [1215]	11.36 [289]	14.50 [368]	46.25 [1175]	170
6		Consult Cutler-Hammer for Availability					
7							
8							
9							



BOXES 1-4



BOX 10



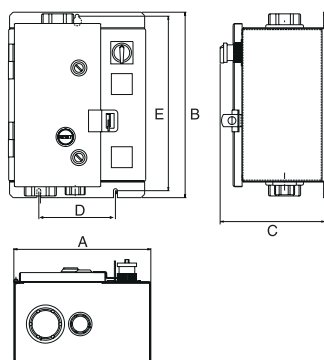
NEMA, Contactors & Starters, (Freedom)

APPROXIMATE DIMENSIONS AND SHIPPING WEIGHTS (Continued)

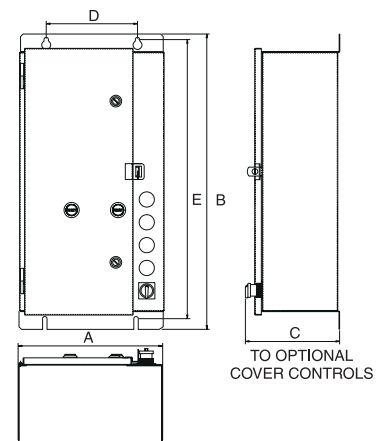
Do not use for construction.

NON-REVERSING & REVERSING CONTACTORS — ENCLOSED TYPE NEMA 3R, 4/4X & 12

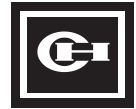
NEMA Size (poles)	Box No.	Dimensions in Inches [mm]					Ship Wt. Lbs.
		Wide A	High B	Deep C	Mounting		
					Wide D	High E	
NON-REVERSING CONTACTORS - without Control Power Transformers							
0 (2P, 3P, 4P)	5	9.84 [250]	13.31 [338]	7.51 [191]	5.50 [140]	12.50 [3.18]	14
1 (2P, 3P, 4P, 5P)	5	9.84 [250]	13.31 [338]	7.51 [191]	5.50 [140]	12.50 [3.18]	15
2 (2P, 3P, 4P, 5P)	5	9.84 [250]	13.31 [338]	7.51 [191]	5.50 [140]	12.50 [3.18]	15.5
3 (2P, 3P)	8	14.25 [362]	29.10 [739]	9.29 [234]	9.00 [229]	27.50 [699]	45
4 (2P, 3P)	8	14.25 [362]	29.10 [739]	9.29 [234]	9.00 [229]	27.50 [699]	56
5	10	20.00 [508]	47.85 [1215]	11.36 [289]	14.50 [368]	46.25 [1175]	140
6		Consult Cutler-Hammer for Availability					
7							
8							
9							
NON-REVERSING CONTACTORS - with Control Power Transformers							
0 (2P, 3P, 4P)	5	9.84 [250]	13.31 [338]	7.51 [191]	5.50 [140]	12.50 [3.18]	18
1 (2P, 3P, 4P, 5P)	6	12.01 [305]	14.39 [366]	7.51 [191]	8.00 [203]	13.50 [343]	19
2 (2P, 3P, 4P, 5P)	6	12.01 [305]	14.39 [366]	7.51 [191]	8.00 [203]	13.50 [343]	19.5
3 (2P, 3P)	8	14.25 [362]	29.10 [739]	9.29 [234]	9.00 [229]	27.50 [699]	52
4 (2P, 3P)	8	14.25 [362]	29.10 [739]	9.29 [234]	9.00 [229]	27.50 [699]	63
5	10	20.00 [508]	47.85 [1215]	11.36 [289]	14.50 [368]	46.25 [1175]	147
6		Consult Cutler-Hammer for Availability					
7							
8							
9							
3 POLE REVERSING CONTACTORS - with or without Control Power Transformers							
0	6	12.01 [305]	14.39 [366]	7.51 [191]	8.00 [203]	13.50 [343]	18
1	6	12.01 [305]	14.39 [366]	7.51 [191]	8.00 [203]	13.50 [343]	19
2	6	12.01 [305]	14.39 [366]	7.51 [191]	8.00 [203]	13.50 [343]	19
3	8	14.25 [362]	29.10 [739]	9.29 [234]	9.00 [229]	27.50 [699]	47
4	8	14.25 [362]	29.10 [739]	9.29 [234]	9.00 [229]	27.50 [699]	69
5	10	20.00 [508]	47.85 [1215]	11.36 [289]	14.50 [368]	46.25 [1175]	170
6		Consult Cutler-Hammer for Availability					
7							
8							
9							



BOXES 5, 6



BOXES 8, 10



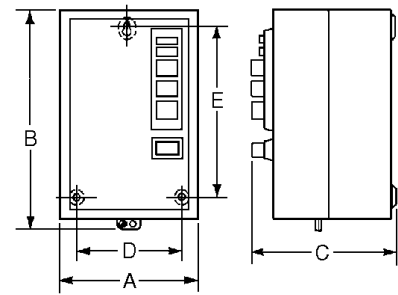
NEMA, Contactors & Starters, (Freedom)

APPROXIMATE DIMENSIONS AND SHIPPING WEIGHTS (Continued)

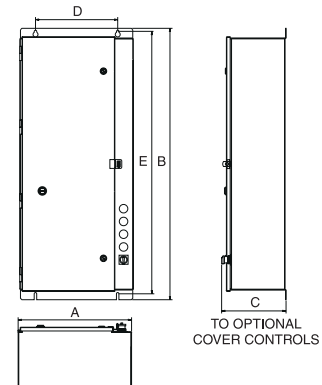
Do not use for construction.

NON-REVERSING & REVERSING STARTERS — ENCLOSED TYPE NEMA 1

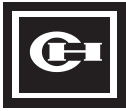
NEMA Size (poles)	Box No.	Dimensions in Inches [mm]					Ship Wt. Lbs.
		Wide A	High B	Deep C	Mounting		
					Wide D	High E	
NON-REVERSING STARTERS Without Control Power Transformers							
00	1	5.62 [143]	10.09 [256]	5.71 [145]	4.50 [114]	8.00 [203]	7
00 with top adders	3	12.65 [321]	14.40 [366]	7.31 [186]	9.75 [248]	11.25 [286]	10
0	1	5.62 [143]	10.09 [256]	5.71 [145]	4.50 [114]	8.00 [203]	7.1
0 with top adders	3	12.65 [321]	14.40 [366]	7.31 [186]	9.75 [248]	11.25 [286]	10
1	1	5.62 [143]	10.09 [256]	5.71 [145]	4.50 [114]	8.00 [203]	7.9
1 with top adders	3	12.65 [321]	14.40 [366]	7.31 [186]	9.75 [248]	11.25 [286]	11.5
2	2	7.73 [196]	13.21 [336]	6.75 [172]	6.00 [152]	10.75 [273]	8.5
3	4	11.66 [296]	26.51 [673]	8.89 [226]	9.00 [229]	23.38 [594]	35
4	4	11.66 [296]	26.51 [673]	8.89 [226]	9.00 [229]	23.38 [594]	47
5	10	20.00 [508]	47.85 [1215]	11.36 [289]	14.50 [368]	46.25 [1175]	139
6		Consult Cutler-Hammer for Availability					
7							
8							
9							
NON-REVERSING STARTERS With Control Power Transformers							
00	3	12.65 [321]	14.40 [366]	7.31 [186]	9.75 [248]	11.25 [286]	15
0	3	12.65 [321]	14.40 [366]	7.31 [186]	9.75 [248]	11.25 [286]	15
1	3	12.65 [321]	14.40 [366]	7.31 [186]	9.75 [248]	11.25 [286]	16
2	3	12.65 [321]	14.40 [366]	7.31 [186]	9.75 [248]	11.25 [286]	16.2
3	4	11.66 [296]	26.51 [673]	8.89 [226]	9.00 [229]	23.38 [594]	42
4	4	11.66 [296]	26.51 [673]	8.89 [226]	9.00 [229]	23.38 [594]	54
5	10	20.00 [508]	47.85 [1215]	11.36 [289]	14.50 [368]	46.25 [1175]	146
6		Consult Cutler-Hammer for Availability					
7							
8							
9							
REVERSING STARTERS Without Control Power Transformers							
00	2	7.73 [196]	13.21 [336]	6.75 [172]	6.00 [152]	10.75 [273]	8
0	2	7.73 [196]	13.21 [336]	6.75 [172]	6.00 [152]	10.75 [273]	8
0 with top adders	3	12.65 [321]	14.40 [366]	7.31 [186]	9.75 [248]	11.25 [286]	11
1 with top adders	3	12.65 [321]	14.40 [366]	7.31 [186]	9.75 [248]	11.25 [286]	13.4
2	3	12.65 [321]	14.40 [366]	7.31 [186]	9.75 [248]	11.25 [286]	15
3	4	11.66 [296]	26.51 [673]	8.89 [226]	9.00 [229]	23.38 [594]	43
4	9	25.50 [648]	29.10 [739]	9.31 [237]	20.00 [508]	27.50 [699]	65
5	10	20.00 [508]	47.85 [1215]	11.36 [289]	14.50 [368]	46.25 [1175]	165
6		Consult Cutler-Hammer for Availability					
7							
8							
9							
REVERSING STARTERS With Control Power Transformers							
00 with top adders	3	12.65 [321]	14.40 [366]	7.31 [186]	9.75 [248]	11.25 [286]	15
0	3	12.65 [321]	14.40 [366]	7.31 [186]	9.75 [248]	11.25 [286]	15
0 with top adders	3	12.65 [321]	14.40 [366]	7.31 [186]	9.75 [248]	11.25 [286]	17
2	3	12.65 [321]	14.40 [366]	7.31 [186]	9.75 [248]	11.25 [286]	19
3	4	11.66 [296]	26.51 [673]	8.89 [226]	9.00 [229]	23.38 [594]	50
4	9	25.50 [648]	29.10 [739]	9.31 [237]	20.00 [508]	27.50 [699]	72
5	10	20.00 [508]	47.85 [1215]	11.36 [289]	14.50 [368]	46.25 [1175]	172
6		Consult Cutler-Hammer for Availability					
7							
8							
9							



BOXES 1-4



BOXES 9-10



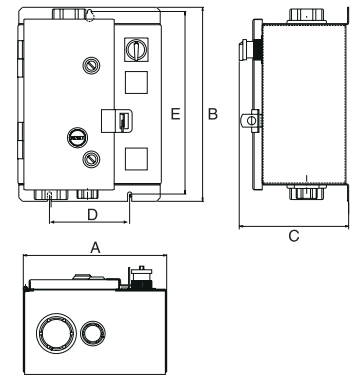
NEMA, Contactors & Starters, (Freedom)

APPROXIMATE DIMENSIONS AND SHIPPING WEIGHTS (Continued)

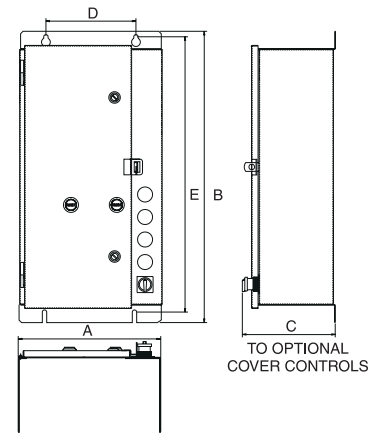
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NON-REVERSING & REVERSING STARTERS — ENCLOSED TYPE NEMA 3R, 4/4X & 12

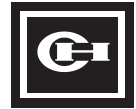
NEMA Size (poles)	Box No.	Dimensions in Inches [mm]					Ship Wt. Lbs.
		Wide A	High B	Deep C	Mounting		
					Wide D	High E	
NON-REVERSING STARTERS - without Control Power Transformers							
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2	6	12.01 [305]	14.39 [366]	7.51 [191]	8.00 [203]	13.50 [343]	16
3	8	14.25 [362]	29.10 [739]	9.29 [234]	9.00 [229]	27.50 [699]	46
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4	9	25.50 [648]	29.10 [739]	9.31 [237]	20.00 [508]	27.50 [699]	60
5	10	20.00 [508]	47.85 [1215]	11.36 [289]	14.50 [368]	46.25 [1175]	150
6		Consult Cutler-Hammer for Availability					
7							
8							
9							
NON-REVERSING STARTERS - with Control Power Transformers							
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2	6	12.01 [305]	14.39 [366]	7.51 [191]	8.00 [203]	13.50 [343]	20
3	8	14.25 [362]	29.10 [739]	9.29 [234]	9.00 [229]	27.50 [699]	53
4	8	14.25 [362]	29.10 [739]	9.29 [234]	9.00 [229]	27.50 [699]	67
4	9	25.50 [648]	29.10 [739]	9.31 [237]	20.00 [508]	27.50 [699]	67
5	10	20.00 [508]	47.85 [1215]	11.36 [289]	14.50 [368]	46.25 [1175]	157
6		Consult Cutler-Hammer for Availability					
7							
8							
9							
REVERSING STARTERS - with or without Control Power Transformers							
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1-2	7	16.26 [413]	14.37 [365]	7.51 [191]	11.00 [279]	13.50 [343]	24
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5	10	20.00 [508]	47.85 [1215]	11.36 [289]	14.50 [368]	46.25 [1175]	175
6		Consult Cutler-Hammer for Availability					
7							
8							
9							



BOXES 5, 6, 7, 9



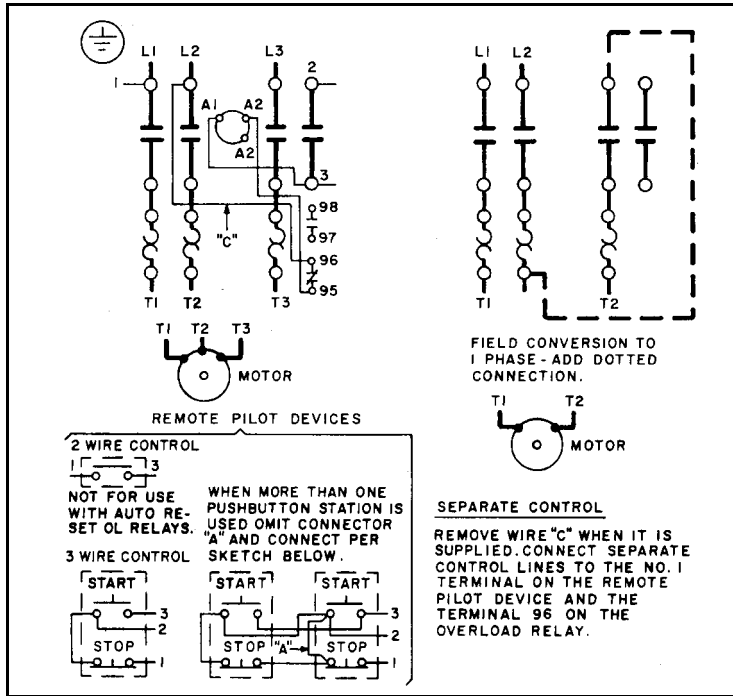
BOXES 8, 10



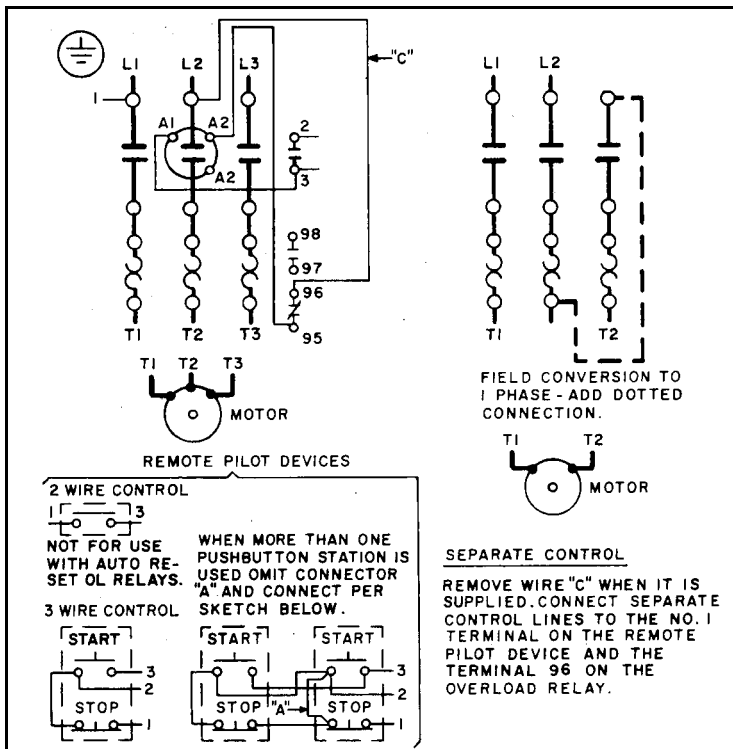
NEMA, Contactors & Starters, (Freedom)

WIRING DIAGRAMS

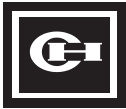
NON-REVERSING STARTERS



SIZE 00



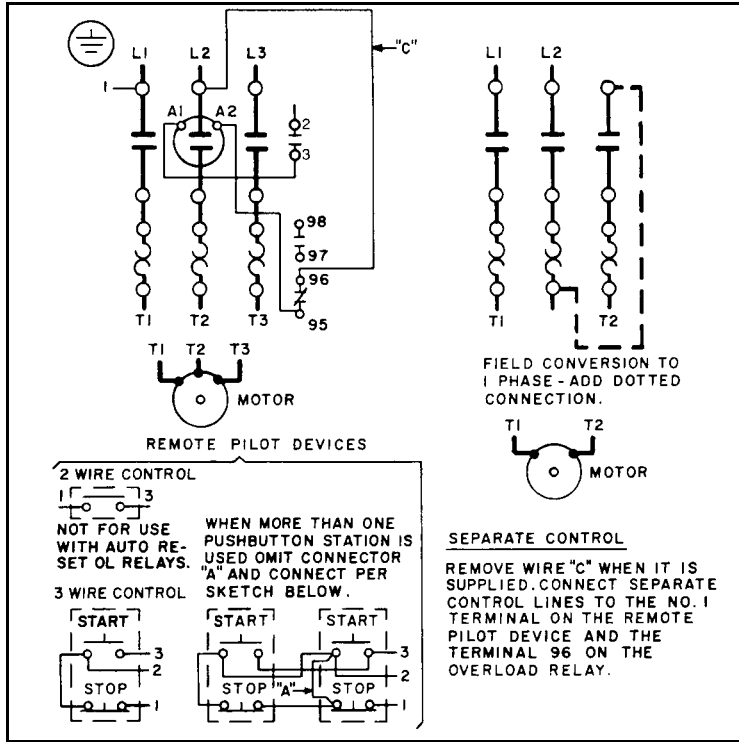
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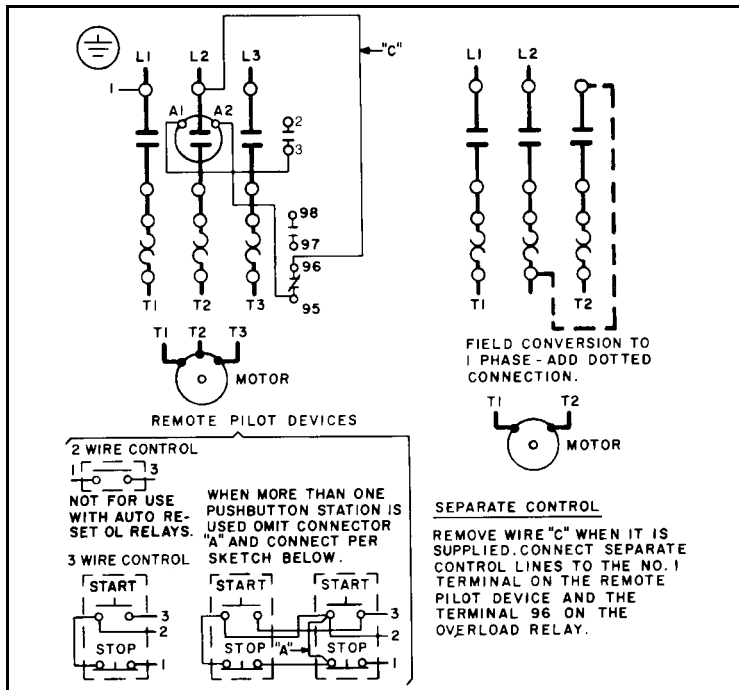
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WIRING DIAGRAMS (Continued)

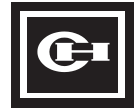
NON-REVERSING STARTERS (Continued)



SIZES 1 & 2



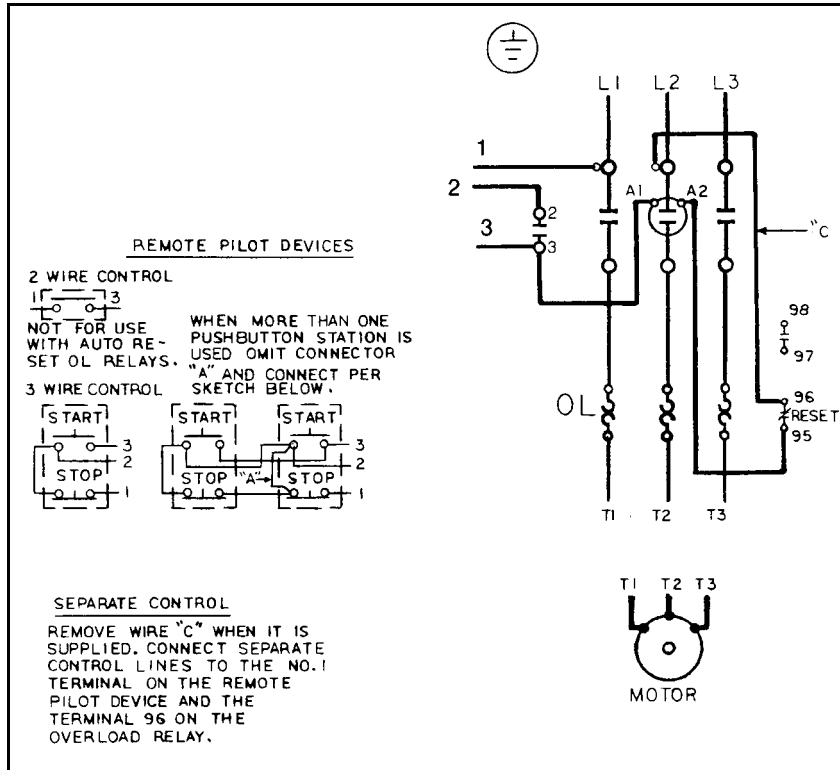
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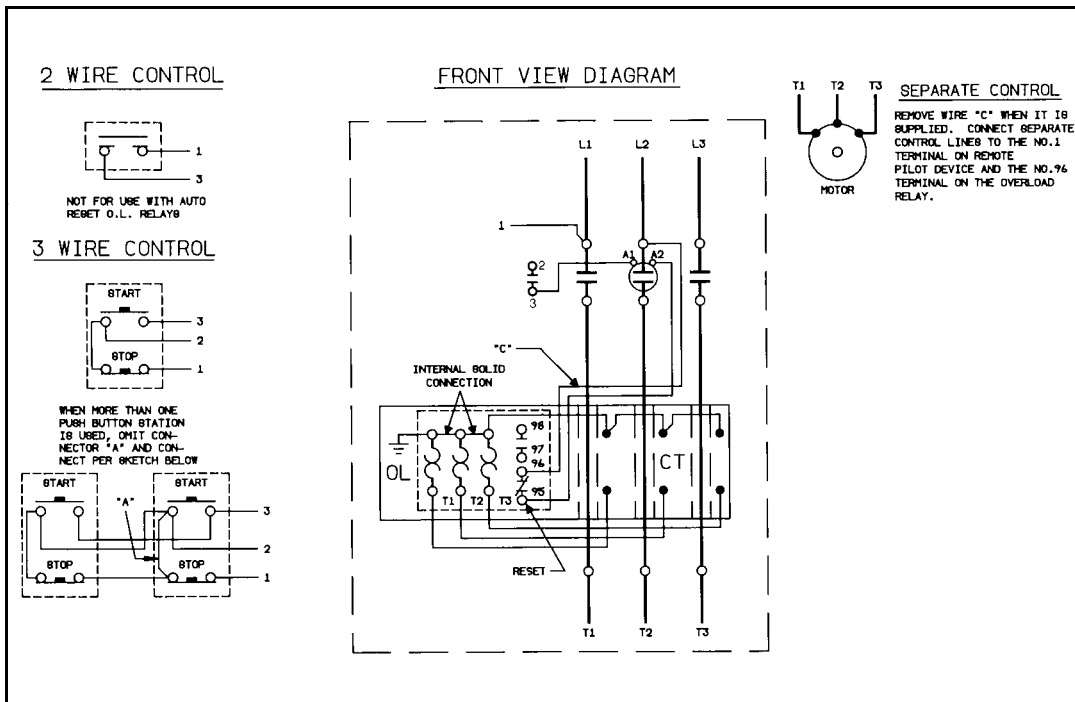
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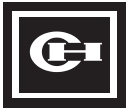
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SIZE 4



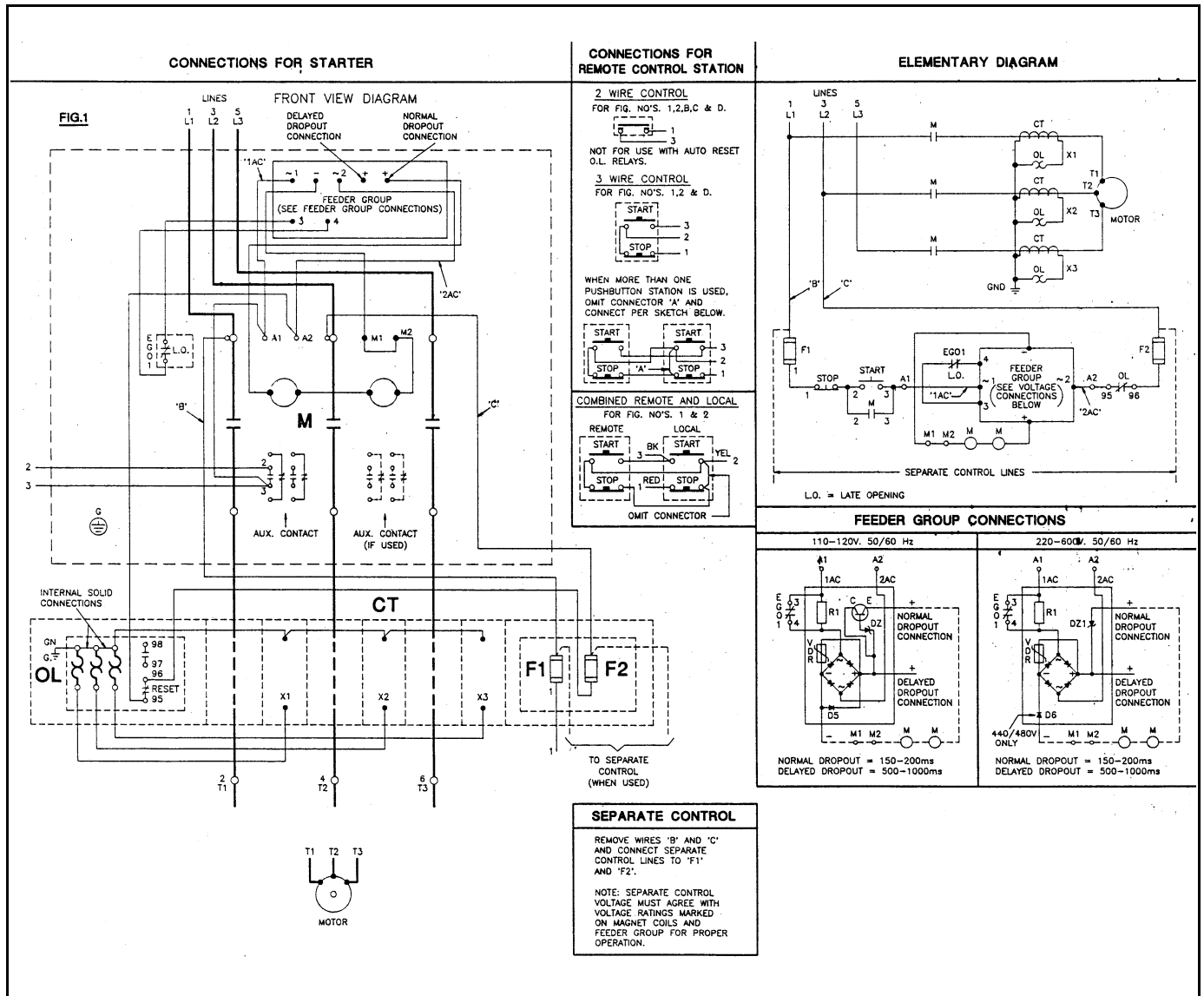
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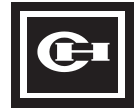
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WIRING DIAGRAMS (Continued)

NON-REVERSING STARTERS (Continued)



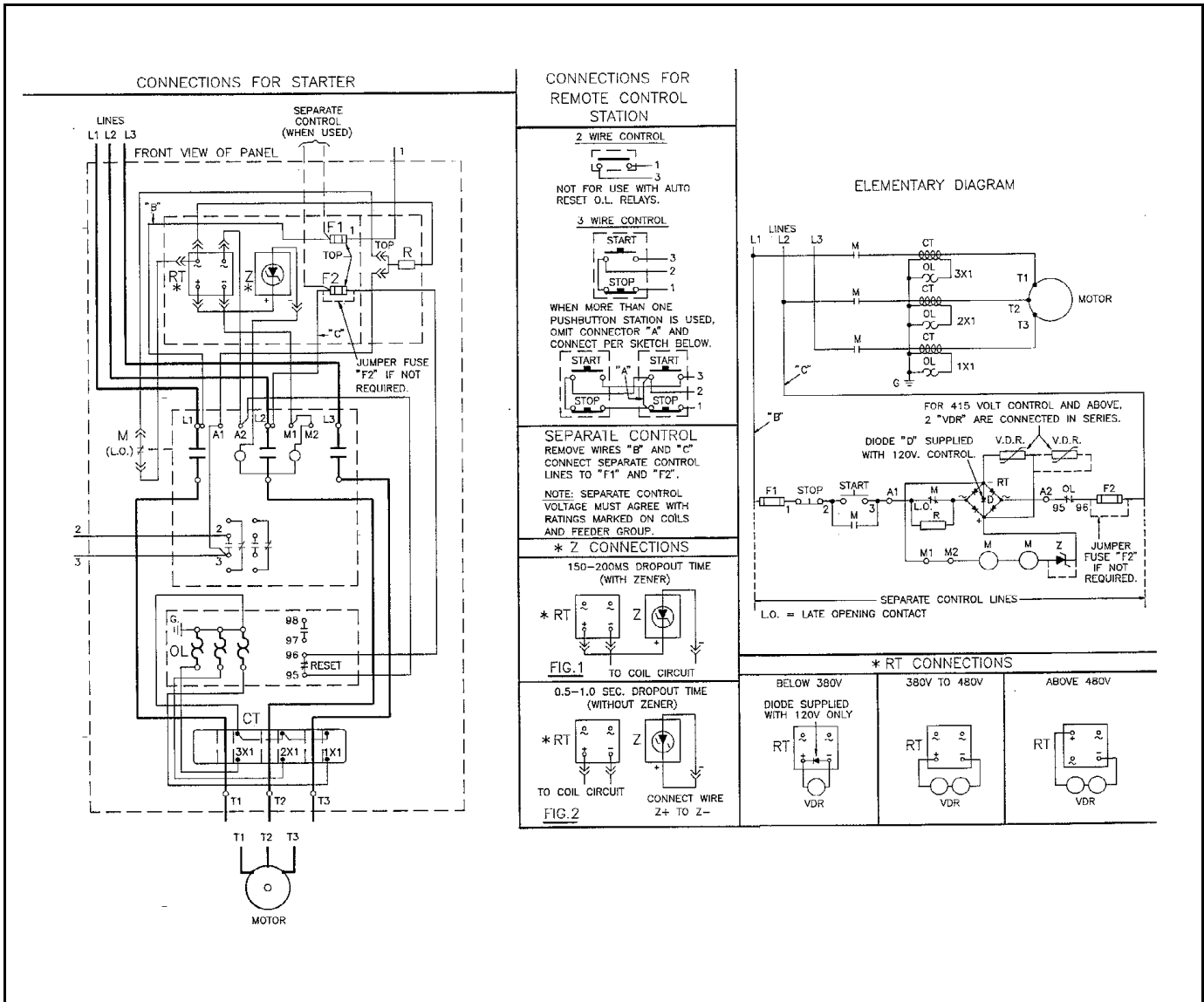
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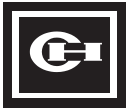
NEMA, Contactors & Starters, (Freedom)

WIRING DIAGRAMS (Continued)

NON-REVERSING STARTERS (Continued)



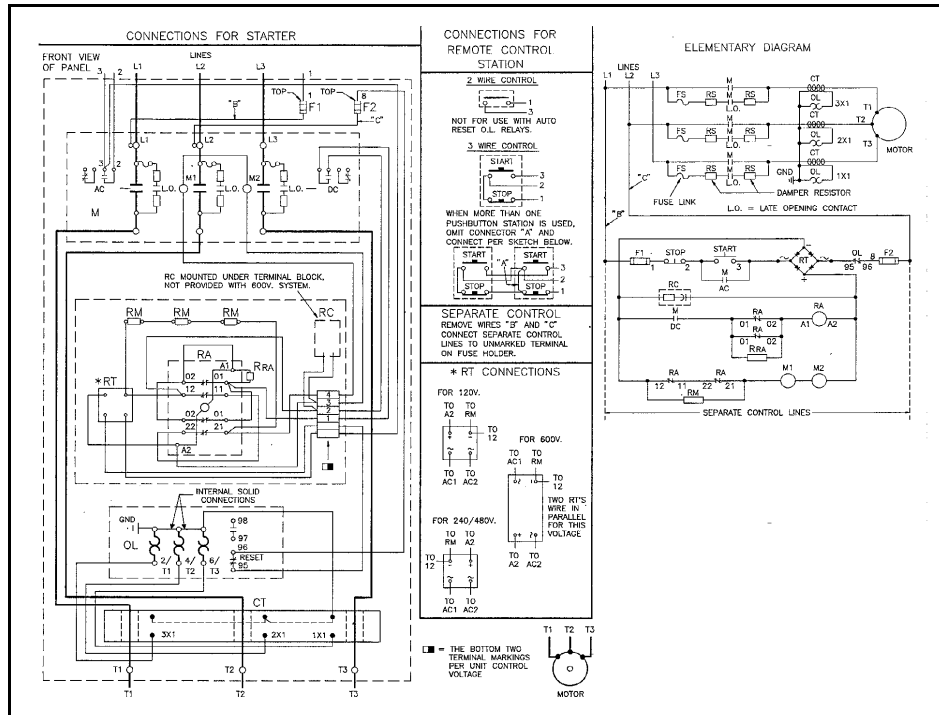
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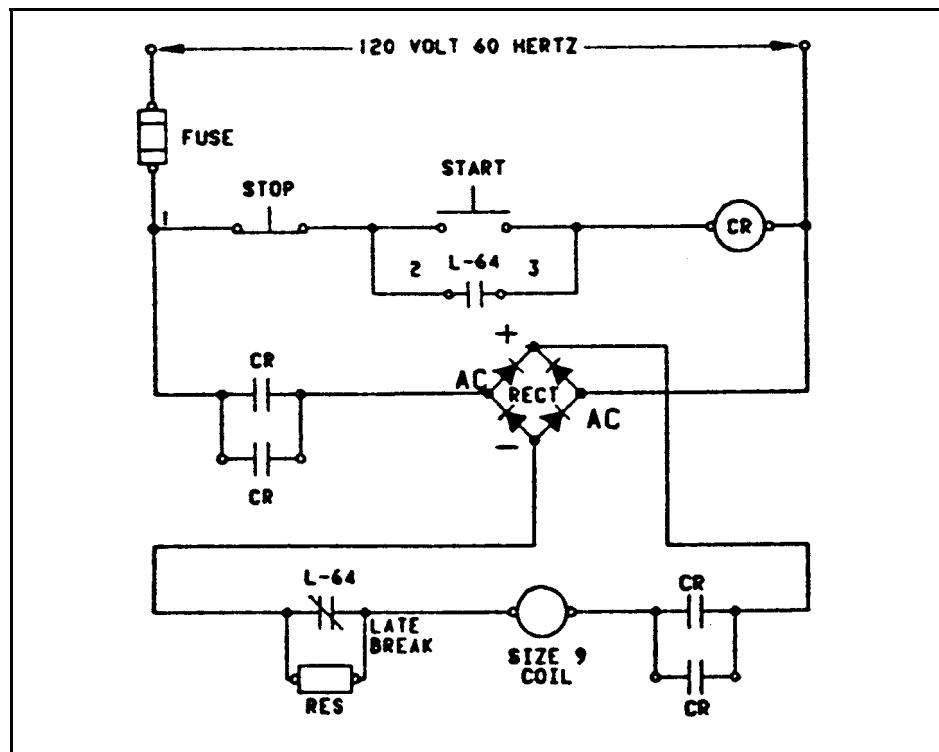
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WIRING DIAGRAMS (Continued)

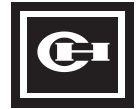
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SIZE 8



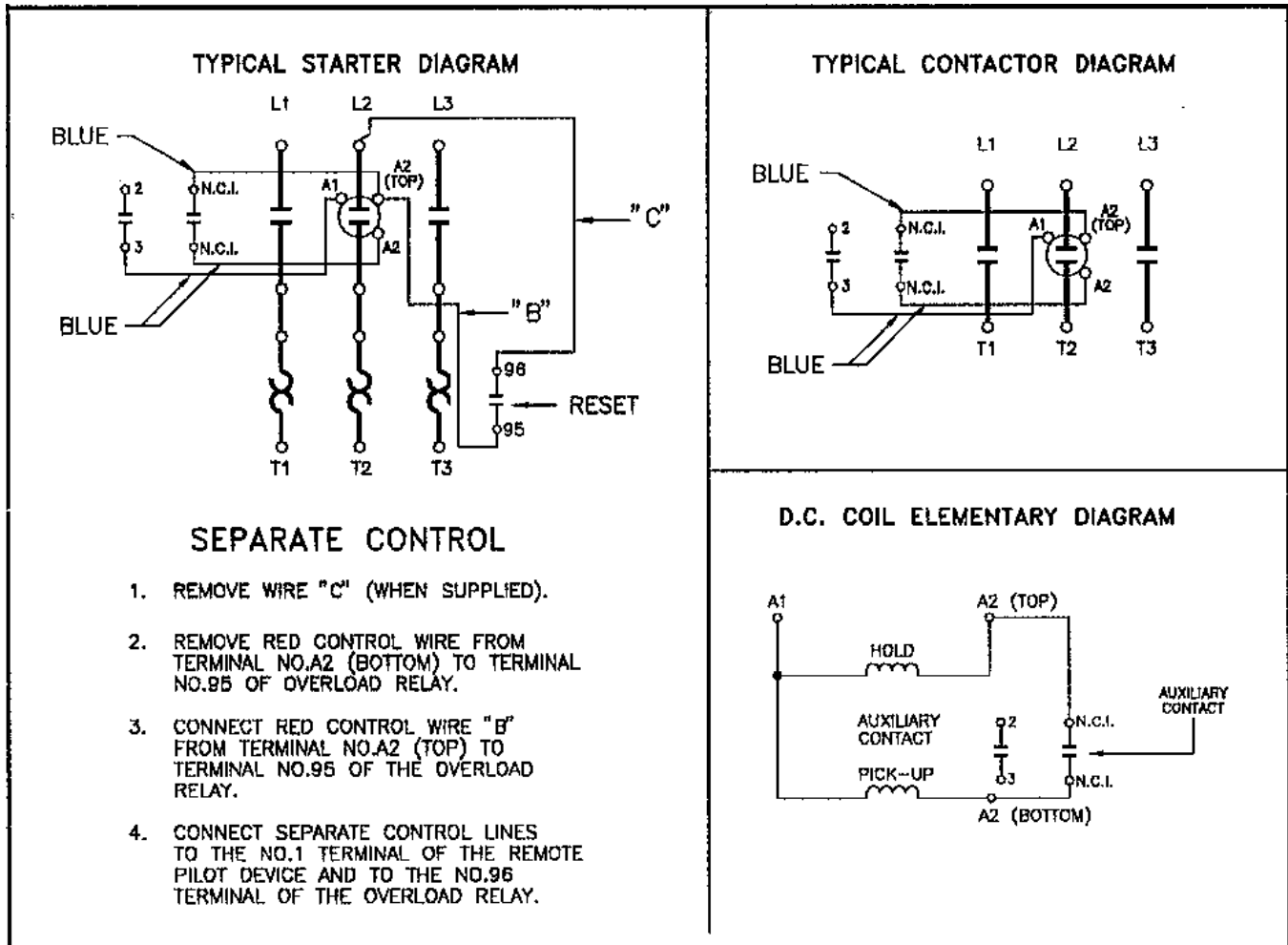
SIZE 9 CONTROL CIRCUIT

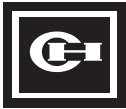


NEMA, Contactors & Starters, (Freedom)

WIRING DIAGRAMS (Continued)

TYPICAL DC CONTROL WIRING DIAGRAM

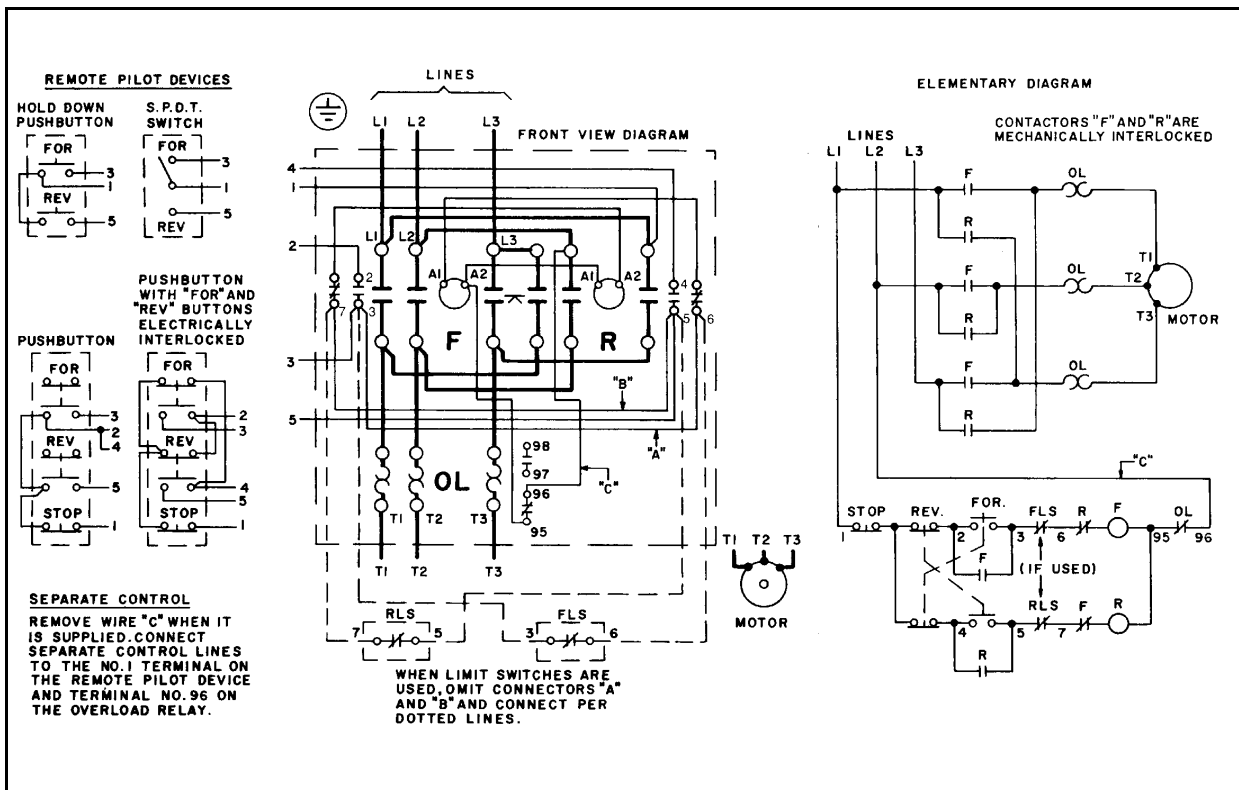
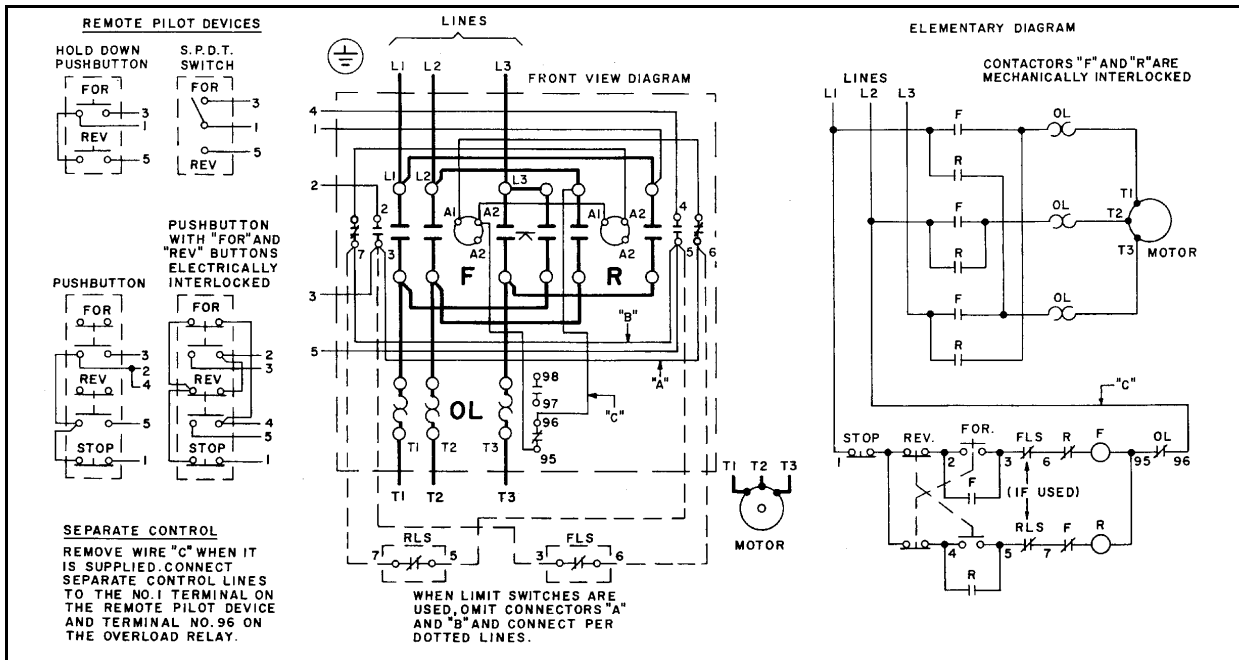


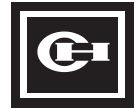


NEMA, Contactors & Starters, (Freedom)

WIRING DIAGRAMS (Continued)

REVERSING STARTERS

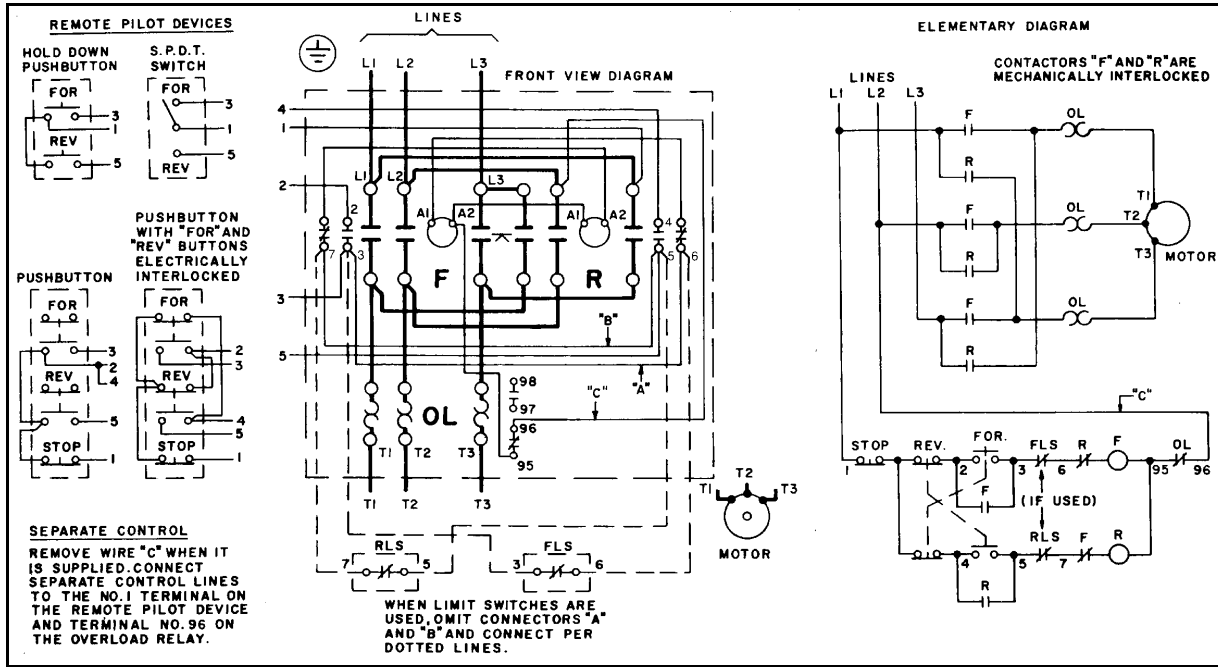




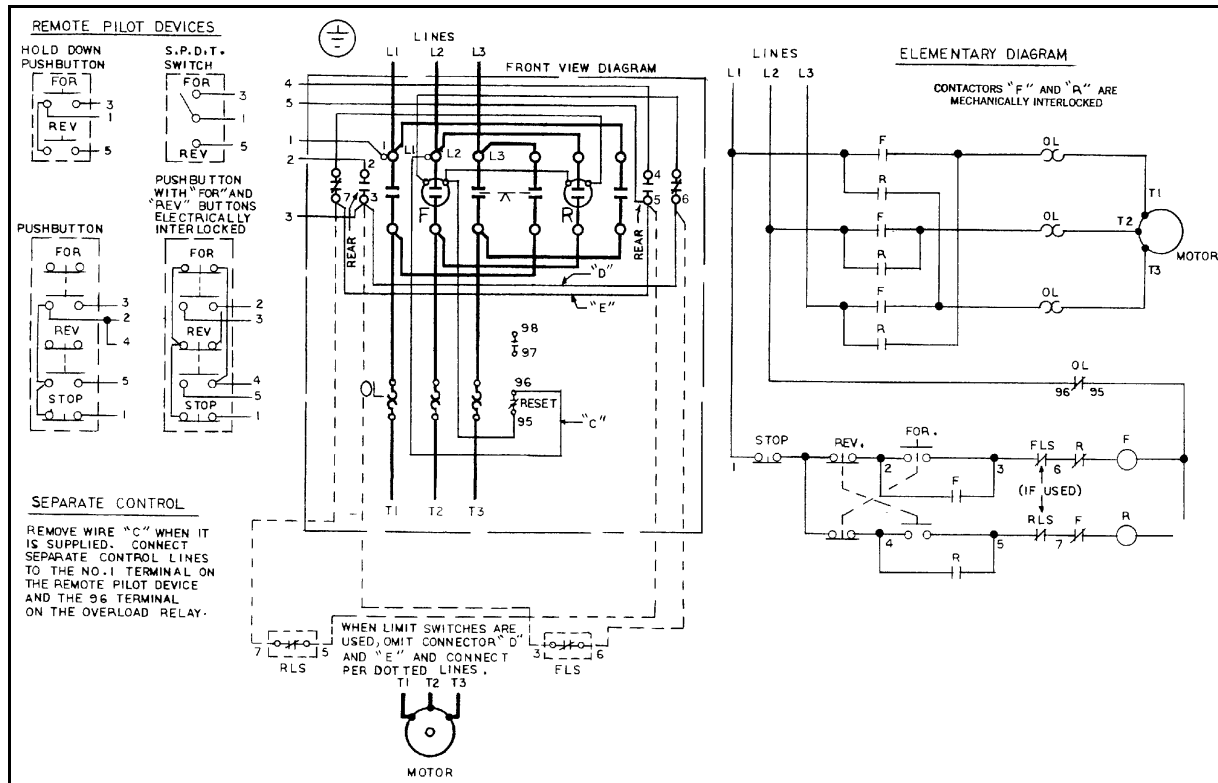
NEMA, Contactors & Starters, (Freedom)

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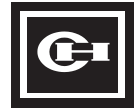
REVERSING STARTERS (Continued)



SIZE 3



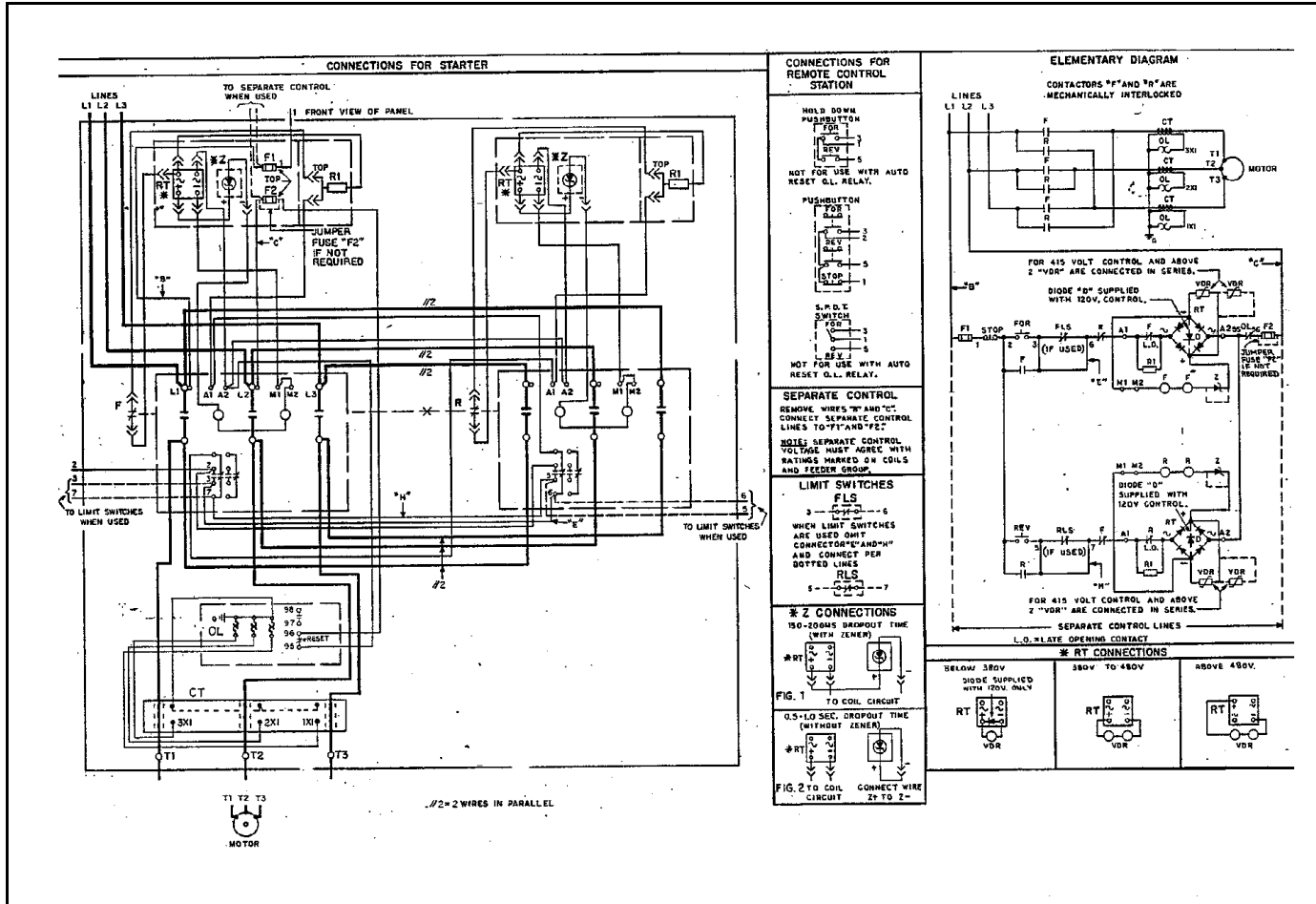
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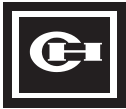
NEMA, Contactors & Starters, (Freedom)

WIRING DIAGRAMS (Continued)

REVERSING STARTERS (Continued)



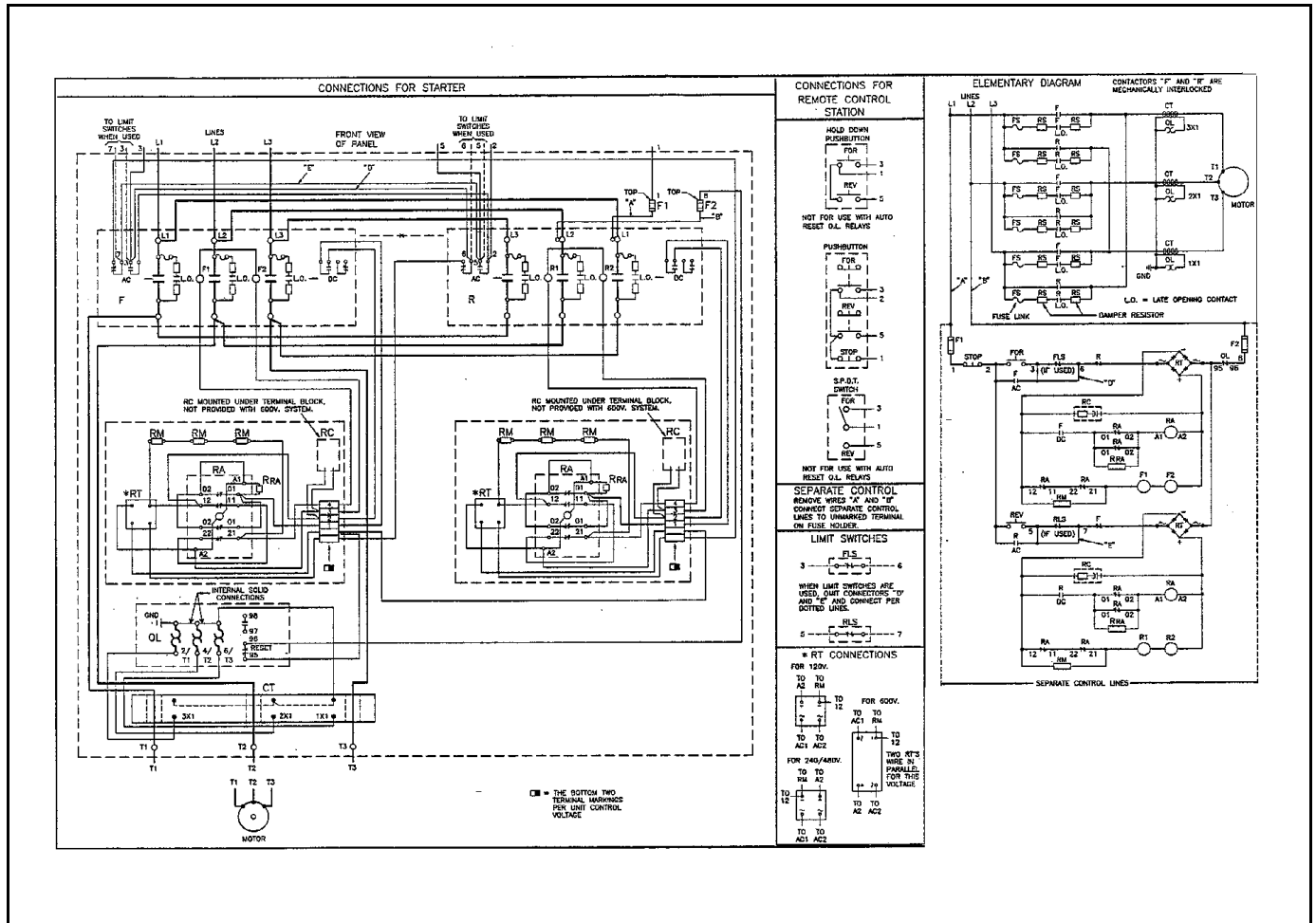
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NEMA, Contactors & Starters, (Freedom)

WIRING DIAGRAMS (Continued)

REVERSING STARTERS (Continued)



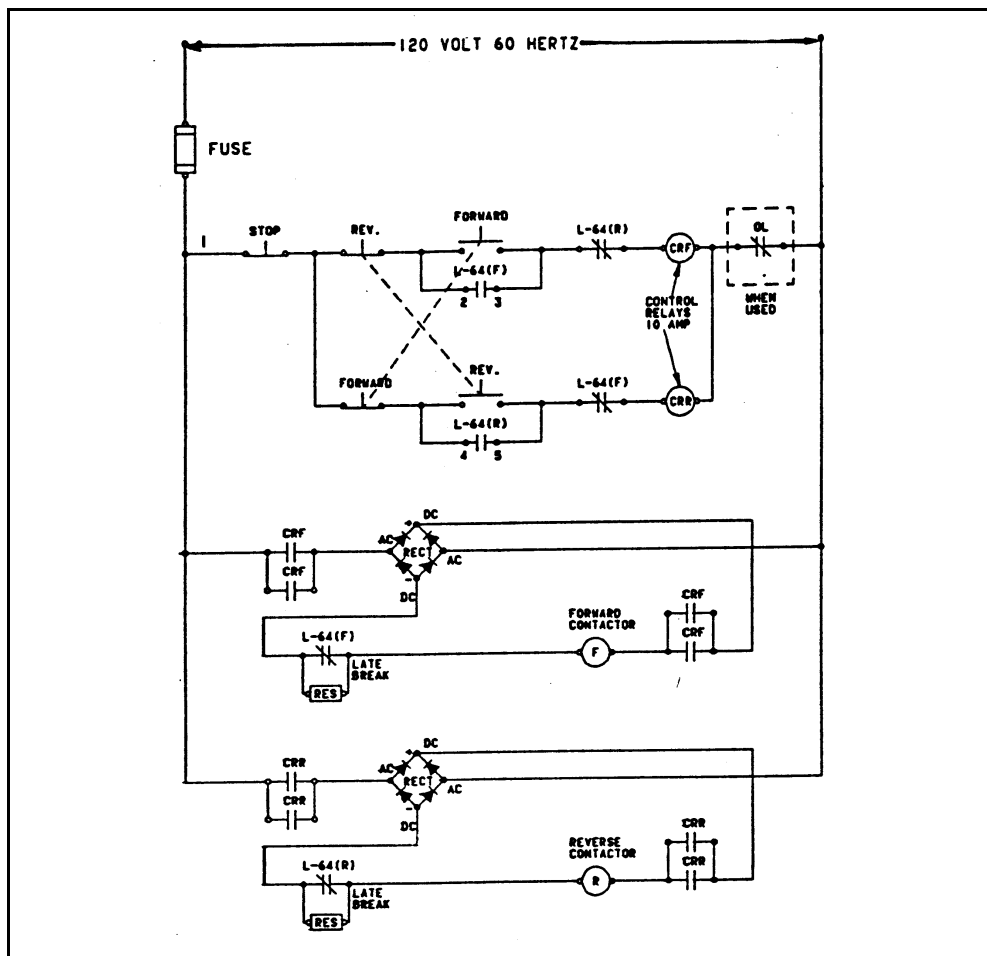
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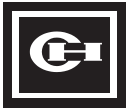
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WIRING DIAGRAMS (Continued)

REVERSING STARTERS (Continued)

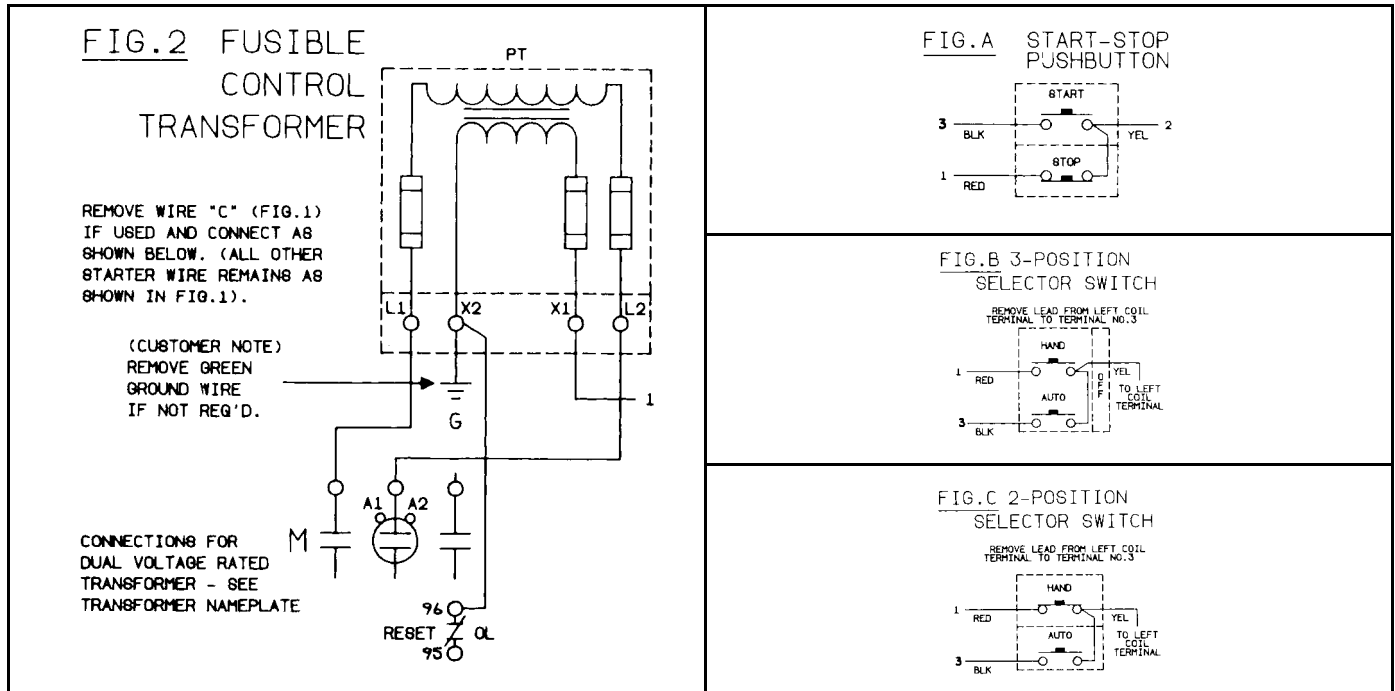


SIZE 9 — CONTROL CIRCUIT

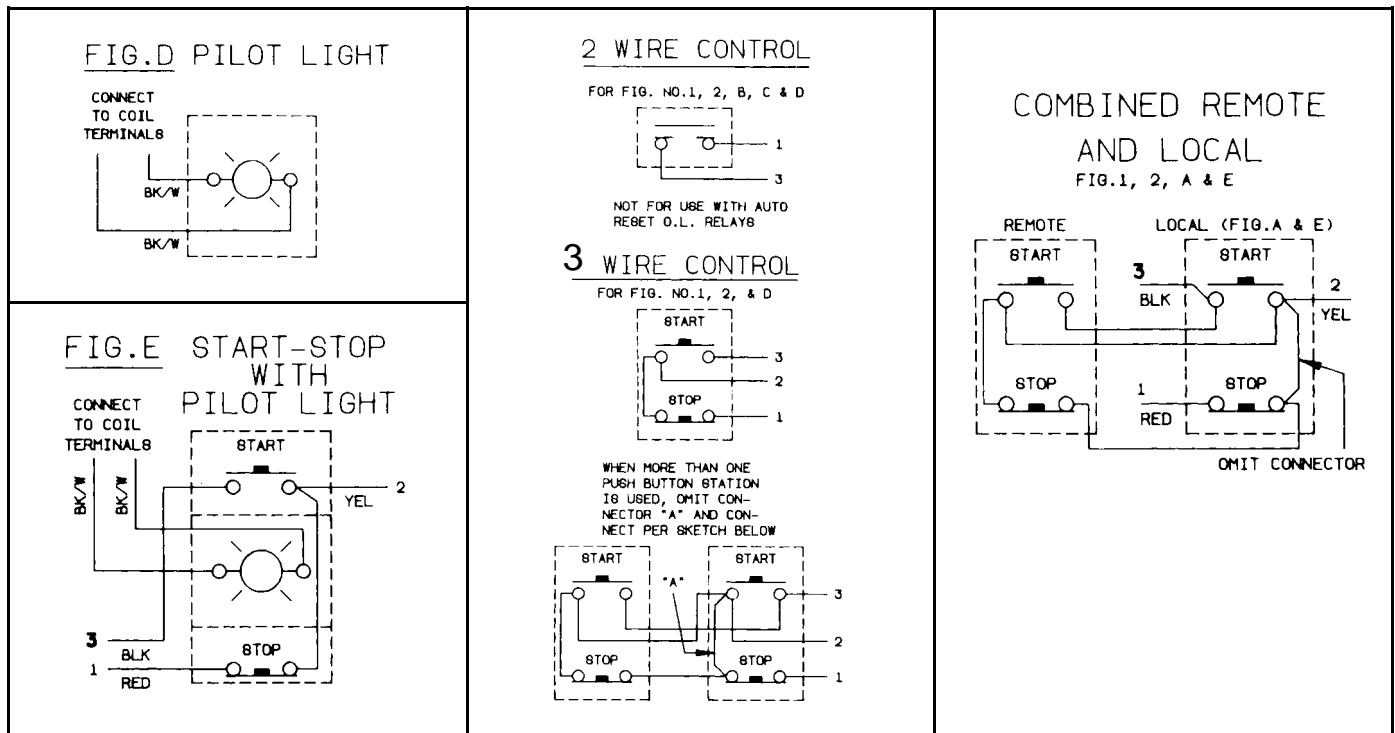


NEMA, Contactors & Starters, (Freedom)

WIRING DIAGRAMS (Continued)



ACCESSORIES



ACCESSORIES

EATON

Installation Instructions for EHD, EDB, EDS, ED, EDH, EDC, FDB, FD, HFD, FDC, HFDDC Circuit Breakers and Molded Case Switches



Contents

Description	Page
Introduction	2
Installation	2
Manual Operation	4
Inspection and Field Testing	4
HFDDC	4

⚠ WARNING

DO NOT ATTEMPT TO INSTALL OR PERFORM MAINTENANCE ON EQUIPMENT WHILE IT IS ENERGIZED. DEATH, SEVERE PERSONAL INJURY OR SUBSTANTIAL PROPERTY DAMAGE CAN RESULT FROM CONTACT WITH ENERGIZED EQUIPMENT. ALWAYS VERIFY THAT NO VOLTAGE IS PRESENT BEFORE PROCEEDING WITH THE TASK, AND ALWAYS FOLLOW GENERALLY ACCEPTED SAFETY PROCEDURES.

EATON IS NOT LIABLE FOR THE MISAPPLICATION OR MISINSTALLATION OF ITS PRODUCTS.

The user is cautioned to observe all recommendations, warnings and cautions relating to the safety of personnel and equipment, as well as all general and local health and safety laws, codes, and procedures.

The recommendations and information contained herein are based on Eaton experience and judgment, but should not be considered to be all-inclusive or covering every application or circumstance which may arise. If any questions arise, contact Eaton for further information or instructions.

1. Introduction



Figure 1. Model D Series C Circuit Breaker and Molded Case Switches

The F-Frame Series C circuit breakers (Fig. 1) are rated from 15A to 225A (150A for 1 pole versions) continuous current and are available as thermal-magnetic circuit breakers and molded case switches. (Molded case switches are available rated at 100A, 150A, and 225A.) Circuit breakers are listed in accordance with Underwriters Laboratories, Inc. Standard UL489, and satisfy the (P1) requirements of the International Electrotechnical Commission Recommendation No. IEC 157-1. Molded case switches are listed in accordance with UL489. For this publication, the term circuit breaker also includes molded case switches and F-Frame is used to cover all of the circuit breakers and molded case switches associated with this leaflet.

2. Installation

The installation procedure consists of inspecting and mounting the circuit breaker, connecting and torquing the line and load terminations, and attaching terminal shields or barriers, when supplied. To install the circuit breaker perform the following steps:

Note: The F-Frame circuit breakers are factory sealed. UL489 requires that internal accessories be installed at the factory. Where local codes and standards permit and UL listing is not required, internal accessories can be field installed. Accessory installation should be done before the circuit breaker is mounted and connected.

Mounting hardware and unmounted terminations (where required) are supplied in separate packages.

2-1. Make sure that the circuit breaker is suitable for the installation by comparing nameplate data with system requirements. Inspect the circuit breaker for completeness and check for damage before mounting.

⚠ WARNING

BEFORE MOUNTING THE CIRCUIT BREAKER IN AN ELECTRICAL SYSTEM, MAKE SURE THERE IS NO VOLTAGE PRESENT WHERE WORK IS TO BE PERFORMED. THE VOLTAGES IN ENERGIZED EQUIPMENT CAN CAUSE INJURY OR DEATH.

2-2. Depending on the equipment configuration, the circuit breaker can be mounted using different styles of hardware. The following steps describe how to mount the circuit breaker using standard hardware. When special hardware is needed (for example, with the electrical operator), the instruction leaflet describing the accessory also describes the special mounting arrangements.

Note: Before mounting the circuit breaker, check if the termination devices should be installed first. See terminations instructions.

2-3. To mount the circuit breaker, perform the following steps:

- a. For individual mounting panels, make sure that mounting panel is predrilled using bolt drilling plan (Fig. 2). For panelboard mounting, only load end support mounting holes are required. For deadfront cover applications make sure panel cover is cut out to correct escutcheon dimensions (Fig.3).

⚠ CAUTION

DO NOT EXCEED CONNECTOR/BUS CAPACITY IN EATON POWER LINE 3A AND 4 PANELS. USE CONNECTOR KIT KPRL3AFD3 (3-POLE) AND KPRL3AFD2 (2-POLE) IN PANEL TYPE PRL3A AND KPRL4FD (3-POLE) AND KPRL4FD2 (2-POLE) IN PANEL PRL4.

- b. If circuit breaker includes factory installed internal accessories, make sure accessory wiring can be reached when the circuit breaker is mounted.
- c. Position circuit breaker on mounting surface.
- d. Install mounting screws, washers, and nuts. Tighten screws firmly, but do not exceed 28 pound-inches (3.16 N.m)

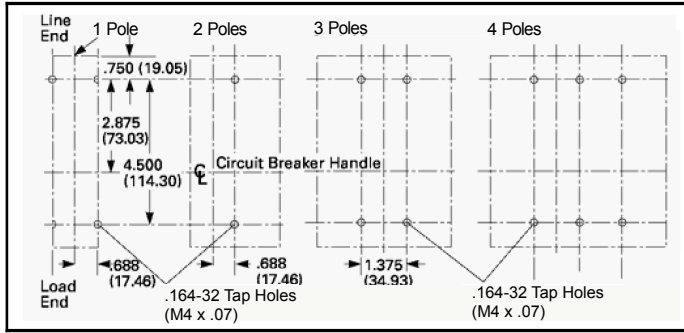


Figure 2. Circuit Breaker Mounting Bolt Drilling Plans

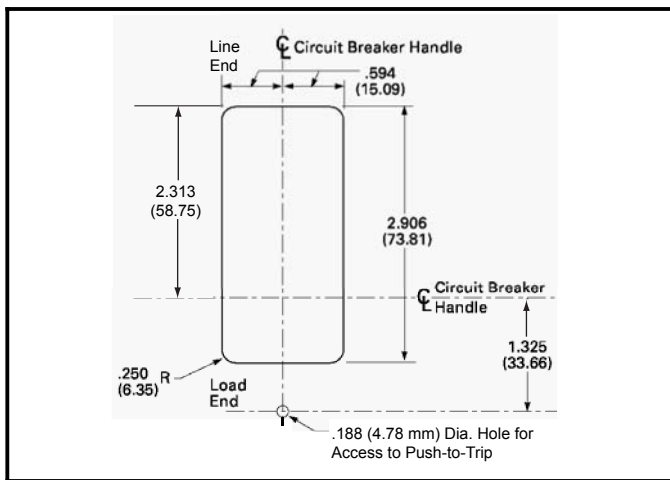


Figure 3. Circuit Breaker Esutcheon Dimensions

2-4. If an optional terminal end cover is to be installed with the circuit breaker (usually line end only), it must be positioned before cable is connected to terminals.

CAUTION

WHEN ALUMINUM CONDUCTORS ARE USED, THE APPLICATION OF A SUITABLE JOINT COMPOUND IS RECOMMENDED TO REDUCE THE POSSIBILITY OF TERMINAL OVERHEATING. TERMINAL OVERHEATING CAN CAUSE NUISANCE TRIPPING AND DAMAGE TO THE CIRCUIT BREAKER.

2-5. After mounting the circuit breaker, line and load terminals and accessory leads should be connected. (See accessory schematic diagram on side of circuit breaker.)

Note: If terminal shield or interphase barriers are to be installed on the circuit breaker, install them after the terminals are connected.

2-6. If required, install terminal shield on circuit breaker cover with mounting screws provided.

2-7. If required, install an interphase barrier by sliding barrier into dovetail grooves between terminals.

2-8. After the circuit breaker is installed, check all mounting hardware and terminal connecting hardware for correct torque loading. Torque values for line/load terminals are given in Tables 1, 2, and 3 and on the circuit breaker nameplate.

Note: See Section 5 for additional details for HFDDC.

Table 1. Terminal Types

Terminal Catalog Number	Terminal Body Material	Screw Head Type	AWG Wire Range	Metric Wire Range	Wire Type	Torque Value, Lb. in.(N.m)
3TA225FD [ⓐ]	Aluminum	3/16 Socket Hex	#4-4/0	25-95	Cu/Al	120 (13.6)
3TA225FDM [ⓐ]	Aluminum	5mm Socket Hex	#4-4/0	25-95	Cu/Al	120 (13.6)
3TA225FDK ^{ⓐ②}	Aluminum	5/16 Socket Hex	#6-300	16-150	Cu/Al	275 (31)
3TA100FD [ⓐ]	Aluminum	Slotted	#14-1/0	2.5-5.0	Cu/Al	See Table 2
3TA50FB [ⓐ]	Aluminum	Slotted	#14-#4	2.5-16	Cu/Al	See Table 2
3T100FB [ⓐ]	Steel	Slotted	#14-1/0	2.5-50	Cu/Al	See Table 2
3T150FB [ⓐ]	Stainless Steel	Slotted	#4-4/0	25-95	Cu Only	See Table 2
3TA150F3K	Aluminum	5/32 Socket Hex	#14-2	2.5-25	Cu/Al	70 (7.9)
3TA150F6K	Aluminum	3/32 Socket Hex	#14-6	2.5-10	Cu/Al	25 (2.8)

Note: Terminal wire connectors are UL listed for standard wire sizes as defined in UL 486A and UL486B.

[ⓐ]Package of Three

^② Individual terminal identified as TA225FD1

Table 2. Terminal Torque Values for Slotted Head

Metric Wire Range	Torque Value N.m	AWG Wire Range	Torque Value, Lb.-In.
2.5-6	3.96	#14-#10	35
10	4.52	#8	40
16-25	5.09	#6-#4	45
35-95	5.65	#3-4/0	50

Table 3. Bolted Connections (Keeper Nut or End Cap)

Termination Catalog Number	Screw Head Type	Nut Thread Size	Torque Value Lb. In. (N.m)
KPR1A/KPR1AM	Upper Supplied	10-32/M5	35 (4.0)
KPEKxxx	Slotted	10-32/M5	35 (4.0)

3. Manual Operation

Manual operation of the circuit breaker is controlled by the circuit breaker handle and the PUSH-TO-TRIP button. The circuit breaker handle has three indicated positions, two of which are shown on the cover with raised lettering to indicate ON and OFF. On the sliding handle barrier, ON, OFF, and trip are also shown by a color-coded strip for each circuit breaker handle position: red for ON, white for tripped, and green for OFF. On the sliding handle barrier, ON/OFF is also shown with the international symbols I/O (See Fig. 4.)

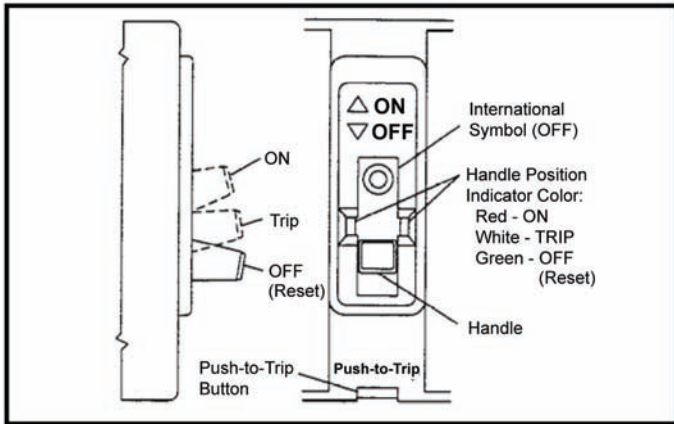


Figure 4. Circuit Breaker Manual Controls.

Circuit Breaker Reset

After tripping, the circuit breaker is reset by moving the circuit breaker handle to the extreme OFF position.

Note: In the event of a thermal trip, the circuit breaker cannot be reset until the thermal element cools.

PUSH-TO-TRIP Button

The PUSH-TO-TRIP button checks the tripping function and is used to periodically exercise the operating mechanism.

4. Inspection and Field Testing

Series C molded case circuit breakers are designed to provide years of almost maintenance-free operation. The following procedure describes how to inspect and test a circuit breaker in service.

Inspection

Circuit breakers in service should be inspected periodically. The inspection should include the following checks 4-1 thru 4-7.

⚠ WARNING

BEFORE INSPECTING THE CIRCUIT BREAKER IN AN ELECTRICAL SYSTEM, MAKE SURE THE CIRCUIT BREAKER IS SWITCHED TO THE OFF POSITION AND THERE IS NO VOLTAGE PRESENT WHERE WORK IS TO BE PERFORMED. SPECIAL ATTENTION SHOULD BE PAID TO REVERSE FEED APPLICATIONS TO ENSURE NO VOLTAGE IS PRESENT. THE VOLTAGES IN ENERGIZED EQUIPMENT CAN CAUSE INJURY OR DEATH.

⚠ CAUTION

MAKE SURE THAT CLEANING AGENTS OR SOLVENTS USED TO CLEAN THE CIRCUIT BREAKER ARE SUITABLE FOR THE JOB. SOME COMMERCIAL CLEANING AGENTS WILL DAMAGE THE NAME PLATES OR MOLDED PARTS.

- 4-1. Remove dust, dirt, soot, grease, or moisture from the surface of the circuit breaker using a lint-free dry cloth, brush, or vacuum cleaner. Do not blow debris into circuit breaker. If contamination is found, look for the source and eliminate the problem.
- 4-2. Switch circuit breaker to ON and OFF several times to be sure that the mechanical linkages are free and do not bind. If mechanical linkages are not free, replace circuit breaker.
- 4-3. Press the PUSH-TO-TRIP button to mechanically trip the circuit breaker. Trip, reset, and switch circuit breaker ON several times. If mechanism does not reset each time the circuit breaker is tripped, replace the circuit.
- 4-4. Check base, cover, and operating handle for cracks, chipping, and discoloration. Circuit breakers should be replaced if cracks or severe discoloration is found.
- 4-5. Check terminals and connectors for looseness or signs of overheating. Overheating will show as discoloration, melting, or blistering of conductor insulation, or as pitting or melting of conductor surfaces due to arcing. If there is no evidence of overheating or looseness, do not disturb or tighten the connections. If there is evidence of overheating, terminations should be cleaned or replaced. Before re-energizing the circuit breaker, all terminations and cable should be refurbished to the condition when originally installed.
- 4-6. Check circuit breaker mounting hardware. Tighten if necessary.
- 4-7. Check area where circuit breaker is installed for any safety hazards, including personal safety and fire hazards. Exposure to certain types of chemicals can cause deterioration of electrical connections.

Field Testing

Any field testing should be done in accordance with applicable NEMA Standards.

5. HFDDC

5-1. The HFDDC circuit breakers and switches are qualified for direct current voltages and interruptions with multiple poles wired in series.

5-2. See Figures 5, 6, 7, and 8 for typical wiring configurations. A 3-pole breaker may be wired as a 2-pole.

5-3. For grounded insulated load configurations, the interruption rating is based on number of poles in series that break the ungrounded leg of power supply.

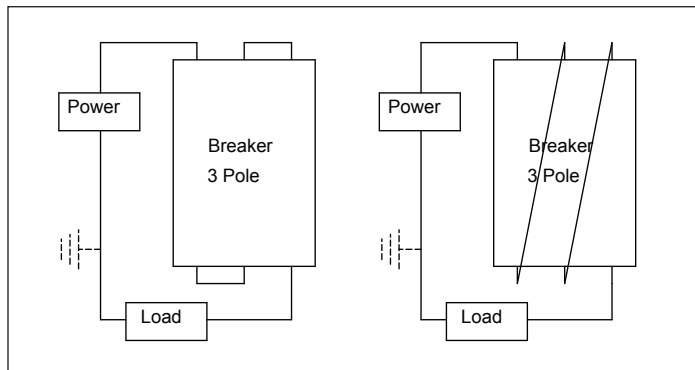


Figure 5. Load Connected to Power Source. Grounded or Ungrounded Systems.

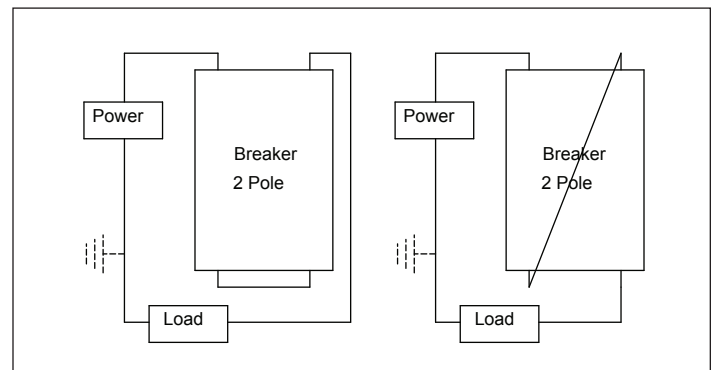


Figure 7. Load Connected to Power Source. Grounded or Ungrounded Systems.

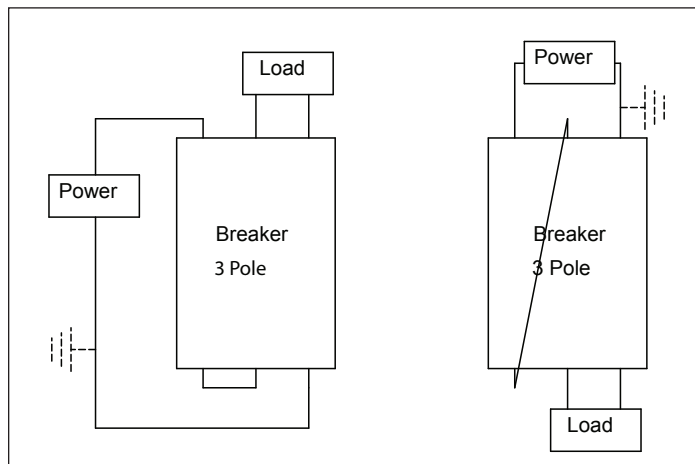


Figure 6. Load Isolated from Power Source. Grounded or Ungrounded Systems. If System Voltage Exceeds 300 Vdc, then Ungrounded Systems Only.

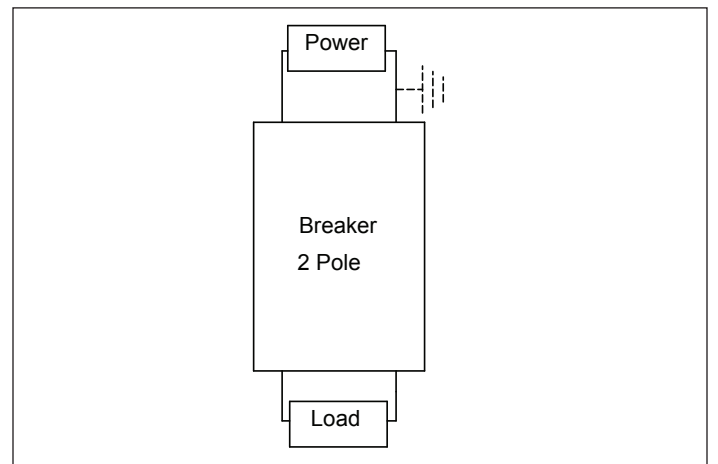


Figure 8. Load Isolated from Power Source. Grounded or Ungrounded Systems. If System Voltage Exceeds 125 Vdc, then Ungrounded Systems Only.

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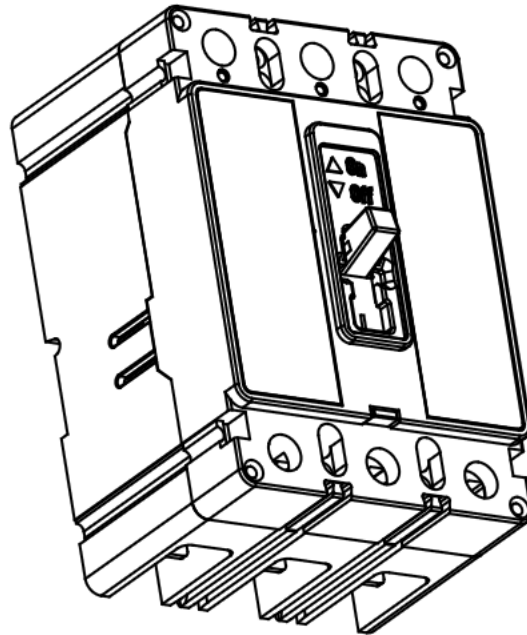
Eaton Corporation
Electrical Group
1000 Cherrington Parkway
Moon Township, PA 15108
United States
877-ETN-CARE (877-386-2273)
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EATON

Installation Instructions for Series C F-Frame Motor Circuit Protector Type HMCP & HMCPS



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Powering Business Worldwide



WARNING

DO NOT ATTEMPT TO INSTALL OR PERFORM MAINTENANCE ON EQUIPMENT WHILE IT IS ENERGIZED. DEATH, SEVERE PERSONAL INJURY, OR SUBSTANTIAL PROPERTY DAMAGE CAN RESULT FROM CONTACT WITH ENERGIZED EQUIPMENT. ALWAYS VERIFY THAT NO VOLTAGE IS PRESENT BEFORE PROCEEDING WITH THE TASK, AND ALWAYS FOLLOW GENERALLY ACCEPTED SAFETY PROCEDURES.

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1. INTRODUCTION

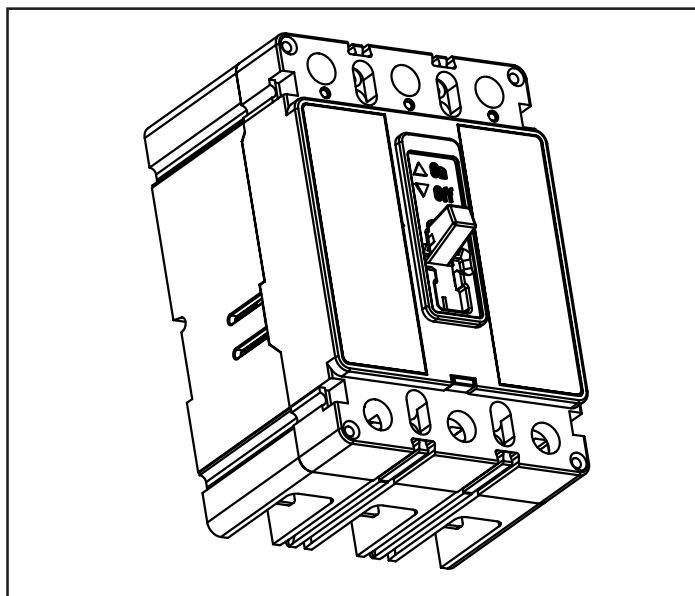


Fig. 1-1 F-Frame Series C Motor Circuit Protector

The user is cautioned to observe all recommendations, warnings, and cautions relating to the safety of personnel and equipment as well as all general and local health and safety laws, codes, and procedures.

The recommendations and information contained herein are based on Eaton experience and judgement, but should not be considered to be all-inclusive or covering every application or circumstance which may arise. If any questions arise, contact Eaton for further information or instructions.

General Information

The F-Frame Series C instantaneous-only (magnetic) motor circuit protector (MCP) (Fig. 1-1) is available in ratings from 3A to 150A continuous current for motor starter sizes 0 through 4. Designated as the Type HMCP and HMCPS, it is available in 3-pole frames only. The MCP is designed to comply with the applicable requirements of Underwriters Laboratories, Inc. Standard UL489 and the International Electrotechnical Commission Recommendations No. IEC 947.

The MCP is a UL recognized component under file E7819. It is used primarily to provide short-circuit protection as part of a combination controller where other circuit protective functions are performed by other devices within the controller. **The MCP is not suitable for reverse feed applications.**

This instruction leaflet (IL) gives procedures for installation, operation, inspection, and checking of F-Frame MCP's by the end user.

Conforming to N.E.C. requirements, the maximum HMCP and HMCPS trip ampere value is set by the motor FLA. Since there are various types and classes of motor designs (based on duty cycle, electrical load, and manufacturer's discretion), locked rotor currents (and resulting in rush current magnitudes) vary. These are normally identified by N.E.C. codes. The listed HMCP and HMCPS trip ampere value is considered typical, but not all inclusive. This is the reason for the adjustable magnetic trip setting, which compensates for different actual motor in rush currents. Trip level adjustments are normal and sometimes necessary to enable the motor to start without nuisance tripping especially when motor or system conditions induce higher than expected in rush currents. These circumstances may be beyond the control of the HMCP and HMCPS, relative to its allowable trip setting. Such conditions should be treated as a special case which may be referred to Eaton.

2. INSTALLATION

The installation procedure consists of inspecting and mounting the MCP, connecting and torquing the line and load terminations, and attaching terminal shields or barriers, when required. To install the MCP, perform the following steps:

F-Frame MCPs are factory sealed. UL489 requires that internal accessories be installed at the factory. Where local codes and standards permit and UL component recognition is not required, internal accessories can be field installed. Accessory installation should be done before the MCP is mounted and connected. The MCP has a cover interlock which requires the handle to be in the OFF position when removing or installing the cover.

If the HMCP or HMCPS is opened at locations other than authorized, the side located adhesive seal must be removed and the 'UR' nameplate mark must be covered. Both of the above steps are required to comply with UL requirements.

No internal maintenance, adjustments, or replacement items are authorized. Misuse, mishandling, or unauthorized adjustments can change the operating characteristics of the HMCP or HMCPS.

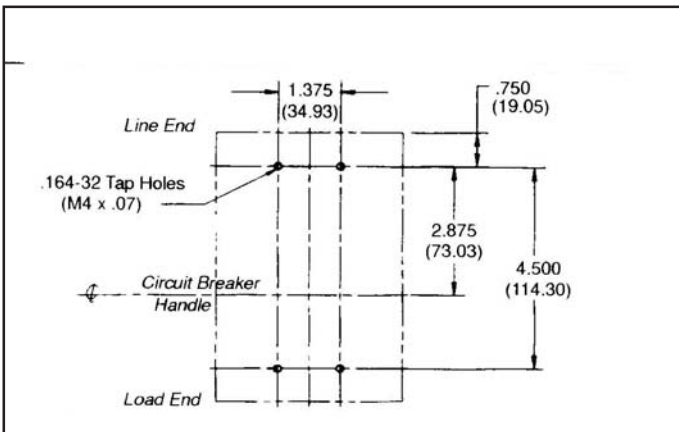


Fig. 2-1 MCP, HMCP and HMCPS Mounting Bolt Drilling Plans

Mounting hardware and unmounted accessories (where required) are supplied in separate packages.

2-1. Make sure that the MCP is suitable for the intended installation by comparing nameplate data with system requirements. Inspect the MCP for completeness and damage before mounting.



WARNING

BEFORE MOUNTING THE MCP IN AN ELECTRICAL SYSTEM, MAKE SURE THE MCP IS SWITCHED TO THE OFF POSITION AND THAT THERE IS NO VOLTAGE PRESENT WHERE WORK IS TO BE PERFORMED. THE VOLTAGES IN ENERGIZED EQUIPMENT CAN CAUSE DEATH OR SEVERE PERSONAL INJURY.

2-2. To mount the MCP, perform the following steps:

Note: If terminal shield or interphase barriers are to be installed on the MCP, install them after the terminals are connected.

- a. For individual mounting panels, make sure that mounting panel is predrilled using drilling plan (Fig. 2-1).
 - b. If MCP includes factory installed internal accessories, make sure accessory wiring can be reached when the MCP is mounted.
 - c. Position MCP on mounting surface.
 - d. Install mounting screws, washers, and nuts. Tighten screws firmly, but do not exceed 28 pound-inches (3.16 N.m)
- 2-3. If an optional terminal end cover is to be installed with the MCP (usually line end only), it must be positioned before cable is connected to terminals.



CAUTION

WHEN ALUMINUM CONDUCTORS ARE USED, THE APPLICATION OF A SUITABLE JOINT COMPOUND IS RECOMMENDED TO REDUCE THE POSSIBILITY OF TERMINAL OVERHEATING. TERMINAL OVERHEATING CAN CAUSE DAMAGE TO THE MCP.

- 2-4. After mounting the MCP, line and load cables and accessory leads should be connected. (See accessory schematic diagram on side of MCP.)
- 2-5. If required, install terminal shield on MCP cover with mounting screws provided.
- 2-6. If required, install interphase barriers by sliding barriers into dovetail grooves between terminals.
- 2-7. After the MCP is installed, check all mounting hardware and terminal connecting hardware for correct torque loading. Torque values for lineload terminals are given in Tables 2-1 and 2-2 and on the MCP nameplate.

Table 2-1. TERMINAL TYPES

Terminal Catalog Number	Terminal Body Material	Screw Head Type	AWG Wire Range	Metric Wire Range	Wire Type	Torque Value LB in. (N•m)
3TA225FD(1)	Aluminum	3/16 Socket Hex	#4-4/0	25-95	Cu/Al	120 (13.6)
3TA225FDM(1)	Aluminum	5mm Socket Hex	#4-4/0	25-95	Cu/Al	120 (13.6)
3TA225FDK(1) (2)	Aluminum	5/16 Socket Hex	#6-300	16-150	Cu/Al	275 (31)
3TA100FD(1)	Aluminum	Slotted	#14-1/0	2.5-50	Cu/Al	See Table 2-2
3TA50FB(1)	Aluminum	Slotted	#14-#4	2.5-16	Cu/Al	See Table 2-2
3T100FB(1)	Steel	Slotted	#14-1/0	2.5-50	Cu/Al	See Table 2-2
3T150FB(1)	Stainless Steel	Slotted	#4-4/0	25-95	Cu Only	See Table 2-2

Note: Terminal wire connectors are UL listed for standard wire sizes as defined in UL 486A and UL 486B.

(1) Package of three
(2) Individual terminal identified as TA225FD1

TABLE 2-2. TERMINAL TORQUE VALUES FOR SLOTTED HEAD

Metric Wire Range	Torque Value. N•m	AWG Wire Range	Torque Value Lb. In.
2.5-6	3.96	#14-#10	35
10	4.52	#8	40
16-25	5.09	#6-#4	45
35-95	5.65	#3-4/0	50

TABLE 2-3. BOLTED CONNECTIONS (KEEPER NUT OR END CAP)

Termination Catalog Number	Screw Head Type	Nut Thread Size	Torque Value. Lb. In. (N•m)
KPR1A / KPR1AM	User Supplied	10-32 / M5	35(4.0)
KPEKxxx	Slotted	10-32 / M5	35(4.0)

3. MANUAL OPERATION

The MCP is normally operated by the handle or the PUSH-TO-TRIP button. The MCP handle has three indicating positions, two of which are shown on the cover by raised lettering to indicate ON and OFF. On the sliding handle barrier, ON, OFF, and TRIP are also shown by a color-coded strip for each MCP handle position: red for ON, white for TRIPPED, and green for OFF. On the sliding handle barrier, ON/OFF is also indicated by the international symbols I/O. (See Fig. 3-1).

CIRCUIT BREAKER RESET

After tripping, the MCP is reset by moving the MCP handle to the extreme OFF position.

PUSH-TO-TRIP Button

The PUSH-TO-TRIP button checks the tripping function and is used to periodically exercise the operating mechanism. The button is designed to be operated by using a small screwdriver.

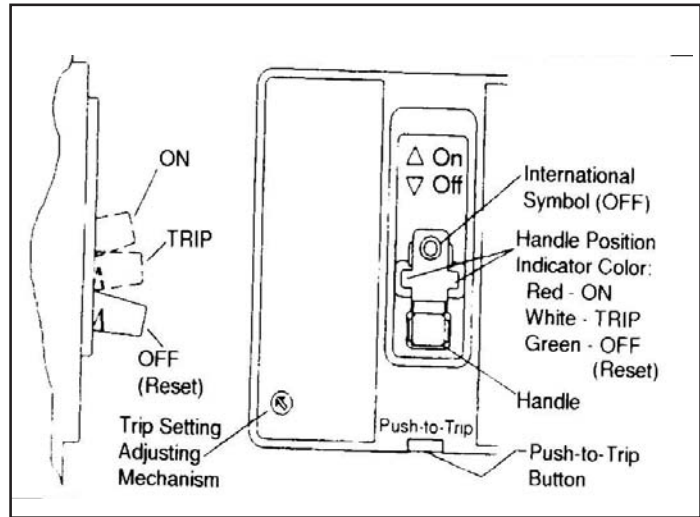


Fig. 3-1 Frame MCP Manual Controls

Adjustment of Trip Setting

The trip setting adjusting mechanism permits the MCP trip range to be changed. The mechanism consists of a cam with eight positions for different trip levels. The trip levels are labeled A through H. Trip values are shown on the MCP cover nameplate and in Tables 3.1 and 3.2. To adjust the trip level, perform the following steps:

- 3-1. Determine the motor locked rotor current from the motor nameplate. Refer to Table 3-1 and select appropriate MCP trip setting. Depress and rotate adjustment button clockwise to the setting.



A ROTATION STOP PREVENTS THE ADJUSTMENT BUTTON FROM BEING ROTATED COUNTER-CLOCKWISE BEYOND POSITION A. THE MCP CAN BE DAMAGED IF THE BUTTON IS FORCED PAST A IN THE COUNTER CLOCKWISE DIRECTION.

- 3-2. For closest protection, turn the adjustment button counter-clockwise to successively lower settings until the MCP trips when the the motor is started. When this setting has been determined, turn the adjustment button clockwise to the next highest setting. The MCP is now adjusted for normal operation.

- 3-3. If the MCP does not trip at the lowest setting (A), leave the adjustment button at this position.

TABLE 3-1: MCP TRIP SETTINGS					
Cam Setting	Typical Motor Full Load Current Amperes ①	NEMA Starter Size	Continuous Amps	MCP Catalog Number	MCP Trip Setting ②
A	.69 - .91	0	3	HMCP003A0 OR HMCPS003A0	9
B	.92 - 1.0				12
C	1.1 - 1.2				15
D	1.3 - 1.5				18
E	1.6 - 1.7				21
F	1.8 - 1.9				24
G	2.0 - 2.2				27
H	2.3 - 2.5				30
A	1.5 - 2.0	0	7	HMCP007C0 OR HMCPS007C0	21
B	2.1 - 2.5				28
C	2.6 - 3.1				35
D	3.2 - 3.6				42
E	3.7 - 3.9				49
F	4.3 - 4.7				56
G	4.8 - 5.2				63
H	5.3 - 5.7				70
A	3.4 - 4.5	0	15	HMCP015E0 OR HMCPS015E0	45
B	4.6 - 5.6				60
C	5.7 - 6.8				75
D	6.9 - 7.9				90
E	8.0 - 9.1				105
F	9.2 - 10.3				120
G	10.4 - 11.4				135
H	11.5 - 12.6				150
A	6.9 - 9.1	1	30	HMCP030H1 OR HMCPS030H1	90
B	9.2 - 11.4				120
C	11.5 - 13.7				150
D	13.8 - 16.0				180
E	16.1 - 18.3				210
F	18.4 - 20.6				240
G	20.7 - 22.9				270
H	23.0 - 25.2				300
A	11.5 - 15.2	2	50	HMCP050K2 OR HMCPS050K2	150
B	15.3 - 19.1				200
C	19.2 - 22.9				250
D	23.0 - 26.8				300
E	26.9 - 30.6				350
F	30.7 - 34.5				400
G	34.6 - 38.3				450
H	38.4 - 42.1				500

TABLE 3-1: MCP TRIP SETTINGS (CONTINUED)					
Cam Setting	Typical Motor Full Load Current Amperes ①	NEMA Starter Size	Continuous Amps	MCP Catalog Number	MCP Trip Setting ②
A	16.1 - 21.4	2	70	HMCP070M2	210
B	21.5 - 26.8				280
C	26.9 - 32.2				350
D	32.3 - 37.5				420
E	37.6 - 42.9				490
F	43.0 - 48.3				560
G	48.4 - 53.7				630
H	53.8 - 59.1				700
A	23.0 - 30.6	3	100	HMCP100R3 OR HMCPS100R3	300
B	30.7 - 38.3				400
C	38.4 - 46.0				500
D	46.1 - 53.7				600
E	53.8 - 61.4				700
F	61.5 - 69.1				800
G	69.2 - 76.8				900
H	76.9 - 84.5				1000
A	34.6 - 46.0	4	150	HMCP150T4 OR HMCPS150T4	450
B	46.1 - 57.5				600
C	57.6 - 69.1				750
D	69.2 - 80.6				900
E	80.7 - 92.2				1050
F	92.3 - 103.7				1200
G	103.8 - 115.2				1350
H	115.3 - 126.7				1500
A	57.0 - 75.0	4	150	HMCP150U4 OR HMCPS150U4	750
B	76.0 - 95.0				1000
C	96.0 - 114.0				1250
D	115.0 - 130.0				1500
E	③				1750
F	③				2000
G	③				2250
H	③				2500

TABLE 3-2: SPECIAL APPLICATION MCP TRIP SETTINGS

Cam Setting	Continuous Ampere Rating	MCP Catalog Number	MCP Trip Setting ②
A	25A	HMCP025D0	40
B			43
C			46
D			49
E			52
F			55
G			58
H			60
A	50A	HMCP050G2	81
B			87
C			93
D			98
E			103
F			109
G			115
H			120
A	70A	HMCP070J2	114
B			122
C			130
D			139
E			145
F			153
G			160
H			168
A	100A	HMCP100L3	163
B			174
C			185
D			196
E			207
F			218
G			229
H			240
①	Motor FLA ranges are typical. The corresponding trip setting is 13 times the FLA value shown. The ± 20% trip tolerance can affect trip response and require increase in cam setting per para 3-2.		
②	For dc applications, actual trip levels may exceed the values shown by as much as 100%. Actual dc trip values are application dependent.		
③	Settings above 130 amps are for special applications. N.E.C. Article 430-110(a) requires the ampere rating of the disconnecting means to be not less than 115% of the motor full ampere rating.		

4. INSPECTION AND FIELD CHECKS

Series C molded case MCPs are designed to provide years of almost maintenance-free operation. The following procedure describes how to inspect and test a MCP in service.

Inspection

MCPs in service should be inspected periodically. The inspection should include the following checks.



WARNING

BEFORE INSPECTING THE MCP IN AN ELECTRICAL SYSTEM, MAKE SURE THE MCP IS SWITCHED TO THE OFF POSITION AND THAT THERE IS NO VOLTAGE PRESENT WHERE WORK IS TO BE PERFORMED. THE VOLTAGES IN ENERGIZED EQUIPMENT CAN CAUSE DEATH OR SEVERE PERSONAL INJURY.



CAUTION

MAKE SURE THAT CLEANING AGENTS OR SOLVENTS USED TO CLEAN THE MCP ARE SUITABLE FOR THE JOB. SOME COMMERCIAL CLEANING AGENTS WILL DAMAGE THE NAMEPLATES OR MOLDED PARTS.

- 4-1. Remove dust, dirt, soot, grease, or moisture from the surface of the MCP using a lint-free dry cloth, brush, or vacuum cleaner. Do not blow debris into MCP. If contamination is found, look for the source and eliminate the problem.
- 4-2. Switch MCP to ON and OFF several times to be sure that the mechanical linkages are free and do not bind. If mechanical linkages are not free, replace MCP.
- 4-3. Press the PUSH-TO-TRIP button to mechanically trip the MCP. Trip, reset, and switch MCP ON several times. If mechanism does not reset each time the MCP is tripped, replace the MCP.
- 4-4. Check base, cover, and operating handle for cracks, chipping, and discoloration. MCPs should be replaced if cracks or severe discoloration is found.

- 4-5 Check terminals and connectors for looseness or signs of overheating. Overheating will show as discoloration, melting, or blistering of conductor insulation, or as pitting or melting of conductor surfaces due to arcing. If there is no evidence of overheating or looseness, do not disturb or tighten the connections. If there is evidence of overheating, terminations should be cleaned or replaced. Before re-energizing the MCP, all terminations and cable should be refurbished to the condition when originally installed.
- 4-6 Check MCP mounting hardware; tighten if necessary.
- 4-7 Check area where MCP is installed for any safety hazards including personal safety and fire hazards. Exposure to certain types of chemicals can cause deterioration of electrical connections.

Field Testing

Any field testing should be done in accordance with applicable NEMA Standards.

Instruction Leaflet IL 29C401J

Effective December 2010

Installation Instructions for Series C F-Frame Motor Circuit Protector Type HMCP & HMCP5

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Eaton Corporation
Electrical Group
1000 Cherrington Parkway
Moon Township, PA 15108
United States
877-ETN-CARE (877-386-2273)
Eaton.com

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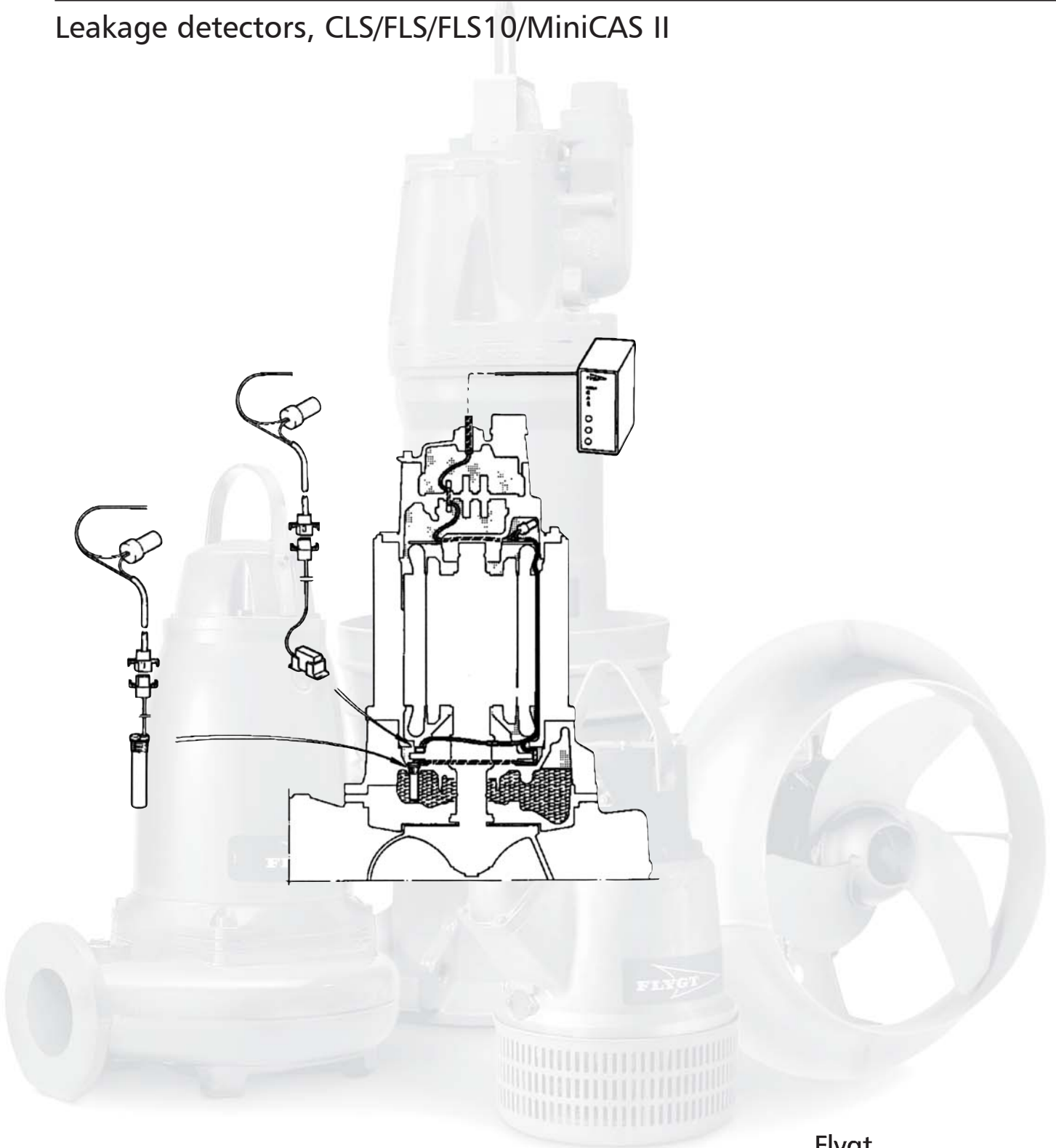
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Installation and application

Leakage detectors, CLS/FLS/FLS10/MiniCAS II



INTRODUCTION

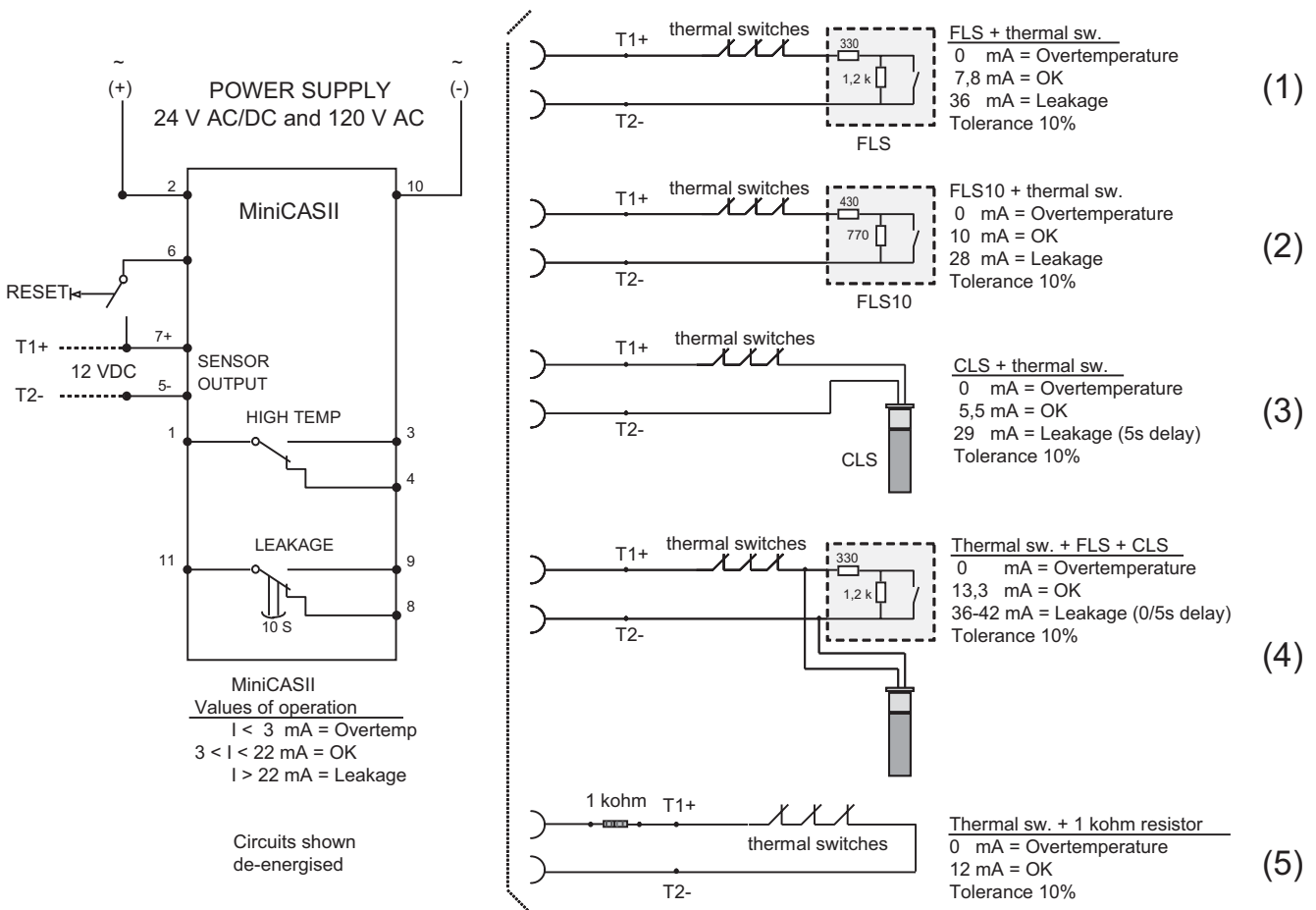
A number of condition monitoring sensors are available for the ITT FLYGT pump range.

- i **Thermal switches** for stator over temperature.
- ii **CLS** for water in oil detection.
- iii **FLS** for the detection of liquid in the stator housing.
- iv **FLS10** for detection of liquid in the inspection chamber in the new midrange pump series, i.e. 3153, 3171, 3202 and 3301.

Any combination of these sensors can be used with the standard versions of the pumps. **Explosion proof** approved pumps are restricted to the use of the thermal switches with or without **FLS and FLS10 only**.

The sensors are monitored by the ITT FLYGT **MiniCAS II** supervision relay, which is situated in the panel.

BASIC SENSOR CONNECTIONS (5 alternative sensor combinations)



Note! MiniCASII 24 V AC/DC, RESET also possible by connecting terminals 6-2.

NOTES

1. Amber LED indicates supply on.
 - ó Overtemperature relay energised when healthy.
 - ó Leakage relay de-energised when healthy.
 - ó Red overtemperature LED off when healthy.
 - ó Red leakage LED off when healthy.
2. MiniCAS II resets automatically after leakage fault. MiniCAS II requires resetting after overtemperature fault. Please see iTechnical Datai.
3. There is not a separate indication when two leakage sensors are used.

INSTALLATION

The monitoring connections at the panel

The **MiniCAS II** supervision relay is installed in the pump panel and simply plugs into an eleven pin relay base. Six basic sensor connections are possible.

1. Thermal switches with FLS

The pilot cores in the pump can be connected to the panel in either polarity.

2. Thermal switches with FLS10

The pilot cores in the pump can be connected to the panel in either polarity.

3. Thermal switches with CLS

The **CLS** sensor is diode protected. For this reason the pilot cores are required to be connected with the correct polarity (brown = +, black = \bar{n}). Connected incorrectly the **MiniCAS II** supervision relay will indicate an open circuit (0 mA), i.e. with the amber supply LED and the red overtemperature LED **both** on. Connected correctly and reset, the amber LED **only** will be on.

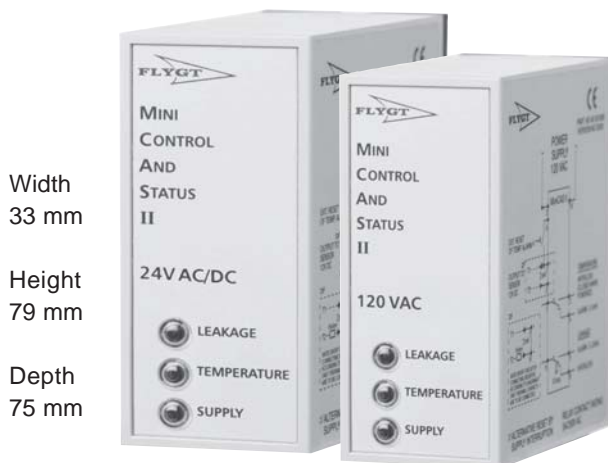
4. Thermal switches with CLS + FLS

The pilot cores in the pump cable are required to be connected with the correct polarity (brown = +, black = \bar{n}), however, because the **FLS** will cause the **MiniCAS II** to indicate healthy, i.e. amber LED **ON**, even when incorrectly connected **CLS**, a current reading of the monitoring circuit must be taken when installing the pump. Correct polarity will indicate 15.0 mA; incorrect polarity will indicate 7.8 mA with healthy conditions.

5. Thermal switches only

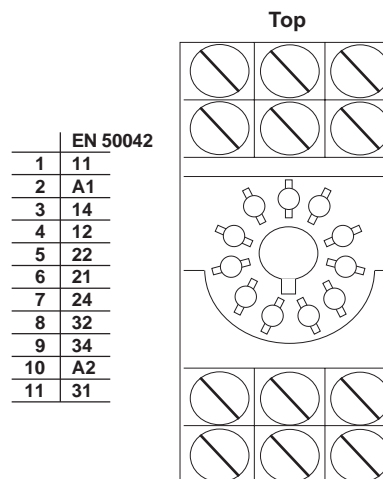
A 1000 Ω resistor must be connected in series with the thermal overtemperature switches. A 1000 ohm resistor is enclosed in the package.

MiniCAS II supervision relay



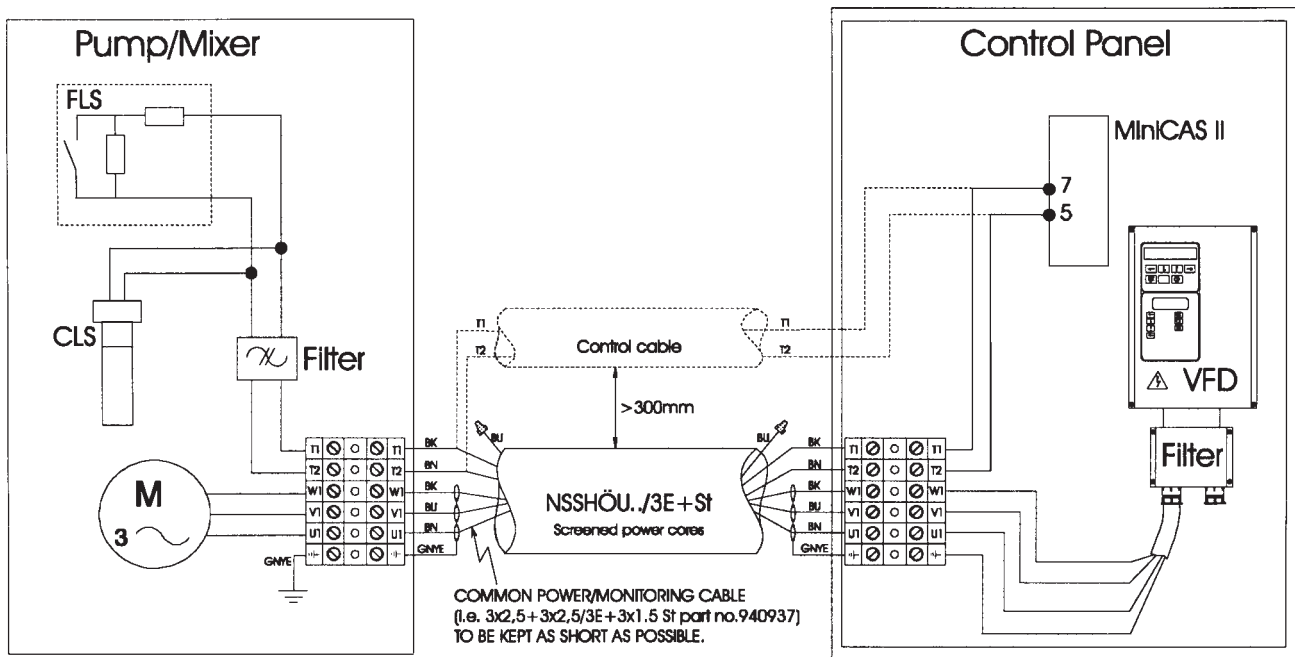
Part-nos: 83 58 57 (24 V AC/DC)
40 501098 (120 V AC)

11 pin relay base



Part-no: 84 55 67

Variable frequency inverter controlled pumps/mixers



In installations utilizing variable frequency inverters for speed control of pumps, interference from a variable frequency drive (VFD) may cause nuisance tripping of monitoring equipment and the electronic sensor CLS.

VFD-interference does not affect FLS and FLS10.

Interference occurs when the pilot cores are in close proximity to the power cores.

The interference may be suppressed by connecting a suitable filter¹ between the monitoring conductors (T1, T2) and ground (PE).

The filter should ideally be situated in the pump/mixer junction box.

Cables containing both power and pilot cores should be kept to a minimum length.

The power cable and control cable should be run in separate cable ducts with a distance of at least 300 mm between them.

Our pumps are CE-marked according to EMC-directive and the VFD that we buy from a subcontractor should also be CE-marked. In order to make the VFD pass the EMC-tests the interconnecting cable between pump and VFD has to be **screened**.

¹Available filter kits:

Part no. 6046800

Will fit: 3102, 3127, 4430.

Part no. 6046801

Will fit: 3085, 4410.

Part no. 6046802

Will fit: 3140, 3152, 3170, 3201, 3300.

Part no. 6046804

Will fit: 3231, 3306, 3312, 3351, 3356, 3400, 3501, 3602, 3800, 7045, 7061, 7081, 7101, 7115, 7121.

Part no. 6616000

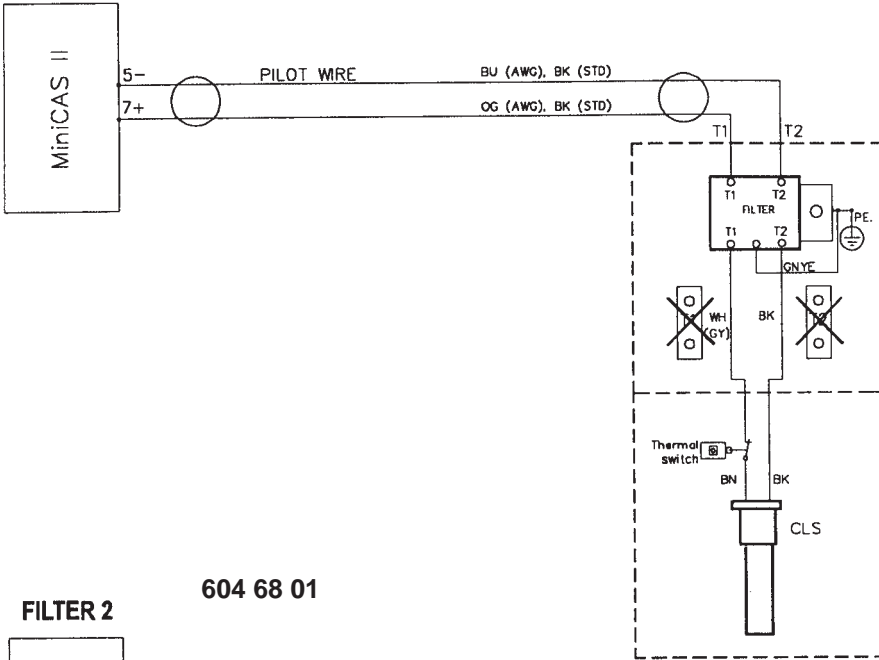
Will fit: 4630, 4640, 4650, 4660.

Part no. 6616001

Will fit: 4670, 4680.

604 68 00

FILTER 1

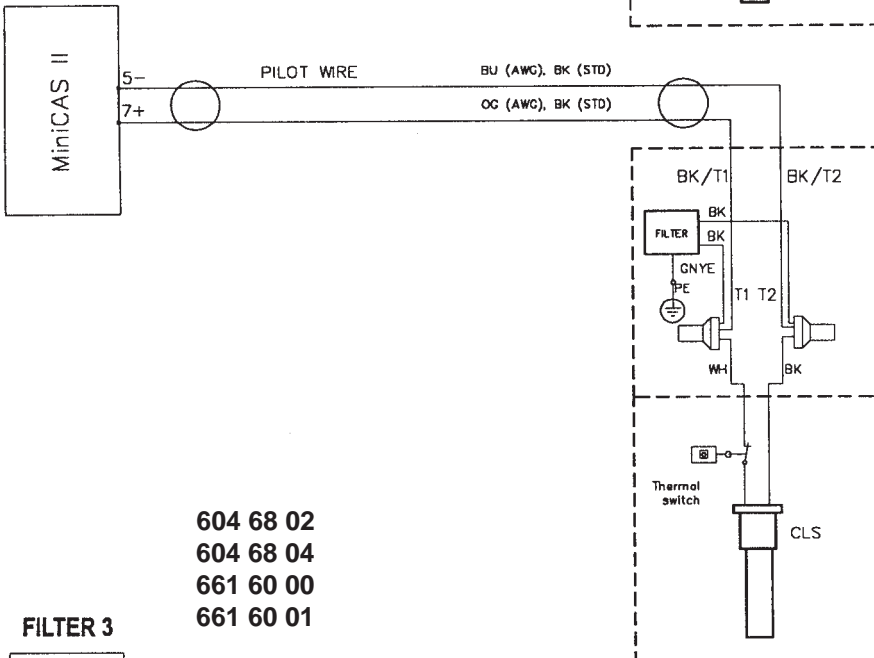


JUNCTION BOX

Remove connection from terminals T1,T2, when using filter

604 68 01

FILTER 2



JUNCTION BOX

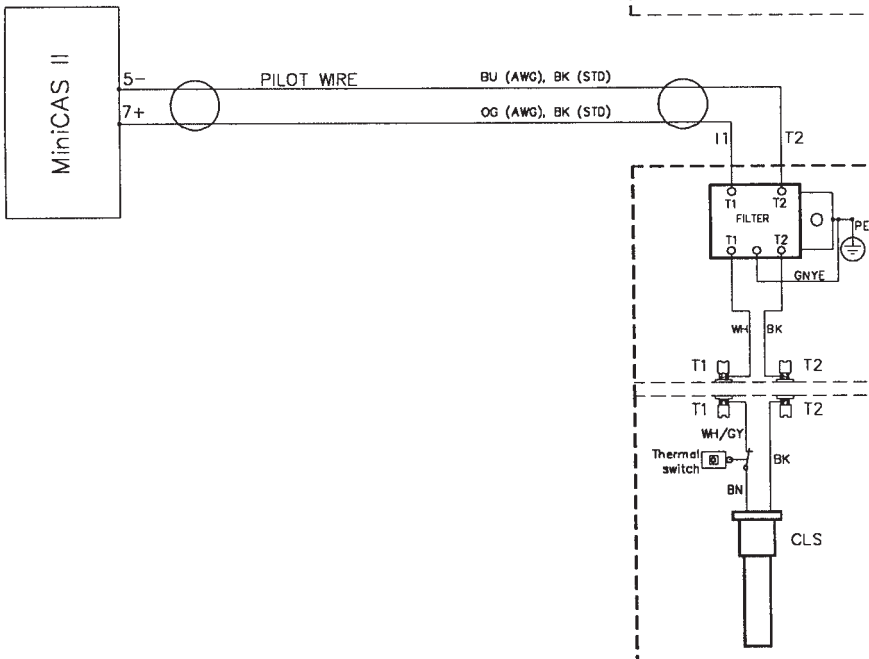
604 68 02

604 68 04

661 60 00

661 60 01

FILTER 3



JUNCTION BOX

Checking the sensor circuit and fault finding

Connect a multimeter in series with the sensors or use the ITT Flygt sensor tester iST-1i (FD part no. 10-581700) to measure the current in the sensor circuit. See figures below.

iST-1i is not yet prepared to handle the new sensor FLS10.

The figures on page 2 is used as reference to determine the status of the sensors (sensor connections).

Circuits with CLS require some extra consideration. Connected with wrong polarity the CLS draws a zero current. The CLS can then be considered not connected.

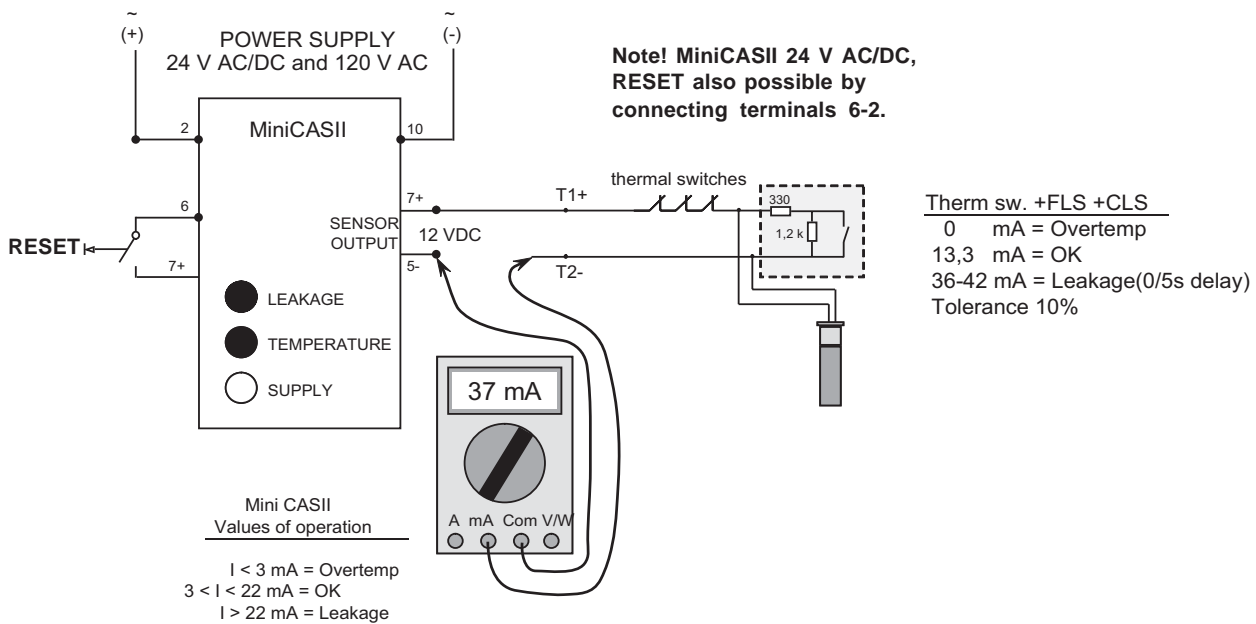
Wrong polarity results in 0 mA for circuit (3). Circuit (4) is reduced to the same as circuit (1).

As opposed to the FLS and FLS10, the CLS has a built-in alarm delay of 5 seconds.

Since the MiniCASII has only one leakage indication lamp, an alarm from the CLS or the FLS looks the same.

For circuit (4), this means that a leakage alarm can not be attributed to either of the two sensors just by looking at the MiniCASII. To make out the tripping sensor without lifting the pump, a measurement of the sensor current is necessary.

Sensor current measurement using a multimeter



General procedure to check the status of the sensors

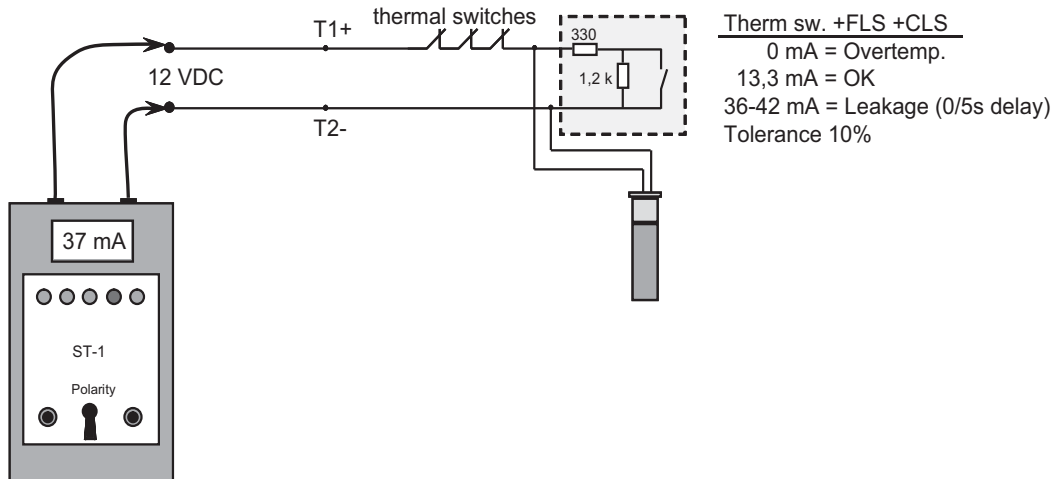
1. Close the sensor circuit by connecting the multimeter test leads according to figure above or on next page.
2. From the moment contact is made, observe the sensor current for at least 5 seconds (to await a possible CLS alarm current).
3. Switch polarity of the sensor leads (5, 7) and repeat steps 1 and 2.
4. Identify the actual sensor circuit with the help of the first page figure and analyse the sensors' status.
5. In case circuit (4) is used: By using the wrong polarity and delay properties of the CLS, it is possible to conclude if a leakage alarm is attributed to the CLS or FLS.
6. To ensure that the polarity is right after the measurement, restore the connection resulting in the largest current.

To be noted

A zero current may be the result of a broken sensor lead or an open thermal switch.

A leakage alarm may be caused by a short circuit due to pinched sensor leads or a correct leakage signal from FLS, FLS10 or CLS.

Sensor current measurement using ST-1

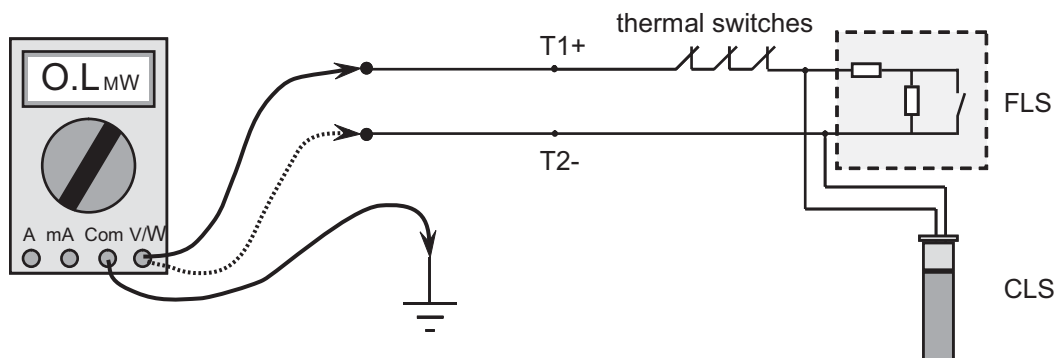


Checking earth faults

Earth faults on the monitoring cores must be checked for and avoided as they may cause spurious seal leakage indications. Fault finding of this nature should only be carried out using a multimeter ohms scale and not an insulation tester utilising 500 V or above as a test voltage.

Measure between each sensor lead and earth. Ideally the value should be infinite but Mega ohm values are acceptable.

Earth fault measurement

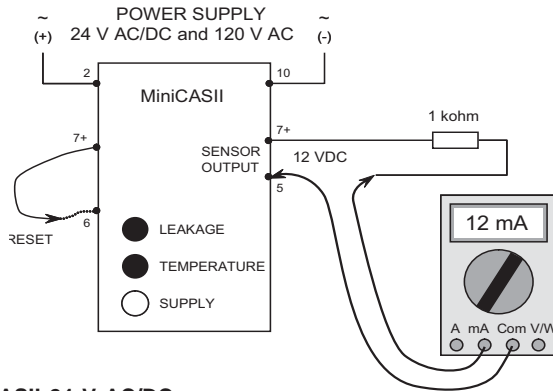


Checking the MiniCASII

The MiniCASII can be checked by using loose sensors connected to the sensor output or by simulating the sensors using resistors.

A simple test can be performed with a resistor, for example the one enclosed in the delivery package (1 kohm):

Connect the MiniCASII input , 2 and 10 to the correct voltage, 24V AC/DC or 120V AC.



Note! MiniCASII 24 V AC/DC, RESET also possible by connecting terminals 6-2.

The mA reading with a 1 kohm resistor: $12 \text{ V} / 1000 \text{ ohm} = 12 \text{ mA}$.

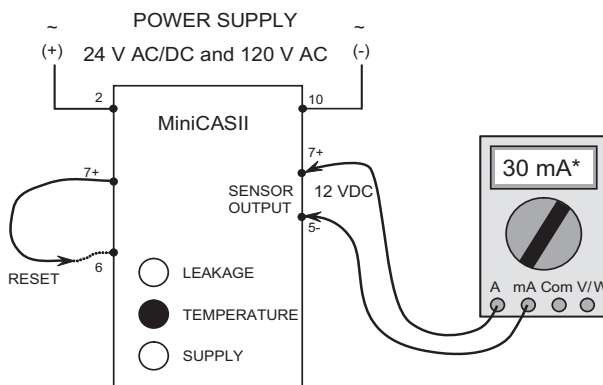
Mini CASII Values of operation	
$I < 3 \text{ mA}$	= Overtemp
$3 < I < 22 \text{ mA}$	= OK
$I > 22 \text{ mA}$	= Leakage

Simulating temperature alarm

If nothing is connected to the sensor outputs 5 and 7 (open circuit), the SUPPLY and TEMPERATURE lamps are both lit. The current is obviously zero mA.

Simulating leakage alarm

The leakage condition can be checked by connecting a 500 ohm (or less) resistor to the sensor outputs 5 and 7. It is fine to short circuit the output with the multimeter or a jumper. Note that there is a 10 s delay¹ before the LEAKAGE lamp is lit. The TEMPERATURE lamp may or may not be lit depending on if the MiniCASII has been reset.



Note! MiniCASII 24 V AC/DC, RESET also possible by connecting terminals 6-2.

Mini CAS II Values of operation	
$I < 3 \text{ mA}$	= Overtemp
$3 < I < 22 \text{ mA}$	= OK
$I > 22 \text{ mA}$	= Leakage

* At short circuit, MiniCASII limits the current to 30 mA

¹ The MiniCASII 24 V AC/DC has been updated at one occasion. Both versions have part no 835857 but are easily distinguished by looking at the circuit diagram on the side of the unit. Check the delay of the leakage alarm.

The original version has a 5 s delay.

The updated version has a 10 s delay. This version also has an improved noise protection. In some cases where noise, generated by a *variable frequency drive*, has made the original version fail, the new version works.

TECHNICAL DATA

MiniCAS II supervision relay

Operational principle:	Current Sensing
Approvals:	CE, C-UR (covering USA and Canada) and CSA
Environment:	-25 to 60C (maximum 90% relative humidity)
Supply voltage 24 V AC/DC:	20-30 V AC (50-60Hz) 23.5-30 V DC
Supply voltage 120 V AC:	120 V AC (50-60 Hz)
Relay contact rating:	250 V AC / 5A
Voltage to sensor:	12 V DC +/-5%
Values of operation:	3mA < I < 22 mA = OK condition I < 3 mA = High temperature (or interruption) I > 22 mA = Leakage (or short circuit), 10 s delay of alarm (I = current measured by MiniCAS II)
Power supply required:	5 VA

OPERATION

Leakage:	Changeover contacts	11-8 Normally closed for interlock 11-9 Closes for alarm
	Automatic reset	
	Red LED for indication	- follows the relay
	Red indication lamp on:	Leakage
	Red indication lamp off:	No leakage
Temperature:	Changeover contacts	1-3 Closes for interlock when energized 1-4 Normally closed for alarm
	Manual reset (see below)	
	Red indication lamp on:	Over temperature
	Red indication lamp off:	Normal temperature
<i>Reset of Temperature Alarm:</i>	External reset is possible either by connecting terminals 6-7 with an external push button or by interrupting the supply voltage. Note, in the 24 V version, Reset is also possible between 6-2.	

DIMENSIONS:	Width	33 mm
	Height	79 mm
	Depth	75 mm

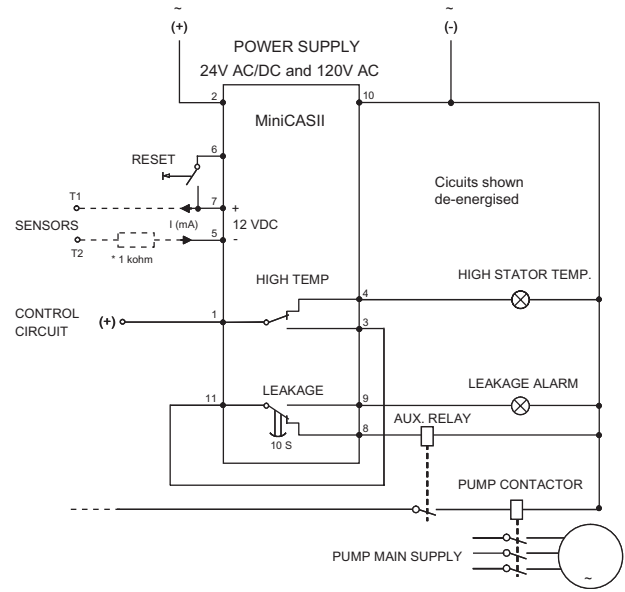
PART NOS:	83 58 57 (24 V AC/DC)
	40 501098 (120 V AC)

CONNECTIONS

Leakage alarm will stop the pump

This installation can be used if the leakage alarm shall stop the pump.

It is recommended if the FLS sensor is used. The FLS is detecting liquid in the stator housing, which is critical and requires a quick stop of the pump.



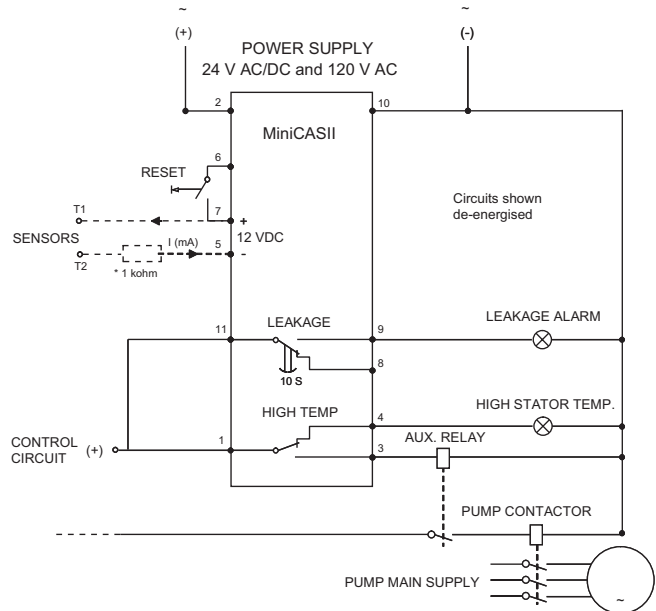
Note! MiniCASII 24 V AC/DC, RESET also possible by connecting terminals 6-2.

Leakage alarm will not stop the pump (only warning)

This installation can be used if the leakage alarm shall not stop the pump but give a warning on the MiniCASII.

It is recommended if FLS10 in inspection chamber or CLS is used. These sensors detect liquid in the inspection chamber (FLS10) and water in the oil (CLS), which is less critical than water in the stator housing.

FLS10 is used in the new midrange pump series, i.e. 3153, 3171, 3202 and 3301.



*) Fit resistor to avoid short circuit if only thermal contacts are to be connected.

TECHNICAL DATA

FLS stator leakage sensor

Signal:	8 mA non-alarm current, 36 mA alarm current
Supply voltage:	12 VDC
Max. duty temperature:	90 C
Material:	Aluminium

Physical size, sensor

Length:	27 mm
Width:	16 mm
Height:	16 mm

Part Number 518 89 02

CLS water in oil sensor

Trip emulsion:	35% of water in oil
Signal:	5.5 mA non-alarm current, 29mA alarm current (5 s delay of alarm)
Poles:	2 wires protected with a diode (wrong polarity connection = 0 mA)
Supply voltage:	12 VDC ($\pm 10\%$) (brown = +. black = \bar{n})
Metal parts:	Acid proof stainless steel
Sensor surface:	Glass
Max. pressure:	10 MPa 1h
Test pressure:	40 MPa
Duty pressure:	2 MPa
Max. temperature:	90C, 1h
Test temperature:	115C, 1h
Max. duty temperature	70 C

Physical size, sensor

Length:	75 mm
Diameter:	12 mm
Thread:	M16 1.5, length 15 mm

Part number: 505 12 00

FLS10 inspection chamber sensor

Signal:	10 mA non-alarm current, 28 mA alarm current
Supply voltage:	12VDC
Max. duty temperature:	90 C
Material:	Stainless steel and nitril rubber

Physical size, sensor

Length:	44 mm
Diameter:	22 mm
Thread:	M12 1, length 9 mm

Part number 6630400

**Warning: Sensor body made of glass.
Handle with care.**



www.flygt.com

EATON



ANSI Approval Date
October 14, 2003

NEMA Standards Publication ANSI/NEMA PB 1.1-2002

*General Instructions for Proper Installation, Operation, and Maintenance of
Panelboards Rated 600 Volts or Less*

Published by:

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Rosslyn, VA 22209

www.nema.org

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Foreword

This publication is a guide of practical information containing instructions for the proper installation, operation, and maintenance of panelboards rated 600 volts or less.

These instructions do not purport to cover all details or variations in equipment, nor to provide for every possible contingency regarding installation, operation, or maintenance.

It is recommended that work described in this set of instructions be performed only by qualified personnel familiar with the construction and operation of panelboards and that such work be performed only after reading this complete set of instructions. For specific information not covered by these instructions, you are urged to contact the manufacturer of the panelboard directly.

In the preparation of this Standards Publication input of users and other interested parties has been sought and evaluated. Inquiries, comments, and proposed or recommended revisions should be submitted to the concerned NEMA product section by contacting the following: These recommendations will be reviewed periodically and updated as necessary.

Vice President, Engineering
National Electrical Manufacturers Association
1300 North 17th Street, Suite 1847
Rosslyn, Virginia 22209

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This Standards Publication was developed by the Panelboard and Distribution Board Product Group of the LVDE Section. Product Group approval of the standard does not necessarily imply that all Product Group members voted for its approval or participated in its development. At the time it was approved, the Product Group was composed of the following members:

Cooper B-Line—Highland, IL
The Durham Company—Lebanon, MO
Eaton Corporation—Cleveland, OH
GE—Plainville, CT
Hubbell, Inc.—Orange, CT
Industrial Electric Manufacturing, Inc.—Fremont, CA
Milbank Manufacturing Company—Kansas City, MO
Penn Panel & Box Company—Collingdale, PA
Post Glover Resistors, Inc.—Erlanger, KY
The Pringle Electrical Mfg. Co.—Montgomeryville, PA
Reliance Controls Corporation—Racine, WI
Siemens Energy & Automation, Inc.—Alpharetta, GA
Square D Company—Palatine, IL
Thomas & Betts Corporation—Memphis, TN

Section 1

SCOPE

This publication covers single panelboards or groups of panel units suitable for assembly in the form of single panelboards, including buses, and with or without switches or automatic overload protective devices (fuses or circuit breakers), or both. These units are used in the distribution of electricity at 600 volts and less with:

- 1600—ampere mains or less
- 1200—ampere branch circuits or less

Specifically excluded are live-front panelboards, panelboards employing cast enclosures for special service conditions, and panelboards designed primarily for residential and light commercial service equipment.

Section 2 REFERENCES

National Fire Protection Association (NFPA)
Batterymarch Park
Quincy, MA 02269

NFPA 70 2002 *National Electrical Code*
NFPA 70E 2000 *Safety Related Work Practices*

National Electrical Manufacturers Association (NEMA)
1300 North 17th Street, Suite 1847
Rosslyn, Virginia 22209

AB 4-2000 *Guidelines for Inspection and Preventative Maintenance of Molded Case Circuit Breakers Used in Commercial and Industrial Applications*

PB 2.2-1999 *Application Guide for Ground Fault Protective Devices for Equipment*

Guidelines for Handling Water Damaged Electrical Products

Section 3 GENERAL

WARNING: Hazardous voltages in electrical equipment can cause severe personal injury or death. Unless otherwise specified, inspection and maintenance should only be performed on panelboards and equipment to which power has been turned off, disconnected and electrically isolated so that no accidental contact can be made with energized parts. Follow all manufacturer's warnings and instructions.

Safety related work practices, as described in NFPA 70E, Part II should be followed at all times.

CAUTION: Hydrocarbon spray propellants and hydrocarbon based sprays or compounds will cause degradation of certain plastics. Contact the panelboard manufacturer before using these products to clean, dry, or lubricate components during installation or maintenance.

3.1 SUCCESSFUL OPERATION OF PANELBOARDS

The successful operation of panelboards is dependent upon proper installation, operation, and maintenance. Neglecting fundamental installation and maintenance requirements may lead to personal injury, death, or damage to electrical equipment or other property.

3.2 QUALIFIED PERSONNEL

Installation, operation, and maintenance of panelboards should be conducted only by qualified personnel.

3.3 DEFINITION OF QUALIFIED PERSONNEL

For purposes of these guidelines, a qualified person is one who is familiar with the installation, construction, and operation of the equipment and the hazards involved. In addition, the person is:

3.3.1 Requirements

Knowledgeable of the requirements of the *National Electrical Code* and of all other applicable codes, laws, and standards.

3.3.2 Established Safety Practices

Trained and authorized to test, energize, clear, ground, tag, and lockout circuits and equipment in accordance with established safety practices.

3.3.3 Protective Equipment

Trained in the proper care and use of protective equipment such as rubber gloves, hard hat, safety glasses or face shields, and flash resistant clothing in accordance with established safety practices.

3.3.4 First Aid

Trained in rendering first aid.

3.4 SUITABLE RATINGS

Verify that all equipment being installed has ratings suitable for the installation.

Section 4

INSTALLATION OF PANELBOARD CABINETS (BOXES)

4.1 INSTALLATION INSTRUCTIONS

Installation of the cabinet in a neat and workmanlike manner. Follow the manufacturer's installation instructions.

4.2 LOCATION IN BUILDING

Locate the cabinet so that it is readily accessible and not exposed to physical damage.

4.3 FLAMMABLE MATERIAL

Locate the cabinet well away from flammable material.

4.4 UNUSUAL SERVICE CONDITIONS

Do not locate the cabinet where it will be exposed to ambient temperatures above 40°C (104°F), corrosive or explosive fumes, dust, vapors, dripping or standing water, abnormal vibration, mechanical shock, high humidity, tilting, or unusual operating conditions, unless the cabinet/panelboard combination has been designed and so identified by the manufacturer for these conditions.

4.5 INDOOR DAMP LOCATIONS

Locate or shield the cabinet so as to prevent moisture and water from entering and accumulating therein. Mount the cabinet so that there is at least 1/4 inch of air space between the cabinet and the wall or other supporting surface.

4.6 WET LOCATIONS

Cabinets should be specifically approved for wet locations. Mount the cabinet so that there is at least 1/4 inch of air space between the cabinet and the wall or other supporting surface.

4.7 CLEARANCE FROM CEILING

Do not locate the cabinet against a non-fireproof ceiling; allow a space of 3 feet between the ceiling and cabinet unless an adequate fireproof shield is provided.

4.8 SPACE AROUND THE CABINET

When selecting a location, provide sufficient access and working space around the cabinet (See Section 110.26 of the *National Electrical Code*). The width of the working space in front of the panelboard should be at least 30 inches and this space should not be used as storage. The working space should have adequate lighting and a minimum head room of 6 feet 6 inches.

4.9 MOUNTING OF CABINET

The cabinet should be reliably secured to the mounting surface. Do not depend on wooden plugs driven into holes in masonry, concrete, plaster, or similar materials. (See Section 110.13 of the *National Electrical Code*.)

4.10 FLUSH MOUNTING IN WALL

In walls of concrete, tile, or other noncombustible material, install the cabinet so that its front edge will not set back more than 1/4 inch from the finished surface. In walls of wood or other combustible material, cabinets should be flush with or project beyond the finished surface. (See Section 312.3 of the *National Electrical Code*.)

4.11 UNUSED OPENINGS IN CABINET

Effectively close unused openings in the cabinet to provide protection which is substantially equivalent to that afforded by the wall of the cabinet.

4.12 GROUNDING OF PANELBOARD CABINETS

Ground the cabinet as specified in Article 250 of the *National Electrical Code*. When the cabinet contains service equipment, it is necessary to bond the cabinet to the grounded (neutral) service conductor.

Section 5 INSTALLATION OF CONDUIT AND CONDUCTORS

5.1 CONDUITS INSTALLATION

Conduits should be installed so as to prevent moisture or water from entering and accumulating within the enclosure. Provision should be made to protect conductors from abrasion in accordance with Article 312 of the *National Electrical Code*.

5.2 KNOCKOUTS REMOVAL

Knockouts should be removed as follows:

IMPORTANT: Remove knockouts, ONE AT A TIME, alternating INWARD and OUTWARD.

5.2.1 First Step—Remove Center Knockout

Remove center knockout INWARD.

5.2.1.1 Screwdriver Blade

Place screwdriver blade against point farthest from tie and strike INWARD (Figure 1). Bend back and forth to break tie.

5.2.2 Next Step—Remove Rings

Remove rings ONE AT A TIME without straining remaining rings.

5.2.2.1 Pry First Ring

Pry first ring OUTWARD with screwdriver midway between ties, using pliers flat against box under screwdriver (Figure 2). Bend ring sections OUTWARD with pliers, then back and forth to break ties (Figure 5-3).

5.2.2.2 Second Ring

Remove second ring INWARD by striking screwdriver (with blade against point midway between ties) then breaking ring sections inward and back and forth to break ties.

5.3 NATIONAL ELECTRICAL CODE, ARTICLE 300

Refer to the *National Electrical Code*, Article 300 for proper wiring methods. See 6.7 for making proper connections.

5.4 CONDUCTOR LENGTH

Keep conductor length to a minimum within the wiring gutter. Excessive conductor length will result in additional heating and may result in overheating. However, conductors should be long enough to reach the terminal location in a manner that avoids strain on the terminal.

5.5 EXERCISE CARE

Exercise care to maintain the largest practical bending radius of conductors; otherwise the insulation may be damaged and terminal connections may become loosened. Deflection of conductors shall comply with NEC Section 312.6.

5.6 NATIONAL ELECTRICAL CODE, ARTICLE 725.54

Refer to the National Electrical Code, Article 725.54 for the separation requirements for conductors of Class 2 and Class 3 remote-control, signaling and power-limited circuits.

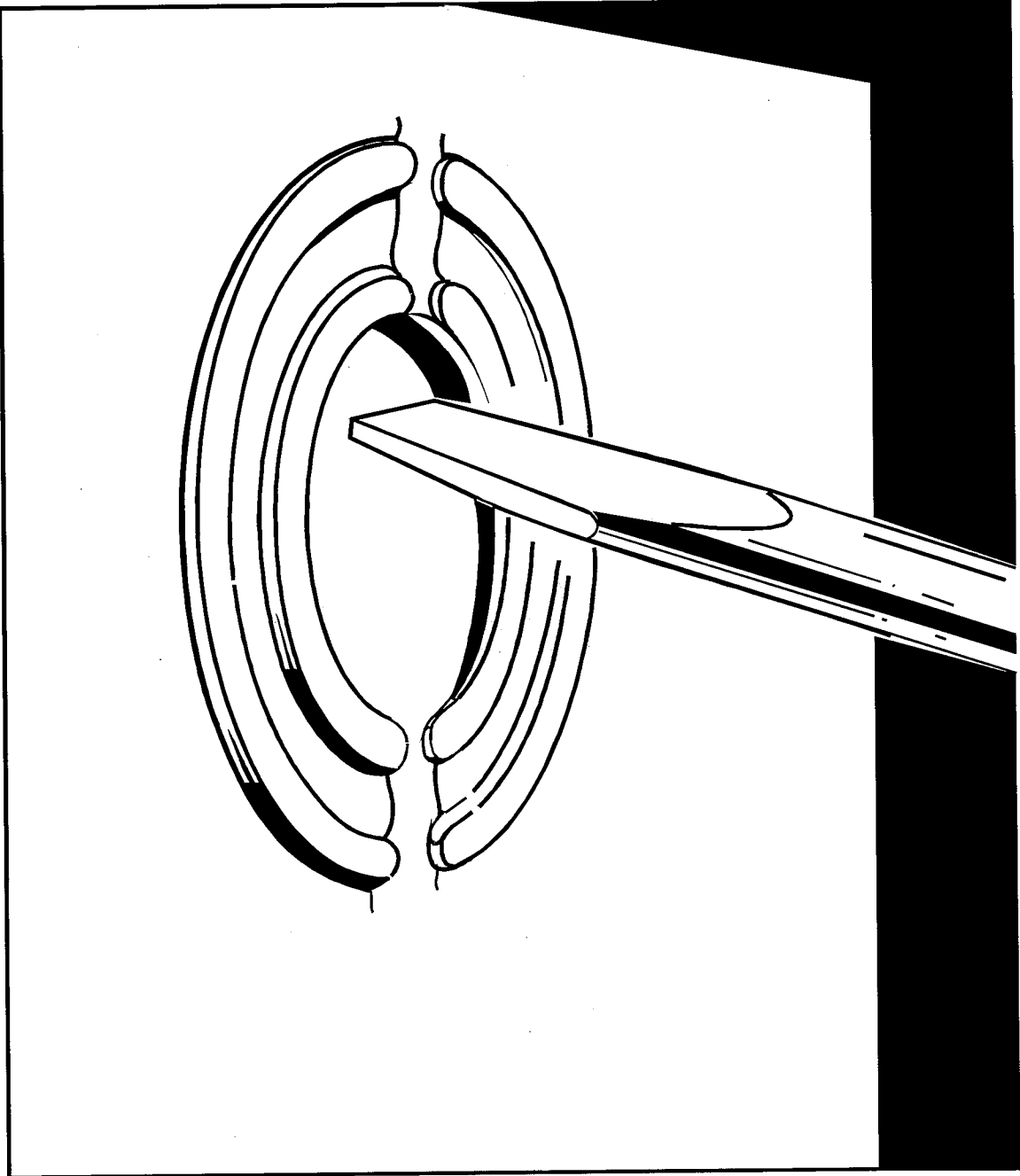


Figure 5-1
KNOCKOUT REMOVAL—STEP 1

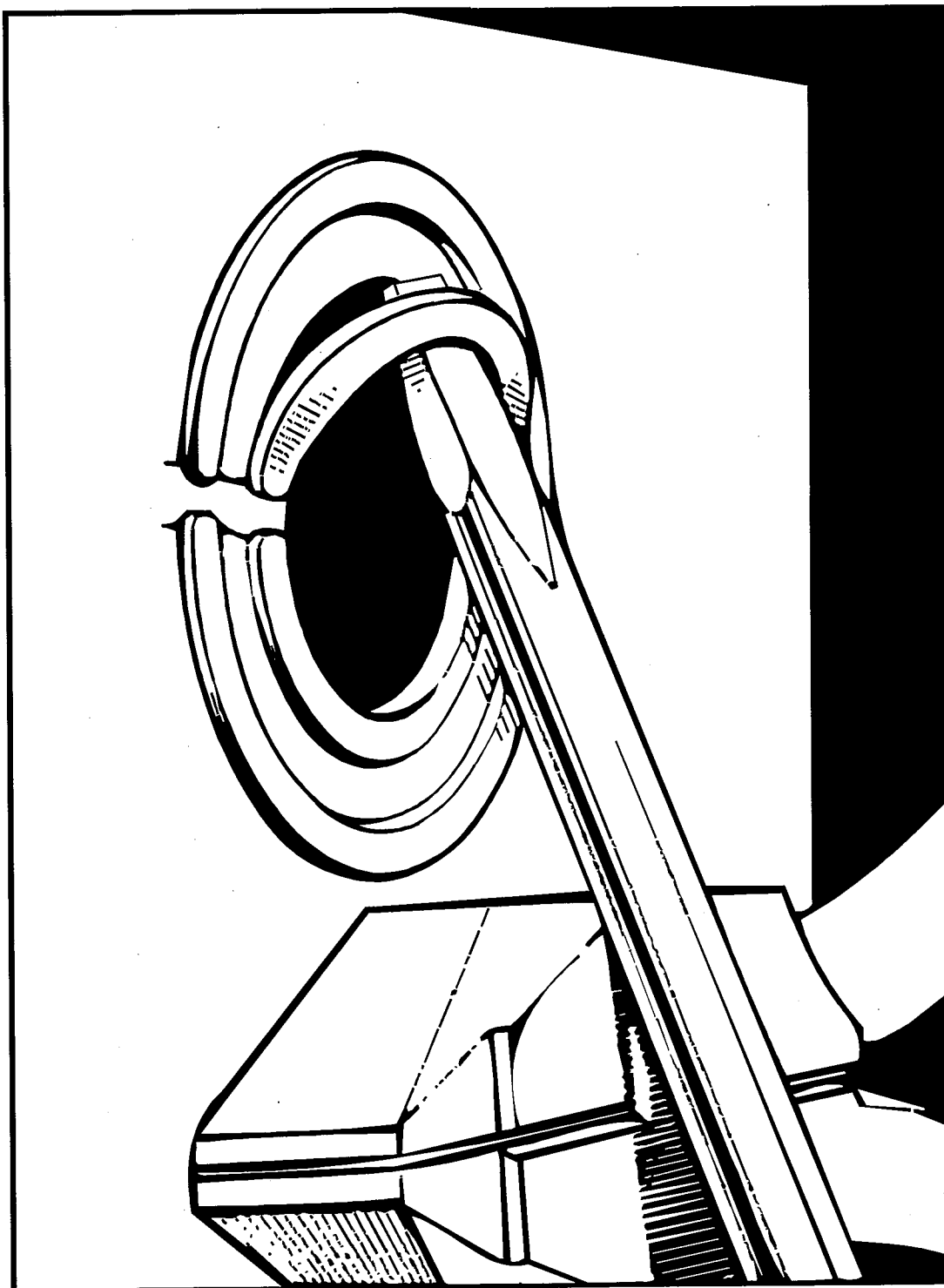


Figure 5-2
KNOCKOUT REMOVAL—STEP 2

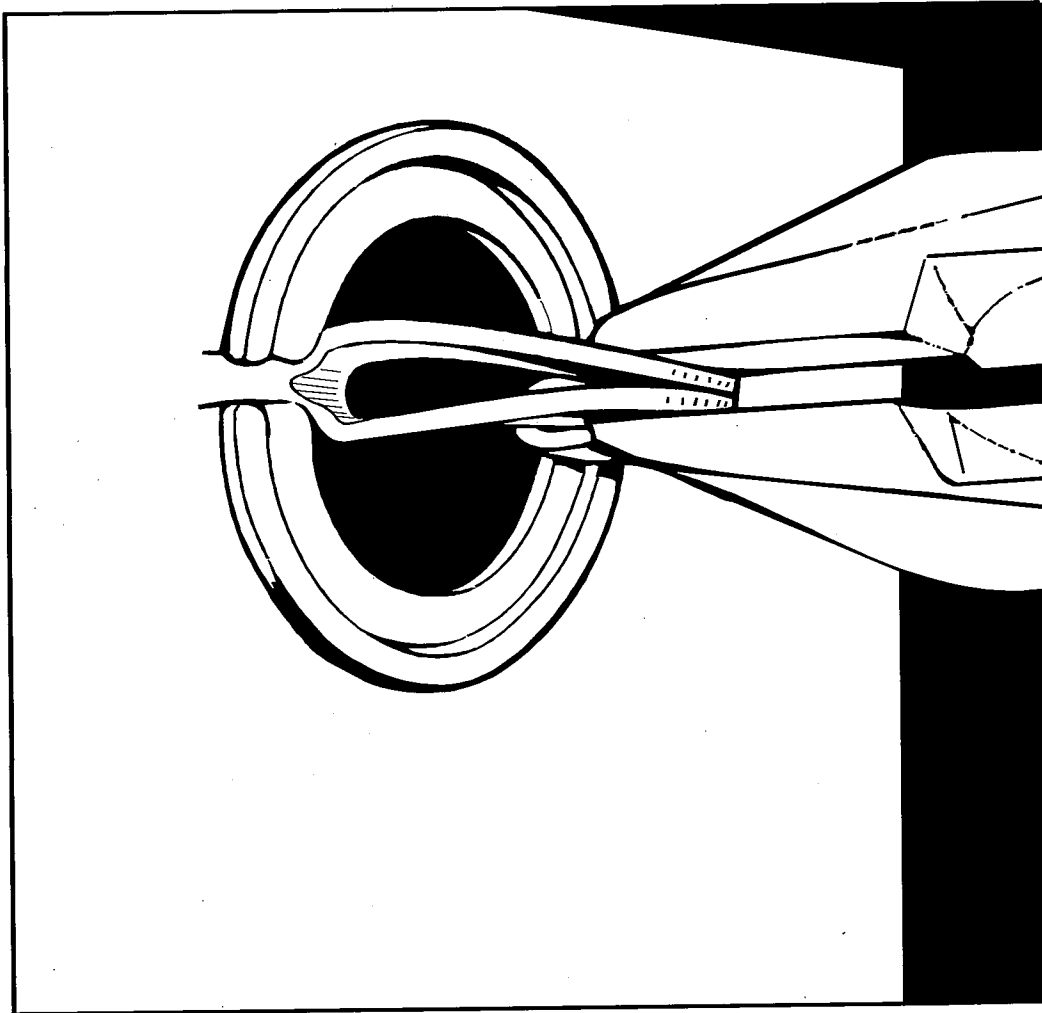


Figure 5-3
KNOCKOUT REMOVAL—STEP 3

Section 6 INSTALLATION OF PANELBOARD

6.1 PROPER STORAGE

Store the panelboard in a clean, dry place located so that mechanical damage from work personnel in the area is not likely to happen.

6.2 UNPACKING

Care should be exercised in unpacking the panelboard to prevent damage and loss of instruction materials and loose parts.

6.3 INSPECTION

Check for shipping damage and check to make sure that the panelboard is the correct one for installation in the cabinet.

6.4 CARE

Care should be taken to protect the panelboard internal parts from contamination during the installation process.

6.4.1 Cleaning

Clean the cabinet of all foreign materials. If parts at connection points are spattered with cement, plaster, paint, or other foreign material, remove the foreign materials with great care to avoid damage to the plating.

CAUTION: Hydrocarbon spray propellants and hydrocarbon based sprays or compounds will cause degradation of certain plastics. Contact the panelboard manufacturer before using these products to clean, dry, or lubricate panelboard components during installation or maintenance.

6.5 MANUFACTURER'S INSTRUCTIONS

Carefully follow the manufacturer's instructions and labels.

6.6 INSTALLATION

6.6.1 Alignment Devices

Adjust the alignment devices where provided.

6.6.2 Panelboard

Install the panelboard, finalize its alignment, and tighten it securely in the cabinet.

6.6.3 Flange of Deadfront Shield

Unless otherwise instructed by the manufacturer, adjust the panelboard so that the flange of the deadfront shield is no more than 3/16 inch from (1) the front of the cabinet for surface mounting or (2) the surrounding wall surfaces for flush mounting.

6.7 LINE AND BRANCH CONDUCTORS

Connect Line and Branch Conductors

6.7.1 Conductors

Use care in stripping insulation from conductors so as not to nick or ring the conductor. For aluminum, clean all oxide from the stripped portion and apply an antioxidant compound.

6.7.1.1 Wiring Gutters

Distribute and arrange conductors neatly in the wiring gutters. (See Section 5.)

6.7.1.2 Types and Temperature Ratings

Care should be exercised to ensure that the types and temperature ratings of conductors being installed in the panelboard are suitable for use with the terminals, which have been provided.

6.7.1.3 Tighten All Terminals

Use the manufacturer's torque values. (See 7.1).

6.8 PANELBOARD GROUNDING

Ground the panelboard cabinet in accordance with 4.12. (See Section 408.20 of the *National Electrical Code*.)

6.8.1 Equipment Grounding Conductors

Where separate equipment grounding conductors are used, prepare equipment grounding conductors in accordance with 6.7.1 and connect them to the equipment grounding terminal bar. Check to be sure that the terminal bar is securely bonded to the cabinet or panelboard frame and that it is not connected to the neutral bar except at service equipment (as permitted in Section 250.28 of the *National Electrical Code*) or at separately derived systems (as permitted in Section 250.30 of the *National Electrical Code*).

NOTE—An equipment grounding terminal bar is not always required. For example, when a properly installed metallic raceway is used as the equipment grounding path or when the grounded conductor terminals (neutral bar) complies with the conditions of the last sentence of Section 408.20 of the *National Electrical Code*.

6.9 PROPER TYPE OR CLASS AND RATING

When installing circuit breakers or fuses, ensure that they are of the proper type or class and rating.

6.10 DEBRIS

Clean the cabinet of all debris, which has accumulated during the panelboard installation (see 6.4.1).

6.11 STEPS IN SECTION 7

If the job is complete, perform the steps in Section 7 and then install the cabinet front (see Section 8).

Section 7

STEPS TO BE TAKEN BEFORE ENERGIZING

7.1 ACCESSIBLE ELECTRICAL CONNECTIONS

Tighten all accessible electrical connections to the manufacturer's torque specifications. If such information is not provided with the equipment, consult the manufacturer.

7.2 BLOCKS AND PACKING MATERIALS

Make certain that all blocks and packing materials used for shipment have been removed from all component devices and the panelboard.

7.3 SWITCHES, CIRCUIT BREAKERS, AND OTHER OPERATING MECHANISMS

Manually exercise all switches, circuit breakers, and other operating mechanisms to make certain they operate freely.

7.4 SHORT CIRCUITS AND GROUND FAULTS

To make sure that the system is free from short circuits and ground faults, conduct an insulation resistance test phase to ground and phase to phase with the switches or circuit breakers in both the open and closed positions. If the resistance reads less than 1 megohm while testing with the branch circuit devices in the open position, the system may be unsafe and should be investigated. If after investigation and possible correction, low readings are still observed, the manufacturer should be contacted. Some electronic equipment (metering, TVSS, etc.) may be damaged by this testing. Refer to the manufacturers equipment markings for guidelines.

7.5 GROUND FAULT PROTECTION SYSTEM

Test the ground fault protection system (if furnished) in accordance with the manufacturer's instructions. See Section 230.95 of the *National Electrical Code* and NEMA Standards Publication PB 2.2, Application Guide for Ground Fault Protective Devices for Equipment.

7.6 ADJUSTABLE TIME CURRENT TRIP DEVICE SETTINGS

Set any adjustable time current trip device settings to the proper values.

NOTE—Experience has indicated that damage from overcurrent can be reduced if the devices used for overload and short-circuit protection are set to operate instantaneously (that is, without intentional time delay) at 115 percent of the highest value of phase current which is likely to occur as the result of any anticipated motor starting or welding currents.

7.7 GROUNDING CONNECTIONS

Check to determine that all grounding connections are properly made. If the panelboard is used as service equipment, make certain that the neutral, if present, is properly bonded to the cabinet.

7.8 FOREIGN MATERIAL

Remove all foreign material from the panelboard and cabinet before installing the cabinet front. Make certain that all deadfront shields are properly aligned and tightened. Install the cabinet front in accordance with Section 8.

Section 8 INSTALLATION OF CABINET FRONT

8.1 CABINET FRONT OR TRIM PACKAGE

The cabinet front or trim package is designed to prevent damage to the front during shipment and handling.

8.2 UNPACKING

Care should be used when unpacking and handling the cabinet front.

8.3 COVERS AND DOORS

Install covers, close doors, and make certain that no conductors are pinched and that all enclosure parts are properly aligned and tightened.

8.4 TOUCH-UP

A suitable paint or other corrosion-resistant finish should be applied to those places where the finish is damaged.

8.5 FRONT ALIGNMENT

The cabinet front may be provided with an adjusting means to align it squarely with the building even though the cabinet may be slightly out of plumb with the building.

Section 9 ENERGIZING EQUIPMENT

WARNING: Hazardous voltages in electrical equipment can cause severe personal injury or death. Energizing a panelboard for the first time after initial installation or maintenance is potentially dangerous.

9.1 QUALIFIED PERSONNEL

Qualified personnel should be present when the equipment is energized for the first time. If short circuit conditions caused by damage or poor installation practices have not been detected in the procedures specified in Section 7, serious personal injury and damage can occur when the power is turned on.

9.2 LOAD ON THE PANELBOARD

There should be no load on the panelboard when it is energized. Turn off all of the downstream loads.

9.3 ENERGIZED IN SEQUENCE

The equipment should be energized in sequence by starting at the source end of the system and working towards the load end. In other words, energize the main devices, then the feeder devices, and then the branch-circuit devices. Turn the devices on with a firm positive motion.

9.4 LOADS SUCH AS LIGHTING CIRCUITS, CONTACTORS, HEATERS, AND MOTORS

After all main, feeder, and branch circuit devices have been closed, loads such as lighting circuits, contactors, heaters, and motors may be turned on.

Section 10 MAINTENANCE

10.1 MAINTENANCE PROGRAM

A maintenance program for panelboards should be conducted on a regularly scheduled basis in accordance with the following:

10.2 PANELBOARD WHICH HAS BEEN CARRYING ITS REGULAR LOAD FOR AT LEAST 3 HOURS

A panelboard which has been carrying its regular load for at least 3 hours just prior to inspection should be field tested by feeling the deadfront surfaces of circuit breakers, switches, interior trims, doors, and enclosure sides with the palm of the hand. If the temperature of these surfaces does not permit you to maintain contact for at least 3 seconds, this may be an indication of trouble and investigation is necessary. Thermographic (infrared) scanning has become a useful method of investigating thermal performance.

WARNING: Hazardous voltages in electrical equipment can cause severe personal injury or death. Unless otherwise specified, inspection and maintenance should only be performed on panelboards to which power has been turned off, disconnected and electrically isolated so that no accidental contact can be made with energized parts. Follow all manufacturer's warnings and instructions.

Safety related work practices, as described in NFPA 70E, Part II should be followed at all times.

CAUTION: Hydrocarbon spray propellants and hydrocarbon based sprays or compounds will cause degradation of certain plastics. Contact the panelboard manufacturer before using these products to clean, dry, or lubricate panelboard components during installation or maintenance.

10.3 INSPECT PANELBOARD ONCE EACH YEAR

Inspect the panelboard once each year or after any severe short circuit.

10.4 ACCUMULATION OF DUST AND DIRT

If there is an accumulation of dust and dirt, clean out the panelboard by using a brush, vacuum cleaner, or clean lint-free rags. Avoid blowing dust into circuit breakers or other components. Do not use a blower or compressed air.

10.4.1 Visible Electrical Joints and Terminals

Carefully inspect all visible electrical joints and terminals in the bus and wiring system.

10.4.2 Conductors and Connections

Visually check all conductors and connections to be certain that they are clean and secure. Loose and/or contaminated connections increase electrical resistance which can cause overheating. Such overheating is indicated by discoloration or flaking of insulation and/or metal parts. Pitting or melting of connecting surfaces is a sign of arcing due to a loose, or otherwise poor connection. Parts which show evidence of overheating or looseness should be cleaned and re-torqued or replaced if damaged. Tighten bolts and nuts at bus joints to manufacturer's torque specifications.

CAUTION: Do not remove plating from aluminum parts in joints or terminations. Damage to plating can result in overheating. Replace damaged aluminum parts.

10.4.3 Fuse Clip Contact Pressure and Contact Means

Examine fuse clip contact pressure and contact means. If there is any sign of overheating or looseness, follow the manufacturer's maintenance instructions or replace the fuse clips. Loose fuse clips can result in overheating.

10.4.4 Plug Fuses

Re-tighten plug fuses.

10.4.5 Conditions Which Caused Overheating

Be sure that all conditions which caused the overheating have been corrected.

10.5 PROPER AMPERE, VOLTAGE, AND INTERRUPTING RATINGS

Check circuit breakers, switches, and fuses to ensure they have the proper ampere, voltage, and interrupting ratings. Ensure that non-current-limiting devices are not used as replacements for current-limiting devices. Never attempt to defeat rejection mechanisms which are provided to prevent the installation of the incorrect class of fuse.

10.5.1 Mechanisms Free and in Proper Working Order

Operate each switch or circuit breaker several times to ensure that all mechanisms are free and in proper working order. Replace as required. See NEMA AB-4 for maintenance of molded case circuit breakers.

10.6 OPERATION OF ALL MECHANICAL COMPONENTS

Check the operation of all mechanical components. Replace as required.

10.6.1 Switch Operating Mechanisms

Exercise switch operating mechanisms and external operators for circuit breakers to determine that they operate freely to their full on and off positions.

10.6.2 Integrity of Electrical and Mechanical Interlocks

Check the integrity of all electrical and mechanical interlocks and padlocking mechanisms.

10.6.3 Missing or Broken Parts

Whenever practical, check all devices for missing or broken parts, proper spring tension, free movement, corrosion, dirt, and excessive wear.

10.6.4 Manufacturer's Instructions

Adjust, clean, and lubricate or replace parts according to the manufacturer's instructions.

10.6.4.1 Clean Nonmetallic Light Grease or Oil

Use *clean* nonmetallic light grease or oil as instructed.

10.6.4.2 Molded Case Circuit Breakers

Do *not* oil or grease parts of molded case circuit breakers.

10.6.4.3 Clean, Light Grease

If no instructions are given on the devices, sliding copper contacts, operating mechanisms, and interlocks may be lubricated with clean, light grease.

10.6.4.4 Excess Lubrication

Wipe off excess lubrication to avoid contamination.

CAUTION: Hydrocarbon spray propellants and hydrocarbon based sprays or compounds will cause degradation of certain plastics. Contact the panelboard manufacturer before using these products to clean, dry, or lubricate panelboard components during installation or maintenance.

10.6.5 Accessible Copper Electrical Contacts, Blades, and Jaws

Clean and dress readily accessible copper electrical contacts, blades, and jaws according to the manufacturer's instructions when inspection indicates the need.

10.7 DAMAGED INSULATING MATERIAL AND ASSEMBLIES

Look for and replace damaged insulating material and assemblies where sealing compounds have deteriorated.

10.8 MOISTURE OR SIGNS OF PREVIOUS WETNESS OR DRIPPING

Look for any moisture or signs of previous wetness or dripping inside the cabinet.

NOTE—Condensation in conduits or dripping from outside sources is one known cause of panelboard malfunction.

10.8.1 Conduits Which Have Dripped Condensate

Seal off any conduits which have dripped condensate, and provide means for further condensate to drain away from the panelboard.

10.8.2 Cracks or Openings

Seal off any cracks or openings which have allowed moisture to enter the enclosure. Eliminate the source of any dripping on the enclosure and any other source of moisture.

10.8.3 Insulating Material Which is Damp or Wet

Replace or thoroughly dry and clean any insulating material, which is damp or wet or shows an accumulation of deposited material from previous wettings.

10.8.4 Component Devices Which Show Evidence of Moisture Damage

Inspect all component devices. Replace any component device which shows evidence of moisture damage or has been subjected to water damage or flooding. Additional information may be found in the NEMA document "Guidelines for Handling Water Damaged Electrical Products."

10.9 BEFORE CLEANUP AND CORRECTIVE ACTION IS ATTEMPTED

In the event of water damage, e.g., flooding or sprinkler discharge, the manufacturer should be consulted before clean up and corrective action is attempted.

10.10 SEVERE ELECTRICAL SHORT CIRCUIT

If a severe electrical short circuit has occurred, the excessive currents may have resulted in structural component and/or bus and conductor damage due to mechanical distortion, thermal damage, metal deposits, or smoke. Examine all devices and bus supports for cracks or breakage. The manufacturer should be consulted before cleanup and correction is attempted.

10.11 GROUND FAULT PROTECTION SYSTEM

Test the ground fault protection system (if furnished) in accordance with the manufacturer's instructions. See Section 230.95 of the *National Electrical Code* and NEMA Standards Publication PB 2.2, *Application Guide for Ground Fault Protective Devices for Equipment*.

10.12 INSULATION RESISTANCE

Check insulation resistance (see 7.4) under any of the following conditions:

10.12.1 Severe Short Circuit

If a severe short circuit has occurred (see 10.10);

10.12.2 Parts Replaced

If it has been necessary to replace parts or clean insulating surfaces;

10.12.3 Panelboard Exposed to High Humidity

If the panelboard has been exposed to high humidity, condensation, or dripping moisture.

Section 11 PERMISSIBLE LOADING OF PANELBOARDS

11.1 NATIONAL ELECTRICAL CODE

In compliance with the *National Electrical Code*, the normal continuous loads (3 hours or more) of panelboard circuits should be not more than 80 percent of the rating of the overcurrent protective device, unless the marking of the device indicates that it is suitable for continuous duty at 100 percent of its rating.

11.2 HARMONICS IN ELECTRICAL SYSTEM

Some types of electrical equipment cause harmonics in the electrical system, which may result in overheating. This condition should be considered when determining panelboard loading.

EATON

Instructions for Installation, Operation, and Maintenance of Dry-Type Distribution Transformers

Instrucciones para la instalación, operación y mantenimiento de los Transformadores de Distribución Tipo Seco

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**WARNING**

ALWAYS TURN OFF THE POWER SUPPLYING THIS EQUIPMENT BEFORE WORKING INSIDE. FAILURE TO DO SO COULD RESULT IN SERIOUS PERSONAL INJURY, DEATH, OR PROPERTY DAMAGE.

1. INTRODUCTION

Transformers should be installed and serviced only by competent personnel familiar with good safety practices. These instructions are written for such personnel and are not intended as a substitute for adequate training and experience in the use of transformers. Refer to NEMA Standard ST-20 for more information on general application requirements.

2. RECEIVING

All dry-type distribution transformers are completely assembled and carefully tested at the factory before being shipped.

Upon receipt of the transformer:

- Inspect it for possible shipping damage.
- Check the bill of lading for possible shortages.

If shipping damage occurs, a claim should immediately be filed with the carrier. Notify the local sales office with the carrier's name and the extent of the damage.

3. LIFTING AND HANDLING**WARNING**

FAILURE TO PROPERLY LIFT THE TRANSFORMER MAY CAUSE DAMAGE TO THE PRODUCT, OTHER PROPERTY, OR RESULT IN PERSONAL INJURY.

ALWAYS MOVE A VENTILATED DESIGN TRANSFORMER IN AN UPRIGHT POSITION ONLY. FAILURE TO DO SO COULD RESULT IN TRANSFORMER DAMAGE.

Ventilated design transformers:

- Use spreaders with lifting chains or slings connected to the holes located on both sides panels or remove the top cover to access the lifting holes on each end of the top of the core-coil assembly.

OR

- Lift the unit with a fork lift when a pallet is provided.
- For further information see Figure 1 on Page 3.

Encapsulated design transformers (above 2 kVA):

- Lift the transformer by its lifting brackets.

OR

- Lift the unit with a fork lift when a pallet is provided.
- For further information see Figure 2 on Page 3.

**ADVERTENCIA**

SIEMPRE DESENERGICE ESTE EQUIPO ANTES DE TRABAJAR EN ÉL. EL NO HACERLO PUEDE CAUSAR LESIONES PERSONALES SERIAS, MUERTE O DAÑOS A LA PROPIEDAD.

1. INTRODUCCION

Los transformadores deben ser instalados y mantenidos por personal calificado y conocedor de prácticas de seguridad. Estas instrucciones van dirigidas a ellos sin intención de sustituir la adecuada capacitación y experiencia en transformadores. Consulte el estándar N.E.M.A. (National Electrical Manufacturers Association E.U.A.) ST-20 para requisitos de aplicaciones generales.

2. ARRIVO

Todos los transformadores de distribución tipo seco son completamente ensamblados y cuidadosamente probados en la fábrica antes de ser enviados.

Al recibir el transformador:

- Inspeccione si se ocasionaron daños debido al transporte.
- Verifique las partes para posibles faltantes.

En caso de ocurrir daño por transporte, levante un reporte con el transportista. Avise a la oficina local de ventas, provea el nombre del transportista y el alcance del daño.

3. IZADO Y MANEJO**ADVERTENCIA**

LEVANTAR Y/O MOVER EL TRANSFORMADOR INCORRECTAMENTE PUEDE AFECTARLO, CAUSAR DAÑOS A LA PROPIEDAD O LESIONES PERSONALES.

TRASLADÉ LAS UNIDADES VENTILADAS SIEMPRE EN POSICIÓN VERTICAL. EL NO HACERLO DAÑARÁ EL TRANSFORMADOR.

Transformadores de Diseño Ventilado:

- Para izar use travesaño con cadena por los orificios redondos ubicados en los paneles laterales o por dentro de la unidad en la parte superior del ensamble del núcleo (remueva la tapa superior).

o

- Use montacargas si el transformador está sobre una tarima.
- Para referencia vea la Figura 1 en la página 3.

Transformadores de Diseño Encapsulado (mayores de 2 kVA):

- Levante la unidad por las ménsulas.

o

- Levante la unidad con montacargas cuando se provea tarima.
- Para referencia, vea la Figura 2 en la página 3.

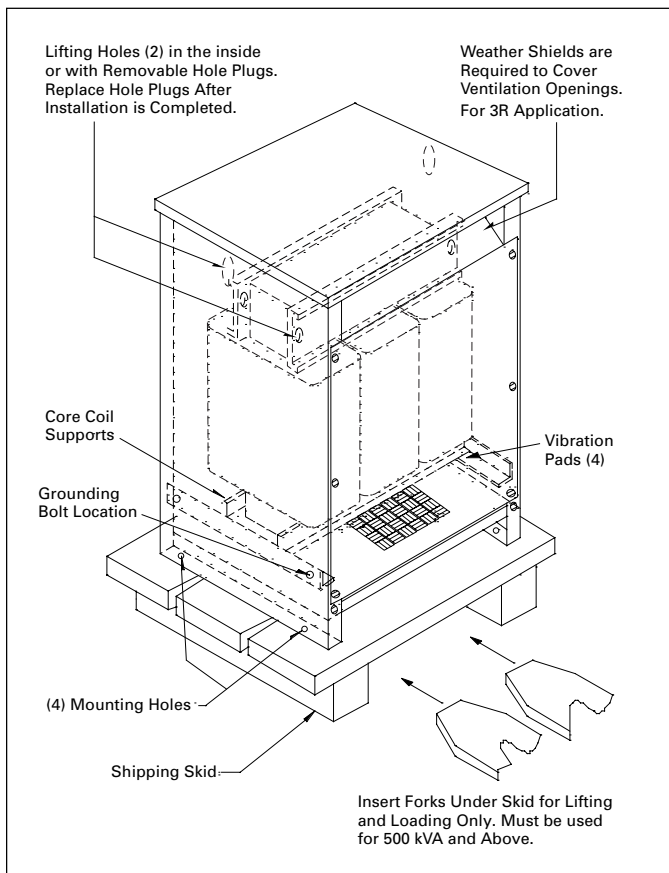


Figure 1 Typical Ventilated Transformer.

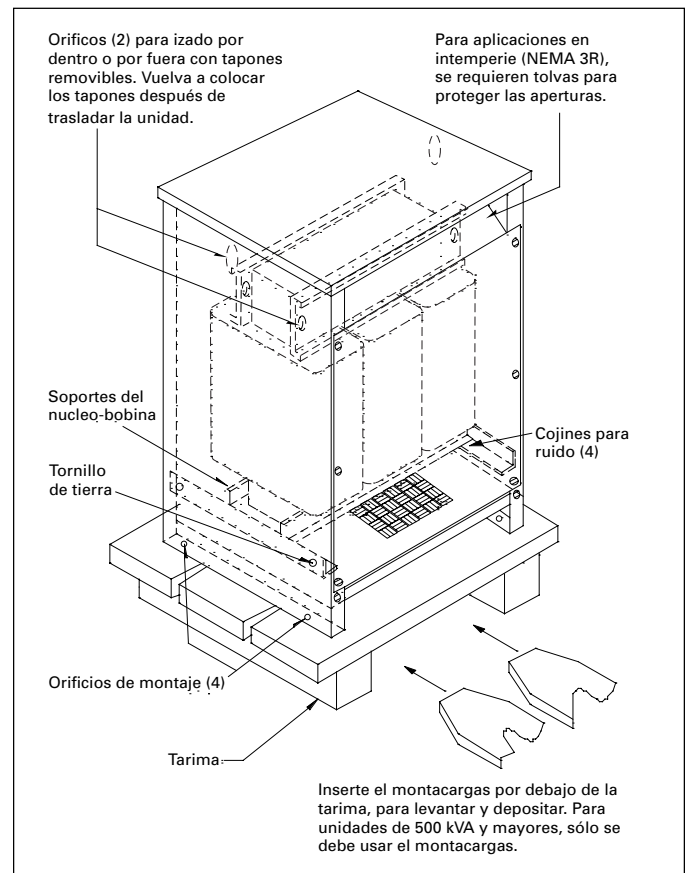


Figura 1 Transformador típico ventilado.

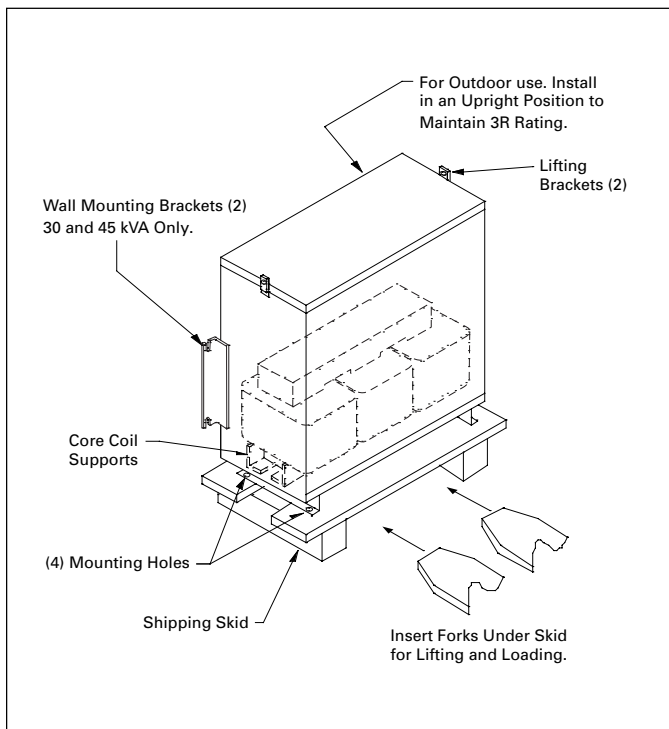


Figure 2 Typical Encapsulated Transformer.

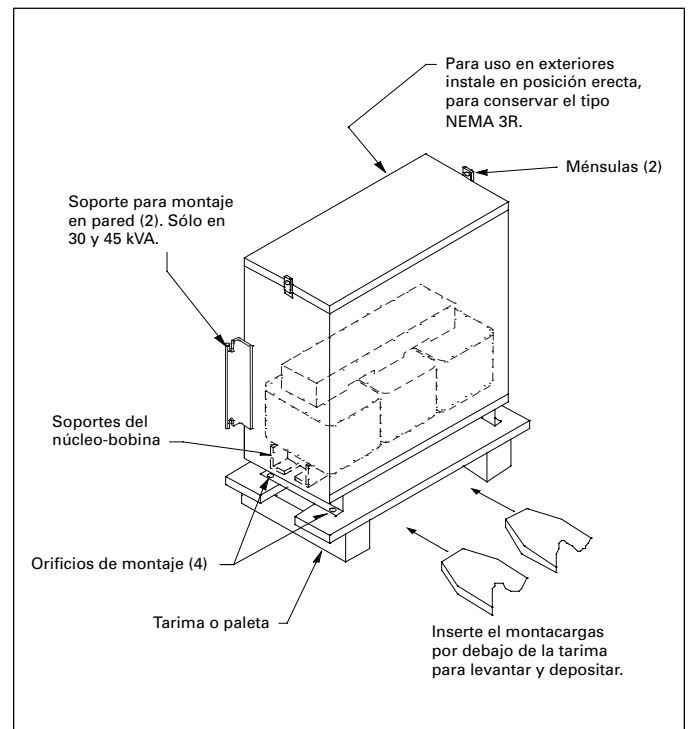


Figura 2 Transformador típico encapsulado.

4. STORAGE PRIOR TO ENERGIZATION

Store dry-type transformers in their original shipping cartons indoors in a clean, dry, temperature stable environment.

5. LOCATION AND MOUNTING

All dry-type transformers:

- Locate the transformer in an area where the transformer is easily accessible and serviceable.
- Install the unit in accordance with the requirements of Article 450 of the National Electrical Code and other appropriate local codes.
- Install the unit in a protected electrical circuit. Do not subject the transformer to voltage surges unless it is properly protected.
- Transformers are not tamper proof and should be installed in secured locations away from all unauthorized personnel.
- Locate unit in a well ventilated area free from excessive moisture, dust, dirt, or explosive/corrosive gases or vapors.
- Locate ventilated units at least 6 inches from front and rear structure to assure proper air circulation. Avoid any obstruction to the bottom and top panel ventilation openings.
- Install transformer on a surface strong enough to support the weight of the unit.
- Install ventilated transformers in an upright position only.
- Encapsulated transformers for indoor use may be mounted in any position. For outdoor application encapsulated transformers must be installed in an upright position to maintain a 3R rating.

6. HOW TO REDUCE SOUND TRANSMISSION

All transformers make some sound mainly due to the vibration generated in its core by alternating flux. NEMA ST-20 defines the sound levels for dry-type distribution transformers as shown in Table 1.

Table 1

kVA	NEMA Average Sound Level (dB) ^①	
	1.2 kV Class	Above 1.2 kV
0-9	40	45
10-50	45	50
51-150	50	55
151-300	55	58
301-500	60	60
501-700	62	62
701-1000	64	64
1001-1500	65	65

^① Applies to general purpose transformers only.

4. ALMACENAJE PREVIO A CONEXION

Mantenga los transformadores en su empaque original, en interiores secos, limpios y a temperatura estable.

5. LOCALIZACION Y MONTAJE

Transformadores de Diseño Ventilado y Encapsulado:

- Coloque el transformador donde pueda ser inspeccionado y tener acceso a él en cualquier momento.
- Instale la unidad de acuerdo a lo provisto en el artículo 450 del N.E.C. (Código Nacional Eléctrico E.U.A.) y/o los códigos o normas locales aplicables.
- Instale la unidad en un circuito eléctrico protegido. No exponga el transformador a sobrevoltajes a menos que esté adecuadamente protegido.
- Los transformadores son fácilmente accesados y por ello deben ser instalados en lugares seguros, lejos de toda persona no autorizada.
- Ubique las unidades en un área ventilada, libre de humedad excesiva, polvo, suciedad o vapores o gases explosivos o corrosivos.
- Ubique el transformador ventilado retirado un mínimo de 15 cm. de estructuras frontal y posterior para asegurar la apropiada circulación de aire. Evite cualquier obstrucción a las aperturas de ventilación de los paneles superior e inferior.
- Instale el transformador sobre una superficie suficientemente rígida para soportar el peso de la unidad.
- Instale los transformadores ventilados en posición vertical solamente.
- Los transformadores encapsulados para uso en interiores pueden ser montados en cualquier posición. Para uso en exteriores deben ser instalados sólo en posición vertical para mantener la nominación N.E.M.A. 3R.

6. COMO REDUCIR LA TRANSMISION DE SONIDO

Todos los transformadores generan sonido principalmente por la vibración generada en el núcleo por el flujo magnético alternante. NEMA ST-20 define los máximos niveles promedio de sonido para transformadores de distribución tipo seco como se muestra en la Tabla 1.

Tabla 1

kVA	Nivel de sonido promedio de N.E.M.A. (dB) ^①	
	Clase 1.2 kV	Mayores de Clase 1.2 kV
0-9	40	45
10-50	45	50
51-150	50	55
151-300	55	58
301-500	60	60
501-700	62	62
701-1000	64	64
1001-1500	65	65

^① Aplica a transformadores de uso general solamente.

All general purpose dry-type distribution transformers are designed to meet NEMA ST-20 established sound levels. However, to minimize the potential for sound transmission to surrounding structures and sound reflection, follow these instructions:

1. Mount the transformer away from corners, walls or ceilings. For installation which must be near a corner, use sound absorbing materials on the walls and ceiling.
2. Use flexible conduit to make the connections to the transformers.
3. Locate the transformers as far away as possible from areas where sound is objectionable.

7. CONNECTING CABLES TO TRANSFORMER TERMINATIONS

Any standard cable of the conductor size specified in N.E.C. Section 310 can be used. Recommended external cable should be rated 90°C (sized at 75% ampacity) for encapsulated designs and 75°C for ventilated designs. Connectors should be selected on the basis of the type cable and cable size used to wire the specific transformer.

- Remove access panels to wiring compartment.
- Install conduit and wiring through sides and/or bottom of transformer case into wiring compartment.
- Top entry of cable should be avoided.
- Clean all electrical joints.
- Connect primary wiring first to correct terminal as shown on the transformer nameplate.
- Insulate any unused tap leads and verify tap connections are tight.
- Energize unit and measure secondary voltage to verify correct voltage.
- De-energize primary circuit and connect secondary wiring to terminations in accordance with nameplate wiring diagram.
- Make sure all connections are tight.
- Re-install access panels.

Grounding

As required by the National Electrical Code, connect a ground cable to the transformer enclosure. The transformer core is grounded to enclosure.

8. ENERGIZATION AND OPERATION GUIDELINES

For ventilated designs only, if moisture is evident, the unit should be dried out by placing it in an oven or by blowing heated air over it. The temperature should not exceed 110° C (230°F) to prevent damage to wiring insulation.

When the tests and connections are complete, the transformer may be energized.

Todos los transformadores de distribución tipo seco son diseñados para cumplir con los niveles de sonido establecidos por NEMA, norma ST-20. Aún así para minimizar la transmisión potencial de sonido y su reflexión, siga estas instrucciones:

1. Monte el transformador alejado de esquinas, paredes y techos. En caso contrario, use materiales absorbentes de sonido en las paredes.
2. Use tubo conduit flexible para hacer las conexiones al transformador.
3. Coloque la unidad lo más retirada posible de áreas en las que el nivel de ruido sea un factor limitante.

7. CONEXION DE CABLES A LAS TERMINALES DEL TRANSFORMADOR

Puede usar cualquier cable conductor aislado, del calibre especificado por N.E.C. o los códigos aplicables. El cable de uso exterior recomendado debe ser para 90°C (calculado al 75% de ampacidad) en diseños encapsulados, y para 75°C en diseños ventilados. Los conectores deberán seleccionarse de acuerdo al tipo y al calibre del cable conductor utilizado en la conexión al transformador específico.

- Remueva los páneces o tapas de acceso al compartimiento de alambrado.
- Instale tubo conduit y el cableado por el fondo o los lados del gabinete del transformador hacia el compartimiento de terminales.
- Evite el acceso de cable por la parte superior del gabinete de diseños ventilados.
- Limpie todas las uniones eléctricas.
- Conecte primero la sección primaria a la terminal correcta, según se muestre en la placa de datos.
- Aisle todo tap (derivación) sin usar y revise que los taps conectados estén apretados.
- Energice la conexión primaria y mida el voltaje en la sección secundaria, verificando que sea el voltaje correcto.
- Desenergice y prepare la conexión en la sección secundaria de acuerdo al diagrama de la placa de datos.
- Asegúrese que todas las conexiones han sido apretadas.
- Reinstale los páneces o tapas de acceso al compartimiento de conductores.

Conexión a tierra (potencial cero)

Conecte el cable de tierra física al gabinete del transformador, así como lo requiere el N.E.C.. El núcleo del transformador ya ha sido aterrizado al gabinete.

8. GUIA DE ENERGIZADO Y OPERACION

Para diseños ventilados solamente: si existe humedad evidente, seque la unidad ya sea dentro de un horno o soplando aire caliente por ella. La temperatura no debe exceder 110°C (230°F) para prevenir daños al alambrado.

Una vez probado el transformador y terminadas las conexiones, el transformador puede ser energizado.

Do not make any connections other than those shown on the nameplate or diagram. Do not change connections or taps while the unit is energized.

This dry-type transformer was built and tested in accordance with applicable standards of American National Standards Institute and National Electrical Manufacturers's Association.

The following operations guides are excerpts from these standards.



WARNING

IT IS IMPORTANT TO FOLLOW THE GUIDELINES SET FORTH BELOW. FAILURE TO DO SO COULD RESULT IN SEVERE PERSONAL INJURY, DEATH, PROPERTY DAMAGE, OR REDUCED TRANSFORMER LIFE.

The maximum allowed overvoltage is 5% above rated secondary voltage at rated kVA load with load power factor at least 80%. If the transformer is energized while the secondary is not connected to a load, then the voltage applied to the primary must not result in a voltage exceeding 110% of the rated secondary voltage.

Continuous overload capability is not deliberately designed into general purpose transformers. For short term overload capability, See ANSI C57.96-01.250 for guidelines and limitations.

Transformers depend entirely on the surrounding air for adequate ventilation. The ambient should not exceed 40°C (104°F) and the average temperature of the air for any 24 hour period should not exceed 30°C (86°F). For operation at higher ambients, transformer loading should be reduced 0.6% of rated KVA for each degree above 30°C average ambient to a maximum of 50°C (122°F).

The transformer may be connected in parallel with other transformers if the phase angle shift is the same; phase rotation is the same; transformers' turn ratios and voltage ratings are within a 0.5% range; and the percent impedance on the same kVA base is within a $\pm 7.5\%$ range.

Transformers are normally designed for operation at altitudes below 1000 meters (3300 feet). To operate a transformer above 1000 meters, it is necessary to reduce the kVA load and to increase the electrical insulation clearances between energized terminals. Refer to NEMA ST-20 for detailed guidelines.

9. MAINTENANCE AND REPAIR



WARNING

BEFORE ATTEMPTING REPAIRS, FOLLOW THE INSTRUCTIONS SET FORTH BELOW. DE-ENERGIZE THE TRANSFORMER BEFORE MAKING REPAIRS. FAILURE TO DO SO COULD RESULT IN SEVERE PERSONAL INJURY, DEATH, OR PROPERTY DAMAGE.

It is the responsibility of the owner to inspect, maintain and keep the transformer in good repair.

Report all failures during the warranty period to your local sales office prior to repairs. All warranty repairs must be made or approved by the manufacturer.

No intente realizar conexiones no mostradas en la placa de datos. No intente modificaciones o cambio de derivaciones (taps) con el transformador energizado.

Este transformador tipo seco fué construido y probado de acuerdo a normas aplicables A.N.S.I. (American National Standards Institute, E.U.A.)

Las siguientes instrucciones de operación son extractos de esas normas.



ADVERTENCIA

ES IMPORTANTE SEGUIR LAS RECOMENDACIONES QUE SE MENCIONAN. EL NO ACATARLAS PUEDE RESULTAR EN LESIONES PERSONALES SEVERAS, MUERTE, DAÑO EN PROPIEDAD O REDUCCIÓN DE LA VIDA ÚTIL DEL TRANSFORMADOR.

El máximo sobrevoltaje permitido es 5% sobre el voltaje nominal secundario, a carga (kVA) nominal, con un factor de potencia de al menos 80%. Si el transformador se energiza sin que el secundario esté conectado a una carga, entonces el voltaje aplicado al primario no debe provocar un voltaje secundario mayor al 110% del nominal.

Los transformadores de uso general no están intencionalmente diseñados para soportar sobrecargas continuas. Para información y orientación sobre la operación de sobrecarga en periodos cortos de tiempo, consulte A.N.S.I. C57.96-01.250.

Los transformadores ventilados dependen completamente del aire circundante para su adecuada ventilación. El ambiente no debe exceder los 40°C (104°F) y el promedio de temperatura del aire, en un periodo de 24 horas, no debe exceder los 30°C (86°F). Para operación a mayores temperaturas, la carga del transformador se reduce un 0.6% de la potencia nominal en KVA por cada grado sobre 30°C (86°F) de ambiente promedio, hasta un máximo de 50°C (122°F).

El transformador puede conectarse en paralelo con otros transformadores si: el ángulo de fase es el mismo, la rotación de fase es igual, la relación de vueltas y los voltajes nominales están dentro de un 0.5% del rango, y el porcentaje de impedancia, basado en mismos KVA, está dentro del rango de $\pm 7.5\%$.

Los transformadores normalmente se diseñan para operar a altitudes por debajo de 1000 metros (3300 Ft.). Operando sobre 1000m es necesario reducir la carga en KVA e incrementar los claros entre terminales energizadas. Consulte N.E.M.A. ST-20 para más detalles.

9. MANTENIMIENTO Y REPARACION



ADVERTENCIA

ANTES DE INTENTAR DAR SERVICIO, SIGA LAS INSTRUCCIONES QUE SE DARÁN. DESENERGICE ESTE EQUIPO ANTES DE TRABAJAR EN ÉL. EL NO HACERLO PUEDE CAUSAR LESIONES PERSONALES SEVERAS, MUERTE O DAÑOS EN PROPIEDAD.

Es responsabilidad del propietario la inspección, mantenimiento y reparación del transformador.

Durante la vigencia de la garantía notifique toda falla a su oficina de ventas antes de reparar. Toda reparación bajo garantía debe ser hecha o aprobada por el fabricante.

Practically no maintenance is required on a dry-type transformer but inspect it periodically as indicated below:

- De-energize transformer.
- Check for any accumulation of dust or dirt on the terminations or vents. If necessary, remove by vacuuming, brushing, or blowing dry air. Special care should be taken when blowing with dry air to prevent further damage to the product or injury to maintenance personnel from flying particles.
- Inspect insulators, terminals, terminal boards, for tracking (discharge), breaks, cracks, or burns. Clean or repair if necessary.
- Check terminal quality and connections, including taps, for tightness. Replace or tighten as necessary.
- Inspect ground connections and ground contact surfaces. Tighten or repair if needed.
- For ventilated designs only, if moisture is evident, the unit should be dried out by placing it in an oven or by blowing heated air over it. The temperature should not exceed 110°C (230°F) to prevent damage to installation wiring.
- Inspect the paint finish for scratches or wear. Repair the finish if necessary.

10. SAFETY

The installation, operation and maintenance of a transformer presents numerous potential unsafe conditions, including, but not limited to the following:

- Improper tap changing operation
- Lethal voltages
- Moving machinery
- Heavy components

All applicable safety procedures as OSHA requirements, regional and local safety requirements, safe working practices, and good judgment must be used by personnel when installing, operating, and/or maintaining such equipment.

Unless otherwise stated, failure to adhere to the following could result in severe bodily damage, injury, death, or property damage. Refer to appropriate areas of this instruction book for further instructions.

1. When the transformer is energized, the electrical terminations are at high voltages. Close exposure to these parts could result in death by electrocution.
2. Do not remove case panels and/or doors when the transformer is energized. Do not energize transformer for operation until the panels are properly installed.
3. Improper or inadequate maintenance could result in reduced transformer life, cause personal injury, death, or property damage.

11. DISCLAIMER OF WARRANTIES AND LIMITATION OF LIABILITY

There are no understandings, agreements, representations or warranties, express or implied, including warranties of merchantability

El transformador tipo seco prácticamente no necesita mantenimiento; aún así, acostumbre revisarlo de la manera siguiente:

- Desenergice el transformador.
- Busque polvo y suciedad acumulados en terminales y respiraderos. De ser necesario, remueva con aspiradora, cepillando o soplando aire seco. Se debe tener cuidado especial al soplar aire seco para prevenir posibles daños al producto o al personal con las partículas sueltas.
- Revise quebraduras, quemaduras y fisuras en aislantes, terminales y soportes de terminales. Limpie o repare si es necesario.
- Revise la calidad y firmeza de terminales y contactos, incluyendo los taps. Apriete o reemplace si es necesario.
- Revise conexiones y superficies de contacto a tierra (potencial cero). Limpie, apriete o repare si es necesario.
- Para diseños ventilados solamente, en caso de humedad evidente, la unidad debe ser secada ya sea dentro de un horno o soplando aire caliente. La temperatura no debe exceder 110°C (230° F) para prevenir daño al alambrado.
- Inspeccione raspaduras o deterioro en el acabado de la pintura exterior del gabinete. Retoque de ser necesario.

10. SEGURIDAD

La instalación, operación y mantenimiento de un transformador presenta numerosas condiciones inseguras, incluyendo entre otras:

- Modificar arreglo de derivaciones (taps) inapropiadamente
- Voltajes mortales
- Equipo en movimiento
- Partes y componentes pesados

Todos los procedimientos de seguridad como los requeridos por O.S.H.A. (Occupational Safety & Health Administration, E.U.A.), instituciones como C.F.E., I.M.S.S. y S.T.P.S. (MEX) u otros aplicables, requerimientos locales y regionales deben ser usados por el personal para instalar y/o dar mantenimiento al equipo, así como también seguir prácticas de seguridad y buen juicio.

A menos que se especifique lo contrario, el no apearse a lo siguiente puede causar daños y lesiones personales, muerte y daños en propiedad. Vea las secciones apropiadas de este manual para más información.

1. Cuando el transformador está energizado las terminales eléctricas mantienen un alto potencial (voltaje). El exponerse a estas partes puede causar muerte por electrocución.
2. No remueva los paneles o tapas cuando el transformador esté energizado. No energice el transformador sin haber reinstalado dichos elementos.
3. El mantenimiento pobre o inapropiado reduce la vida útil de la unidad, puede causar lesiones personales, muerte o daño a la propiedad.

11. LIMITES EN RESPONSABILIDAD Y GARANTIA

No hay entendimientos, acuerdos, representaciones o garantías, expresas o implícitas, incluyendo garantías de mercadeo o

or fitness for a particular purpose, other than those specifically set out by any existing contract between the parties. Any such contract states the entire obligation of seller, the contents of this document shall not become part of or modify any prior or existing agreement, commitment or relationship.

The information, recommendations, descriptions and safety notations in this document are based on industry experience and judgement with respect to transformers. This information should not be considered to be all inclusive or covering all contingencies. If further information is required the local sales office should be consulted. No warranties express or implied, including warranties of fitness for a particular purpose or merchantability, or warranties arising from course of dealing or usage of trade, are made regarding the information, recommendations, descriptions, and safety notations contained herein. In no event will the manufacturer be responsible to the user in contract, in tort (including negligence), strict liability or otherwise for any special, indirect, incidental or consequential damage or loss whatsoever, including but not limited to damage or loss of use of equipment, plant or power system, cost of capital, loss of profits, or revenues, cost of replacement power, additional expenses in the use of existing power facilities, or claims against the user by its customers resulting from the use of the information, recommendations, descriptions and safety notations contained herein.

adecuación a un propósito particular, mas que aquellas estipuladas en un contrato existente entre las partes. Tal contrato establece toda la obligación del vendedor. El contenido de este instructivo no será parte ni modificará cualquier acuerdo, compromiso o relación previa o existente.

La información, recomendaciones, descripciones y notas de seguridad se basan en la experiencia y el juicio del fabricante en la industria de transformadores. Este instructivo no cubre ni incluye todas las contingencias posibles. Si requiere más información consulte la oficina local de ventas. Ninguna garantía, expresa o implícita, incluyendo garantías de adecuación a un propósito particular o mercadeo, o garantías surgidas de negociaciones o tratos comerciales, se hace concerniente a la información, recomendaciones descripciones y notas de seguridad contenidas aquí. En ningún caso el fabricante será responsable ante el usuario en contrato, por agravio, responsabilidad a terceros o de otra forma, por ningún daño o pérdida especial, indirecta, incidental o consecuente, incluyendo pero no limitado a daño o pérdida en el uso de equipo, sistemas de planta o potencia, costo de capital, pérdida de utilidades o ingresos, costo de reemplazo de potencia, gastos adicionales en el uso de instalaciones de potencia existentes, o reclamos contra el usuario de parte de sus clientes por el uso de la información, recomendaciones, descripciones y notas de seguridad contenidas aquí.

EATON



Cutler-Hammer

Motor Control Center Type F2100

Renewal Parts

Supersedes RP.03A.01A.S.E
pages 1-24, dated September 2000

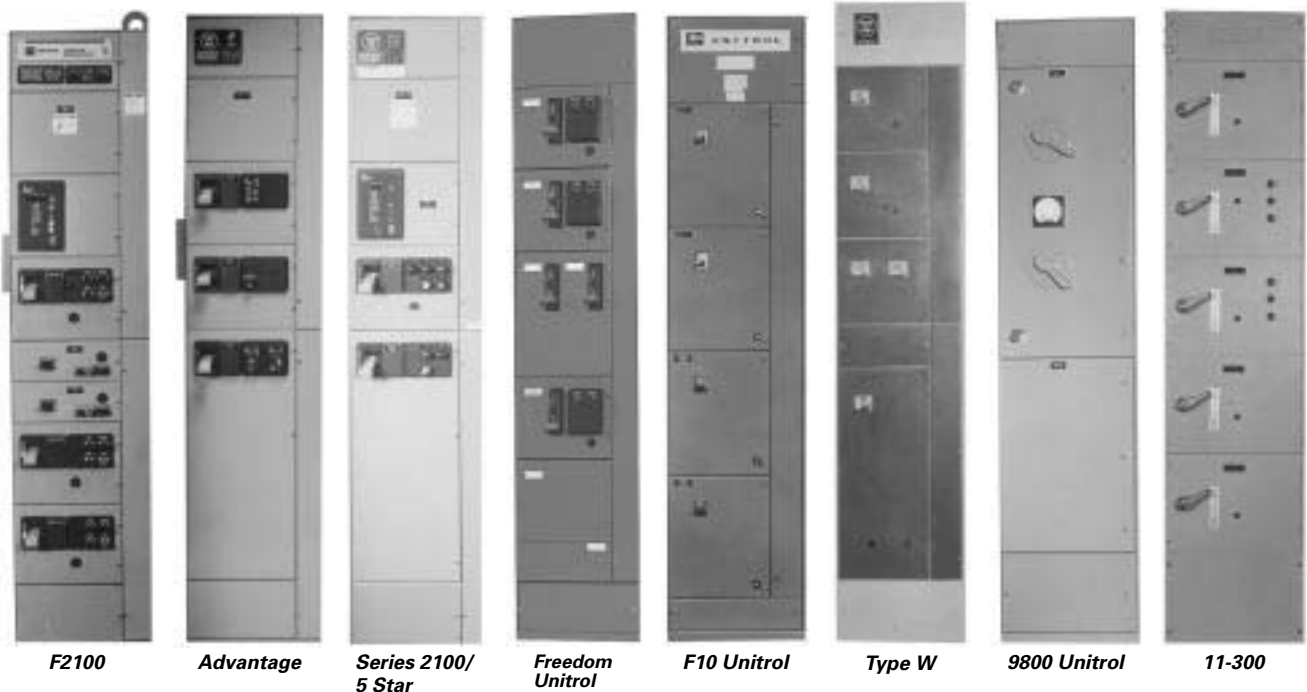
Description

Page

Motor Control Center Type F2100

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MCC Type	Dates	Cutler-Hammer Renewal Parts Publication
F2100 Advantage™ Series 2100	1995 – 1992 – 1987 – 95	RP04304001E RP04304002E RP04304003E
5 Star Freedom Unitrol F10 Unitrol	1975 – 87 1988 – 94 1972 – 89	RP04304003E RP04304004E RP04304005E
Type W 9800 Unitrol 11-300	1965 – 75 1956 – 74 1935 – 65	RP04304006E RP04304007E RP04304008E



Distributor Ordering Instructions

1. Specify the item by catalog or style number.
2. For pricing information, refer to Price List PL04304002E (formerly PL 8991A dated November 1997).
3. Enter the order on VISTALINE™ on Suffix **FVU**, or through e-POD on Suffix **FVU**.
4. Selling Policy 25-000 (SP03000001E) applies, the Discount Symbol is **1CD-2C**.

Procedure for Identifying Motor Control Centers Renewal Units and Parts

1. Identify the design of the Eaton's Cutler-Hammer Motor Control Center (MCC) from the data found on the nameplate. Critical information includes:
 - Type of MCC.
 - Type of contactor.
 - Door width.
 - Bucket width.
2. Refer to **Pages 6 – 24** and turn to the section in this Renewal Parts to identify replacement units, options, structure parts, and unit parts for F2100.
3. For Replacement Feeder Units, refer to **Page 26**.
4. This publication identifies those replacement units and parts which are most frequently ordered. Units should be ordered by complete catalog number, and parts by complete style number.

For parts not listed or shown, contact your authorized Cutler-Hammer distributor or local Cutler-Hammer sales representative.

5. If additional assistance is required, contact the Motor Control Center Aftermarket Product Center in Fayetteville, NC at **(910) 483-2222** or **1-800-OLD-UNIT** or Fax (910) 677-5208 or (910) 677-5272.

You can also contact one of our eight Service Centers for assistance with F2100, Advantage, Series 2100/5 Star, Freedom Unitrol, F10 Unitrol, Type W, 11-300 and 9800 Unitrol Motor Control Centers.

Atlanta

Phone (770) 739-6282
Fax (770) 739-7178

Chicago

Phone (847) 299-1911
Fax (847) 299-0398

Cincinnati

Phone (513) 682-4000
Fax (513) 682-4004

Denver

Phone (303) 373-2133
Fax (303) 375-9095

Hartford

Phone (860) 683-4221
Fax (860) 683-0764

Houston

Phone (713) 939-9696
Fax (713) 939-0427

Los Angeles

Phone (562) 944-6413
Fax (562) 941-7178

Portland

Phone (503) 636-8333
Fax (503) 636-8545

Identifying Motor Control Center Types

In most cases, it is possible to identify MCC design by handle type. Starter type, bucket width and door width can assist in identification.

Table 1. Identifying Motor Control Center Types

MCC Type	Type of Handle Mechanism	Original MCC Starter Type	Bucket Width Inches (mm)	Door Width Inches (mm)	Original Manufacturer ①	Starter Type (Installed in New Unit)
F2100 ②	Lever	Freedom Series	13-3/4 (349.3)	15-5/8 (397.0)	Cutler-Hammer 1994 to Present	Freedom
Advantage ②	Lever	Advantage	13-3/4 (349.3)	15-5/8 (397.0)	Westinghouse until 1994 Cutler-Hammer 1994 to Present	Advantage
Series 2100 ②	Lever	A200	13-3/4 (349.3)	15-5/8 (397.0)	Westinghouse until 1994 Cutler-Hammer 1994 to Present	A200
5 Star ②	Lever	A200	13-3/4 (349.3)	15-5/8 (397.0)	Westinghouse 1975 – 1987	A200
Freedom Unitrol	Slider	Freedom Series	13-7/8 (352.5)	15-1/2 (393.7)	Cutler-Hammer 1988 – 1994	Freedom
F10 Unitrol	Slider and Lever	Citation	14 (355.6)	14-3/4 (374.7) w/ Wireway 19-1/2 (495.3) w/o Wireway	Cutler-Hammer 1972 – 1989	Freedom
Type W	Slider	A200 or 11-200	11-3/4 (298.5)	13-3/8 (339.9)	Westinghouse 1965 – 1975	A200
9800 Unitrol	Rotary ③	3 Star/Citation	16-1/8 (409.7)	19-3/8 (492.3)	Cutler-Hammer 1956 – 1974	Freedom
11-300	Rotary	11-200 Lifeline Type N/A200	15-3/4 (400.1)	20 (508.0)	Westinghouse 1950 – 1965	A200

① MCC types were sometimes produced outside the time spans shown. This was due to the overlap of production when a new design was adopted.

② The unit “wrappers” are mechanically identical for these designs.

③ 9800 originally was supplied with Rotary. New replacement units are manufactured with slider handle mechanism.

Identification by Original Handle Mechanism



*F2100, Advantage,
Series 2100/5 Star*



Freedom Unitrol



*F10 Unitrol Slider
9800 Unitrol*



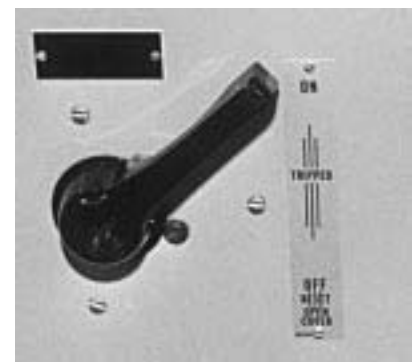
*F10 Unitrol Lever
and 9800 Unitrol*



Type W



9800 Unitrol



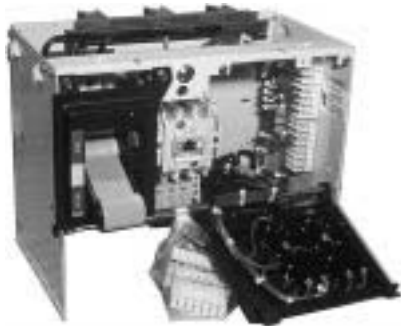
11-300

Procedure for Identifying Motor Control Center Types

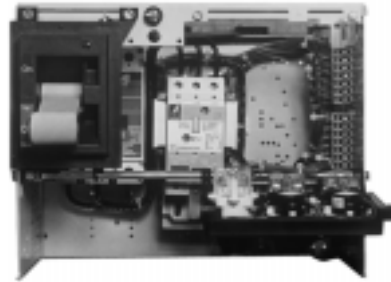
In the event that the nameplate is missing, it is possible to identify the MCC design by the type of handle mechanism, starter type, bucket width and door width.

Table 2. Identifying Motor Control Center Types

MCC Type	Type of Handle Mechanism	Starter Type	Bucket Width Inches (mm)	Door Width Inches (mm)	Cutler-Hammer Renewal Parts Publication
F2100 Advantage Series 2100	Lever Lever Lever	Freedom Series Advantage A200	13-3/4 (349.3) 13-3/4 (349.3) 13-3/4 (349.3)	15-5/8 (397.0) 15-5/8 (397.0) 15-5/8 (397.0)	RP04304001E RP04304002E RP04304003E
5 Star Freedom Unitrol F10 Unitrol	Lever Slider Lever/Slider	A200 Freedom Series Citation	13-3/4 (349.3) 13-7/8 (352.5) 14 (355.6)	15-5/8 (397.0) 15-1/2 (393.7) 14-3/4 (374.7) w/ Wireway or 19-1/2 (495.3) w/o Wireway	RP04304003E RP04304004E RP04304005E
Type W 9800 Unitrol 11-300	Slider Rotary Rotary	A200 or 11-200 3 Star and/or Citation 11-200 Lifeline N and/or A200	11-3/4 (298.5) 16-1/8 (409.7) 15-3/4 (400.1)	13-3/8 (339.9) 19-3/8 (492.3) 20 (508.0)	RP04304006E RP04304007E RP04304008E



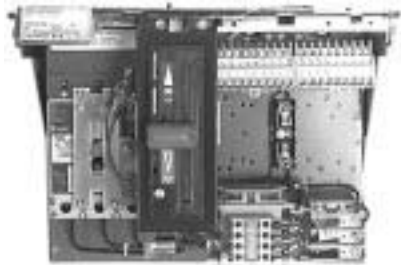
F2100



Advantage



Series 2100/5 Star



Freedom Unitrol



F10 Unitrol



Type W



9800 Unitrol



11-300

F2100 Product Description

The Eaton's Cutler-Hammer business introduced the F2100 MCC in 1995.

The structure is based on the 5 Star, Series 2100, and Advantage MCC design. Vertical structures are normally 20 inches (508.0 mm) wide, 90 inches (2286.0 mm) high, and 16 or 21 inches (406.4 or 533.4 mm) deep. Vertical sections may be bolted together forming a single line-up with continuous horizontal bus and open horizontal wireways. Unit height is measured in 6-inch (152.4 mm) increments, up to a maximum of 72 inches (1828.8 mm) of usable vertical space.

A two-tone paint system is used for this design. Ferro white is applied to the structural framework and units. ANSI 61 gray is applied to the exterior and doors. Starter units are 13-3/4 inches (349.3 mm) wide with 4-5/8 inch (117.6 mm) wireways.

The Freedom starter is used in this design along with the HMCP or HMCPE motor circuit protector. The F2100 starter unit's handle mechanism is a gray toggle type handle with a black exterior mounting panel and is used on the Advantage and Series 2100/5 Star designs. Bus and bus support systems are typically braced to withstand fault currents of 65,000 amperes.

Table 3. F2100 Product Rating

Maximum Ratings
3-Phase, 600V, 600 hp, 3200A Bus



F2100 Structure



F2100 Starter Unit

F2100 Replacement Starter Units

How to Order

When ordering a replacement unit, you receive:

- Series C® HMCP or HMCPE.
- Freedom Starter.
- Unit options as specified.
- New steel wrapper, door and handle mechanism.
- New stabs.
- UL® label.

Use the following steps for creating a catalog number for your specific application:

Step 1

Select the correct replacement unit from **Page 6 – 15**. When selecting, you need to know the following:

- MCC type.
- Class of Unit (FVNR, FVR, Reduced Voltage — Autotransformer or Part Winding or Solid State, FV – 2 Speed, 1 Winding or 2 Speed, 2 Winding, etc.).
- Starter size or horsepower rating.
- Protection device (breaker or fusible).
- Service voltage.
- Control voltage.
- Space required.

Step 2

Verify required space is available.

Step 3

Create a catalog number by selecting Catalog Codes from the columns per the example given.

Step 4

Add modifications as required from the Unit Options on **Pages 17 – 19**. Space available determines allowable options.

Table 4. Catalog Numbering System Example

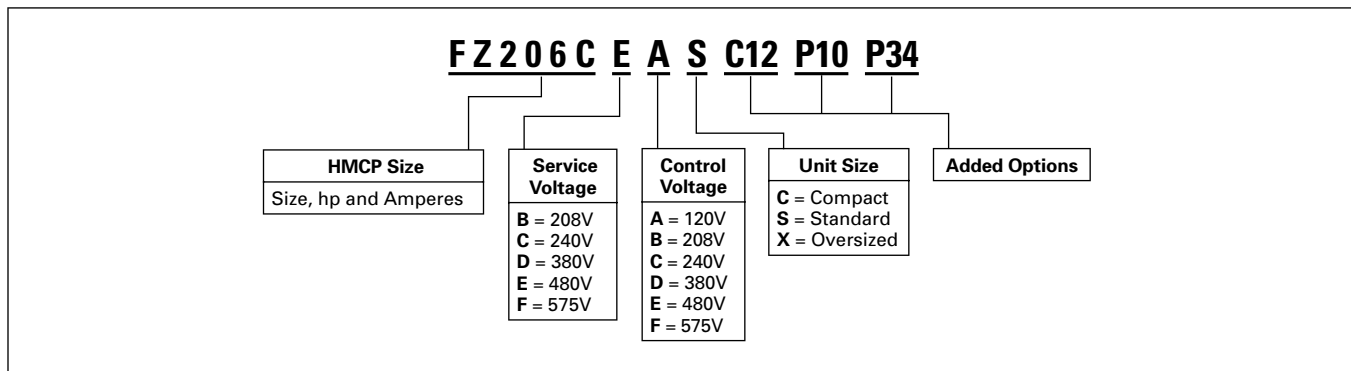


Table 5. Full Voltage Non-Reversing Combination Starter — HMCP (Must specify if HMCPE is required)

NEMA® Size	Maximum Horsepower					HMCP Size	Catalog Code	Service Voltage	Catalog Code	Control Voltage	Catalog Code	Space Options Inches (mm)	Catalog Code
	208V	240V	380V	480V	600V								
1	0.5	0.33	1	1	1.5	3	FZ206A FZ206B FZ206C FZ206D	208	B C D E F	120	A B C D E F	6 (152.4) High 12 (304.8) High 18 (457.2) High	C ① S X
	1	1	2	3	3	7		240		208			
	3	3	5	7.5	7.5	15		380		240			
	7.5	7.5	10	10	10	30		480		380			
								575		480			
2	10	15	25	25	25	50	FZ206E	208	B C D E F	120	A B C D E F	12 (304.8) High 18 (457.2) High	S X
								240		208			
								380		240			
								480		380			
								575		480			
3	25	30	50	50	50	100	FZ206H	208	B C D E F	120	A B C D E F	18 (457.2) High	S
								240		208			
								380		240			
								480		380			
								575		480			
4	40	50	75	100	100	150	FZ206L	208	B C D E F	120	A B C D E F	18 (457.2) High	S
								240		208			
								380		240			
								480		380			
								575		480			
5	60	60	125	150	150	250	FZ206P FZ206R	208	B C D E F	120	A B C D E F	36 (914.4) High	S
	75	100	150	200	200	400		240		208			
								380		240			
								480		380			
										480			

① On 6-inch (152.4 mm) units, the only options available are (3) E22 pilot devices and separate source fuse or disconnect or CPT.

F2100 Replacement Starter Units

Table 6. Full Voltage Reversing Combination Starter — HMCP ①

NEMA Size	Maximum Horsepower					HMCP Size	Catalog Code	Service Voltage	Catalog Code	Control Voltage	Catalog Code	Space Options Inches (mm)	Catalog Code
	208V	240V	380V	480V	600V								
1	0.5	0.33	1	1	1.5	3	FZ216A	208	B	120	A	18 (457.2) High 24 (609.6) High	S X
	1	1	2	3	3	7	FZ216B	240	C	208	B		
	3	3	5	7.5	7.5	15	FZ216C	380	D	240	C		
	7.5	7.5	10	10	10	30	FZ216D	480	E	380	D		
								575	F	480	E		
2	10	15	25	25	25	50	FZ216E	208	B	120	A	18 (457.2) High 24 (609.6) High	S X
	10	15	25	25	25	50	FZ216E	240	C	208	B		
								380	D	240	C		
								480	E	380	D		
								575	F	480	E		
3	25	30	50	50	50	100	FZ216H	208	B	120	A	24 (609.6) High	S
	25	30	50	50	50	100	FZ216H	240	C	208	B		
								380	D	240	C		
								480	E	380	D		
								575	F	480	E		
4	40	50	75	100	100	150	FZ216L	208	B	120	A	30 (762.0) High	S
	40	50	75	100	100	150	FZ216L	240	C	208	B		
								380	D	240	C		
								480	E	380	D		
								575	F	480	E		
5	50	60	100	125	150	250	FZ216P	208	B	120	A	60 (1524.0) High	S
	75	100	150	200	200	400	FZ216R	240	C	208	B		
								380	D	240	C		
								480	E	380	D		
								575	F	480	E		

① Must specify if HMCPE is required.

Table 7. Full Voltage 2 Speed 1 Winding — Constant/Variable Torque — HMCP ②③

NEMA Size	Maximum Horsepower					HMCP Size	Catalog Code	Service Voltage	Catalog Code	Control Voltage	Catalog Code	Space Options Inches (mm)	Catalog Code
	208V	240V	380V	480V	600V								
1	0.5	0.33	1	1	1.5	3	FZ946A	208	B	120	A	24 (609.6) High	S
	1	1	2	3	3	7	FZ946B	240	C	208	B		
	3	3	5	7.5	7.5	15	FZ946C	380	D	240	C		
	7.5	7.5	10	10	10	30	FZ946D	480	E	380	D		
								575	F	480	E		
2	10	15	25	25	25	50	FZ946E	208	B	120	A	24 (609.6) High	S
	10	15	25	25	25	50	FZ946E	240	C	208	B		
								380	D	240	C		
								480	E	380	D		
								575	F	480	E		
3	25	30	50	50	50	100	FZ946H	208	B	120	A	36 (914.4) High	S
	25	30	50	50	50	100	FZ946H	240	C	208	B		
								380	D	240	C		
								480	E	380	D		
								575	F	480	E		
4	40	50	75	100	100	150	FZ946L	208	B	120	A	36 (914.4) High	S
	40	50	75	100	100	150	FZ946L	240	C	208	B		
								380	D	240	C		
								480	E	380	D		
								575	F	480	E		

② Must specify if HMCPE is required.

③ For constant horsepower instead of constant/variable torque, see Option SV6 on Page 18.

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Table 8. Full Voltage 2 Speed 2 Winding — Constant/Variable Torque — HMCP ①②

NEMA Size	Maximum Horsepower					HMCP Size	Catalog Code	Service Voltage	Catalog Code	Control Voltage	Catalog Code	Space Options Inches (mm)	Catalog Code
	208V	240V	380V	480V	600V								
1	0.5	0.33	1	1	1.5	3	FZ956A	208	B	120	A	24 (609.6) High	S
	1	1	2	3	3	7	FZ956B	240	C	208	B		
	3	3	5	7.5	7.5	15	FZ956C	380	D	240	C		
	7.5	7.5	10	10	10	30	FZ956D	480	E	380	D		
								575	F	480	E		
2	10	15	25	25	25	50	FZ956E	208	B	120	A	24 (609.6) High	S
								240	C	208	B		
								380	D	240	C		
								480	E	380	D		
								575	F	480	E		
3	25	30	50	50	50	100	FZ956H	208	B	120	A	30 (762.0) High	S
								240	C	208	B		
								380	D	240	C		
								480	E	380	D		
								575	F	480	E		
4	40	50	75	100	100	150	FZ956L	208	B	120	A	30 (762.0) High	S
								240	C	208	B		
								380	D	240	C		
								480	E	380	D		
								575	F	480	E		

① Must specify if HMCPE is required.

② For constant horsepower instead of constant/variable torque, see Option SV6 on Page 18.

Table 9. Reduced Voltage Autotransformer — HMCP ③④

NEMA Size	Maximum Horsepower					HMCP Size	Catalog Code	Service Voltage	Catalog Code	Control Voltage	Catalog Code	Space Options Inches (mm)	Catalog Code
	208V	240V	380V	480V	600V								
2	10	15	25	25	25	50	FZ606E	208	B	120	A	36 (914.4) High	S
								240	C	208	B		
								380	D	240	C		
								480	E	380	D		
								575	F	480	E		
3	25	30	50	50	50	100	FZ606H	208	B	120	A	48 (1219.2) High	S
								240	C	208	B		
								380	D	240	C		
								480	E	380	D		
								575	F	480	E		
4	40	50	75	100	100	150	FZ606L	208	B	120	A	48 (1219.2) High	S ④
								240	C	208	B		
								380	D	240	C		
								480	E	380	D		
								575	F	480	E		

③ Must specify if HMCPE is required.

④ If existing MCC is back-to-back design, 36 inches (914.4 mm) in bottom rear is unusable.

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Table 10. Reduced Voltage Part Winding — HMCP ①

NEMA Size	Maximum Horsepower					HMCP Size	Catalog Code	Service Voltage	Catalog Code	Control Voltage	Catalog Code	Space Options Inches (mm)	Catalog Code
	208V	240V	380V	480V	600V								
1	10	10	15	15	15	30	FZ706D	208 240 380 480 575	B C D E F	120 208 240 380 480 575	A B C D E F	24 (609.6) High	S
2	20	25	40	40	40	100	FZ706F	208 240 380 480 575	B C D E F	120 208 240 380 480 575	A B C D E F	24 (609.6) High	S
3	40	50	75	75	75	150	FZ706J	208 240 380 480 575	B C D E F	120 208 240 380 480 575	A B C D E F	30 (762.0) High	S
4	— 75	— 75	— 150	100 150	125 150	250 400	FZ706L FZ706M	208 240 380 480 575	B C D E F	120 208 240 380 480 575	A B C D E F	36 (914.4) High	S

① Must specify if HMCPE is required.

Table 11. Reduced Voltage Wye Delta Open Transition — HMCP ②

NEMA Size	Maximum Horsepower					HMCP Size	Catalog Code	Service Voltage	Catalog Code	Control Voltage	Catalog Code	Space Options Inches (mm)	Catalog Code
	208V	240V	380V	480V	600V								
2	20	25	40	40	40	100	FZ806F	208 240 380 480 575	B C D E F	120 208 240 380 480 575	A B C D E F	42 (1066.8) High	S
3	40	50	75	75	75	150	FZ806J	208 240 380 480 575	B C D E F	120 208 240 380 480 575	A B C D E F	54 (1371.6) High	S
4	60 —	75 —	125 150	150 —	150 —	250 400	FZ806M FZ806N	208 240 380 480 575	B C D E F	120 208 240 380 480 575	A B C D E F	60 (1524.0) High	S

② Must specify if HMCPE is required.

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Table 12. Reduced Voltage Wye Delta Closed Transition — HMCP (Non-Chiller Application) ①

NEMA Size	Maximum Horsepower					HMCP Size	Catalog Code	Service Voltage	Catalog Code	Control Voltage	Catalog Code	Space Options Inches (mm)	Catalog Code
	208V	240V	380V	480V	600V								
2	20	25	40	40	40	100	FZ896F	208 240 380 480 575	B C D E F	120 208 240 380 480 575	A B C D E F	42 (1066.8) High	S
3	40	50	50	50	50	100	FZ896J	208 240 380 480 575	B C D E F	120 208 240 380 480 575	A B C D E F	54 (1371.6) High	S
4	60 —	75 —	125 150	150 —	150 —	250 400	FZ896M FZ896N	208 240 380 480 575	B C D E F	120 208 240 380 480 575	A B C D E F	60 (1524.0) High	S

① Must specify if HMCPE is required.

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IT06 — Intelligent Technologies *IT*. Solid-State Reduced Voltage Starter — HMCP

The *IT*. solid-state reduced voltage starter uses SCRs when starting and a low impedance run circuit during operation. Solid-state starters have (5) 24V DC inputs and 2 relay outputs. Soft start units include a disconnect, starter, 24V DC power supply and 100VA CPT.

Motor Service Factor (SF) Effect on *IT*. Starter Selection

- A 1.0 service factor motor may draw up to 1.00 x full load amperes.
- A 1.15 service factor motor may draw up to 1.15 x full load amperes.
- 15% more current. *IT*. starters are current rated devices. In some cases, a larger *IT*. SSRV starter must be supplied for 1.15 SF motors. See the maximum horsepower chart below.

Note: Most motors used in industrial applications are 1.15 Service Factor (SF).

Table 13. Replacement *IT*. Soft Start Units

Service Factor	Horsepower	<i>IT</i> . Soft-Start Amperes	HMCP Amperes	Catalog Code	Service Voltage	Catalog Code	Control Voltage	Catalog Code	Space Options Inches (mm)	Catalog Code	
1.15	10	37	100	FZ306A	208	B	120	A	12 (304.8) High	S	
	15	66		FZ306B			208	B			
	30	105		FZ306C			240	C			18 (457.2) High
	40	135	FZ306D	380			D				
	50	180	400	FZ306E			480	E	36 (914.4) High		
	60	240		FZ306F			575	F			
	75	304		FZ306G			—	—			
1.15	10	37	100	FZ306A	240	C	120	A	12 (304.8) High	S	
	20	66		FZ306B			208	B			
	30	105		FZ306C			240	C			18 (457.2) High
	40	135	FZ306D	380			D				
	60	180	250	FZ306E			480	E	36 (914.4) High		
	75	240		FZ306F			575	F			
	100	304		FZ306G			—	—			
1.15	15	37	100	FZ306A	380	D	120	A	12 (304.8) High	S	
	30	66		FZ306B			208	B			
	45	105		FZ306C			240	C			18 (457.2) High
	55	135	250	FZ306D			380	D			
	75	180		400			FZ306E	480	E		36 (914.4) High
	110	240					FZ306F	575	F		
	132	304	FZ306G				—	—			
1.15	20	37	100	FZ306A	480	E	120	A	12 (304.8) High	S	
	40	66		FZ306B			208	B			
	60	105		150			FZ306C	240			C
	75	135	FZ306D				380	D			
	125	180	400	FZ306E			480	E	36 (914.4) High		
	150	240		FZ306F			575	F			
	200	304		FZ306G			—	—			
1.15	30	37	100	FZ306A	575	F	120	A	12 (304.8) High	S	
	50	66		FZ306B			208	B			
	75	105		150			FZ306C	240			C
	100	135	FZ306D				380	D			
	150	180	250	FZ306E			480	E	36 (914.4) High		
	200	240		400			FZ306F	575			F
	250	304					FZ306G	—			—

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Table 14. Full Voltage Non-Reversing — Fusible ①

NEMA Size	Maximum Horsepower					Fuse Clip Amperes	Catalog Code	Service Voltage	Catalog Code	Control Voltage	Catalog Code	Space Options Inches (mm)	Catalog Code
	208V	240V	380V	480V	600V								
1	7.5	7.5	10	10	10	30	FZ204C	208 240 380 480 575	B C D E F	120 208 240 380 480 575	A B C D E F	6 (152.4) High 12 (304.8) High 18 (457.2) High	C ② S X
2	— 10	— 15	15 25	15 25	25 —	30 60	FZ204E FZ204F	208 240 380 480 575	B C D E F	120 208 240 380 480 575	A B C D E F	12 (304.8) High 18 (457.2) High	S X
3	— 25	20 30	30 50	40 50	50 —	60 100	FZ204H FZ204J	208 240 380 480 575	B C D E F	120 208 240 380 480 575	A B C D E F	24 (609.6) High	S
4	— 50	— 50	— 50	60 100	75 100	100 200	FZ204L FZ204M	208 240 380 480 575	B C D E F	120 208 240 380 480 575	A B C D E F	48 (1219.2) High	S
5	60 100	60 100	100 150	150 200	150 200	200 400	FZ204P FZ204R	208 240 380 480 575	B C D E F	120 208 240 380 480	A B C D E	60 (1524.0) High	S

① Fuse clip ratings shown are based on Class RK1, 5 fuses for all units except 6-inch (152.4 mm) units which use CC fuses.

② On 6-inch (152.4 mm) units, the only option available are (3) E22 pilot devices and separate source fuse or disconnect or CPT.

Table 15. Full Voltage Reversing — Fusible ③

NEMA Size	Maximum Horsepower					Fuse Clip Amperes	Catalog Code	Service Voltage	Catalog Code	Control Voltage	Catalog Code	Space Options Inches (mm)	Catalog Code
	208V	240V	380V	480V	600V								
1	7.5	7.5	10	10	10	30	FZ214C	208 240 380 480 575	B C D E F	120 208 240 380 480 575	A B C D E F	24 (609.6) High	S
2	— 10	— 15	15 25	15 25	25 —	30 60	FZ214E FZ214F	208 240 380 480 575	B C D E F	120 208 240 380 480 575	A B C D E F	24 (609.6) High	S
3	— 25	20 30	30 50	40 50	50 —	60 100	FZ214H FZ214J	208 240 380 480 575	B C D E F	120 208 240 380 480 575	A B C D E F	30 (762.0) High	S
4	— 50	— 50	— 60	60 100	75 100	100 200	FZ214L FZ214M	208 240 380 480 575	B C D E F	120 208 240 380 480 575	A B C D E F	54 (1371.6) High	S

③ Fuse clip ratings shown are based on Class RK1, 5 fuses for all units except 6-inch (152.4 mm) units which use CC fuses.

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Table 16. Full Voltage 2 Speed 1 Winding — Fusible — Constant/Variable Torque ①②

NEMA Size	Maximum Horsepower					Fuse Clip Amperes	Catalog Code	Service Voltage	Catalog Code	Control Voltage	Catalog Code	Space Options Inches (mm)	Catalog Code
	208V	240V	380V	480V	600V								
1	7.5	7.5	10	10	10	30	FZ944C	208 240 380 480 575	B C D E F	120 208 240 380 480 575	A B C D E F	24 (609.6) High	S
2	— 10	— 15	15 25	15 25	25 —	30 60	FZ944E FZ944F	208 240 380 480 575	B C D E F	120 208 240 380 480 575	A B C D E F	36 (914.4) High	S
3	— 25	20 30	30 50	40 50	50 —	60 100	FZ944H FZ944J	208 240 380 480 575	B C D E F	120 208 240 380 480 575	A B C D E F	36 (914.4) High	S
4	— 50	— 50	— 60	60 100	75 100	100 200	FZ944L FZ944M	208 240 380 480 575	B C D E F	120 208 240 380 480 575	A B C D E F	60 (1524.0) High	S

① Fuse clip ratings shown are based on Class RK1, 5 fuses for all units except 6-inch (152.4 mm) units which use CC fuses.

② For constant horsepower instead of constant/variable torque, see Option SV6 on Page 18.

Table 17. Full Voltage 2 Speed 2 Winding — Fusible — Constant/Variable Torque ③④

NEMA Size	Maximum Horsepower					Fuse Clip Amperes	Catalog Code	Service Voltage	Catalog Code	Control Voltage	Catalog Code	Space Options Inches (mm)	Catalog Code
	208V	240V	380V	480V	600V								
1	7.5	7.5	10	10	10	30	FZ954C	208 240 380 480 575	B C D E F	120 208 240 380 480 575	A B C D E F	24 (609.6) High	S
2	— 15	— 15	15 25	15 25	25 —	30 60	FZ954E FZ954F	208 240 380 480 575	B C D E F	120 208 240 380 480 575	A B C D E F	24 (609.6) High	S
3	— 25	20 30	30 50	40 50	50 —	60 100	FZ954H FZ954J	208 240 380 480 575	B C D E F	120 208 240 380 480 575	A B C D E F	36 (914.4) High	S
4	— 50	— 50	— 60	60 100	75 100	100 200	FZ954L FZ954M	208 240 380 480 575	B C D E F	120 208 240 380 480 575	A B C D E F	54 (1371.6) High	S

③ Fuse clip ratings shown are based on Class RK1, 5 fuses for all units except 6-inch (152.4 mm) units which use CC fuses.

④ For constant horsepower instead of constant/variable torque, see option SV6 on Page 18.

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Table 18. Reduced Voltage Autotransformer — Fusible ①

NEMA Size	Maximum Horsepower					Fuse Clip Amperes	Catalog Code	Service Voltage	Catalog Code	Control Voltage	Catalog Code	Space Options Inches (mm)	Catalog Code
	208V	240V	380V	480V	600V								
2	—	—	15	15	25	30 60	FZ604E FZ604F	208 240 380 480 575	B C D E F	120 208 240 380 480 575	A B C D E F	36 (914.4) High	S
	10	15	25	25	—								
3	—	20	30	40	50	60 100	FZ604H FZ604J	208 240 380 480 575	B C D E F	120 208 240 380 480 575	A B C D E F	54 (1371.6) High	S
	25	30	50	50	—								
4	—	—	—	60	75	100 200	FZ604L FZ604M	208 240 380 480 575	B C D E F	120 208 240 380 480 575	A B C D E F	72 (1828.8) High	S ②
	50	50	60	100	100								

① Fuse clip ratings shown are based on Class RK1, 5 fuses for all units except 6-inch (152.4 mm) units which use CC fuses.

② If existing MCC is back-to-back design, 36 inches (914.4 mm) in bottom rear is unusable.

Table 19. Reduced Voltage Part Winding — Fusible ③

NEMA Size	Maximum Horsepower					Fuse Clip Amperes	Catalog Code	Service Voltage	Catalog Code	Control Voltage	Catalog Code	Space Options Inches (mm)	Catalog Code
	208V	240V	380V	480V	600V								
1	10	10	15	15	15	60	FZ704C	208 240 380 480 575	B C D E F	120 208 240 380 480 575	A B C D E F	24 (609.6) High	S
	—	—	—	—	—								
2	—	15	25	30	40	60 100	FZ704E FZ704F	208 240 380 480 575	B C D E F	120 208 240 380 480 575	A B C D E F	24 (609.6) High	S
	20	25	40	40	—								
3	—	—	—	50	60	100 200	FZ704H FZ704J	208 240 380 480 575	B C D E F	120 208 240 380 480 575	A B C D E F	36 (914.4) High	S
	40	50	75	75	75								
4	50	—	100	100	150	200 400	FZ704L FZ704M	208 240 380 480 575	B C D E F	120 208 240 380 480 575	A B C D E F	54 (1371.6) High	S
	75	75	150	150	—								

③ Fuse clip ratings shown are based on Class RK1, 5 fuses for all units except 6-inch (152.4 mm) units which use CC fuses.

F2100 Replacement Starter Units

Table 20. Reduced Voltage Wye Delta Open Transition — Fusible ①

NEMA Size	Maximum Horsepower					Fuse Clip Amperes	Catalog Code	Service Voltage	Catalog Code	Control Voltage	Catalog Code	Space Options Inches (mm)	Catalog Code
	208V	240V	380V	480V	600V								
2	15	15	30	40	40	60	FZ804F	208	B C D E F	120	A B C D E F	30 (762.0) High	S
	20	25	40	—	—	100	FZ804G	240 380 480 575		208 240 380 480 575		36 (914.4) High	S
3	25	30	50	60	75	100	FZ804J	208	B C D E F	120	A B C D E F	36 (914.4) High	S
	40	50	75	75	—	200	FZ804K	240 380 480 575		208 240 380 480 575		48 (1219.2) High	S
4	50	60	100	125	150	200	FZ804M	208	B C D E F	120	A B C D E F	60 (1524.0) High	S
	60	75	150	150	—	400	FZ804N	240 380 480 575		208 240 380 480 575		72 (1828.8) High	S

① Fuse clip ratings shown are based on Class RK1, 5 fuses for all units except 6-inch (152.4 mm) units which use CC fuses.

Table 21. Reduced Voltage Wye Delta Closed Transition — Fusible (Non-Chiller Application) ②

NEMA Size	Maximum Horsepower					Fuse Clip Amperes	Catalog Code	Service Voltage	Catalog Code	Control Voltage	Catalog Code	Space Options Inches (mm)	Catalog Code
	208V	240V	380V	480V	600V								
2	15	15	30	40	40	60	FZ894F	208	B C D E F	120	A B C D E F	30 (762.0) High	S
	20	25	40	—	—	100	FZ894G	240 380 480 575		208 240 380 480 575		36 (914.4) High	S
3	25	30	50	60	75	100	FZ894J	208	B C D E F	120	A B C D E F	48 (1219.2) High	S
	40	50	75	75	—	200	FZ894K	240 380 480 575		208 240 380 480 575			
4	50	60	100	125	150	200	FZ894M	208	B C D E F	120	A B C D E F	60 (1524.0) High	S
	60	75	150	150	—	400	FZ894N	240 380 480 575		208 240 380 480 575		72 (1828.8) High	S

② Fuse clip ratings shown are based on Class RK1, 5 fuses for all units except 6-inch (152.4 mm) units which use CC fuses.

Table 22. Reduced Voltage Non-Reversing Vacuum Starters — Fusible ③

NEMA Size	Maximum Horsepower					Fuse Clip Amperes	Catalog Code	Service Voltage	Catalog Code	Control Voltage	Catalog Code	Space Options Inches (mm)	Catalog Code
	208V	240V	380V	480V	600V								
4	—	—	—	60	75	100	FZV04L	208	B C D E F	120	A B C D E F	36 (914.4) High	S
	50	50	60	100	100	200	FZV04M	240 380 480 575		208 240 380 480 575			
5	60	60	100	150	150	200	FZV04P	208	B C D E F	120	A B C D E F	36 (914.4) High	S
	100	100	150	200	200	400	FZV04R	240 380 480 575		208 240 380 480 575		48 (1219.2) High	S

③ Fuse clip ratings shown are based on Class RK1, 5 fuses for all units except 6-inch (152.4 mm) units which use CC fuses.

F2100 Unit Options

Table 23. Option Groups ①

Groups	Description	Page Number
B	Circuit Breaker Options	16
C	Control Power Source Options	16
G	Ground Fault Protection Options	16
M	Metering Options	16
O	Overload Options	16
P	Pilot Device Options	17
R	Relay and Timer (Control, Voltage, Current) Options	17
S	Starter Contact Options	18
SV	Vacuum Starter Options	18
T	Terminal Block Options	18
U	Unit Wiring Options	18

① Select your option suffix and attach it to the end of the catalog number.

Table 24. Option Suffix

Suffix	Description	Space Required ②
B — Breaker Options		
B10	Shunt Trip 120V AC Wired to Terminal Blocks for Remote Tripping	C
B11	Auxiliary Switch Form C (1NO/1NC) Wired to Terminal Blocks	C
B12	Form C Bell Alarm Contact (1NO/1NC) Wired to Terminal Blocks	C
B13	Undervoltage Release	C
B14	IQ Energy Sentinel — F Frame	③
B15	IQ Energy Sentinel — J Frame	③
B16	IQ Energy Sentinel — K Frame	③
B17	IQ Central Energy Display	③
B18	Thermal Magnetic Circuit Breaker Instead of HMCP	—
C — Control Power Source Options		
C10	Control Fuse Wired for Separate Source in Lieu of Control Power Transformer	C
C11	Control Fuse with Disconnect for Separate Source in Lieu of Control Power Transformer	C
C12	Control Power Transformer 100 VA for Size 1 and 2 Starters (Fused)	C ④
C13	Control Power Transformer 150 VA for Size 3 and 4 Starters (Fused)	C
C14	Control Power Transformer 100 VA with Interposing Relay for Size 5 Starters, Fused	C
C15	Extra 50 VA for Control Power Transformer	S
C16	Extra 100 VA for Control Power Transformer	S
C17	Service Voltage Control, Fused in Lieu of Control Power Transformer	C
C18	Full Capacity Control Power Transformer for Size 5 Starters, Fused	C
G — Ground Fault Protection Options		
G10	Class 1 Ground Fault Protection — GRT1 Size 1 – 4	X
G11	Class 1 Ground Protection — GRT1 Size 5 – 6	X
G12	Ground Fault Test Panel	X
M — Metering Options		
M10	Mini Voltmeter	C ④
M11	Mini Ammeter with Current Transformer	S
M12	Mini Elapsed Time Meter	C ④
M13	Current Transformer for Remote Metering	S
M14	Current Transducer 4-20 mA Output	X
O — Overload Options		
O10	IQ 500 Solid-State Overload Relay	—
O11	IQ 500 Load Protection Module	—
O16	Bell Alarm (1NO) Wired	C
O17	Bi-Metallic Overload Substitution	C
O18	Adjustable A200 Overload Substitution	C
O19	Overload Relay Heater/Heater Pack	C
O20	CEP7 Solid-State Overload Relay	C

② Minimum unit size required (refer to Replacement Unit pages).

③ Consult factory for spacing.

④ Not available in 6 inches (152.4 mm).

F2100 Unit Options

Table 24. Option Suffix (Continued)

Suffix	Description	Space Required ^①
P — Pilot Device Options ^②		
P10	Red "RUN" Light	C
P11	Green "STOPPED" Light	C
P12	Amber "OVERLOAD TRIPPED" Light	C
P13	Green "RUN" Light	C
P14	Red "STOPPED" Light	C
P15	Red "RUN" Push-to-Test Light	C
P16	Green "STOPPED" Push-to-Test Light	C
P17	Amber "OVERLOAD TRIPPED" Push-to-Test Light	C
P18	Green "RUN" Push-to-Test Light	C
P19	Red "STOPPED" Push-to-Test Light	C
P20	Special Function Light	C
P30	"START" Pushbutton	C
P31	"STOP" Pushbutton	C
P32	"START/STOP" Pushbutton	C
P33	"ON" Pushbutton	C
P34	"OFF" Pushbutton	C
P35	"ON/OFF" Pushbutton	C
P36	"FORWARD/REVERSE/STOP" Pushbutton	C
P37	"FAST/SLOW/STOP" Pushbutton	C
P38	"FAST/OFF/SLOW" Pushbutton	C
P39	"HIGH/LOW/STOP" Pushbutton	C
P40	"HIGH/LOW/OFF" Pushbutton	C
P41	Special Function Pushbutton	C
P50	"ON-OFF" Selector Switch	C
P51	"HIGH-LOW" Selector Switch	C
P52	"OFF-AUTO" Selector Switch	C
P53	"START-STOP" Selector Switch	C
P54	"SLOW-FAST" Selector Switch	C
P55	"FORWARD-REVERSE" Selector Switch	C
P56	Special Function 2-Position Selector Switch	C
P57	"HAND-OFF-AUTO" Selector Switch	C
P58	"LOCAL-OFF-REMOTE" Selector Switch	C
P59	"FAST-OFF-SLOW" Selector Switch	C
P60	"HIGH-OFF-LOW" Selector Switch	C
P61	Special Function 3-Position Selector Switch	C
P62	"HIGH-LOW-OFF-AUTO" Selector Switch	C
P63	Special Function 4-Position Selector Switch	C
R — Relay and Timer Options		
R10	Auxiliary Control Relay 2-Pole (1NO/1NC) Convertible Contacts Wired in Parallel with Starter Coil	S
R11	Auxiliary Control Relay 4-Pole (2NO/2NC) Convertible Contacts Wired in Parallel with Starter Coil	S
R12	Auxiliary Control Relay 2-Pole Overload Alarm (1NO/1NC) Convertible Contacts	S
R13	Mechanical Latching Relay (Specify Connection)	X
R14	Ice Cube Relay 300 Volts 3-Pole Blade Type (Specify Connection)	S
R15	Phase Voltage Relay	X
R16	Current Sensing Relay with Contacts Wired to Terminal Blocks	X
R17	Deceleration Timing Relay (Pneumatic "OFF" Delay)	S
R18	Compelling Timing Relay (Pneumatic "ON" Delay)	S
R19	Time Clock 24 Hour	③
R20	Time Clock 7 Day	③
R21	Solid-State Timer Type TR (Specify Connection)	S
R22	DN65 DeviceNet Interface Module	S
R23	D15 2-Pole Control Relay	C
R24	D15 4-Pole Control Relay	C

① Minimum unit size required (refer to Replacement Unit pages).

② Available only with F2100, Advantage, Series 2100/5 Star, Freedom Unitrol, F10 Unitrol and Type W. Consult factory for specific size limitations.

③ Consult factory for spacing.

F2100 Unit Options

Table 24. Option Suffix (Continued)

Suffix	Description	Space Required ^①						
S — Starter Contact Options (Maximum of 8 Contacts)								
S__	To order extra starter contacts, you must specify the number of NO/NC contacts, given a maximum of eight (8). To define the unit option required, create a suffix based on the following example:							
	<table border="1"> <tr> <td></td> <td>Quantity of Normally Open Contacts</td> <td>Quantity of Normally Closed Contacts</td> </tr> <tr> <td>S</td> <td>2</td> <td>3</td> </tr> </table>		Quantity of Normally Open Contacts	Quantity of Normally Closed Contacts	S	2	3	
	Quantity of Normally Open Contacts	Quantity of Normally Closed Contacts						
S	2	3						
SV — Vacuum Starter Options								
SV4	Vacuum Starter Size 4 Substitution FVNR	②						
SV5	Vacuum Starter Size 5 Substitution FVNR	②						
SV6	Constant Horsepower Instead of Constant/Variable Torque	—						
T — Terminal Block Options								
T10	Pull-apart Type Terminal Blocks (Standard on all Vintages Except TYPE W and 11-300)	S						
T11	Utility Screw Type Terminal Blocks (Add 6 Inches (152.4 mm) for Every 18 Points)	—						
T12	Front-mounted Pull-apart Terminal Block for F2100, Advantage, Series 2100/5 Star	S						
T13	T-Lead Power Terminal Blocks for Size 1 Starter	—						
U — Unit Wiring Options								
U10	Surge Suppressor on Coil	C						
U11	Type SIS Control Wire	C						
U12	Type SIS Power Wire	C						
U13	Type 14 Gauge Control Wire (Standard for all Vintages Except F2100, Series 2100/5 Star, Type W and 11-300)	C						
U14	Wiremarkers — Sleeve Type on all Control Wire	C						
U15	Locking Fork Terminals on all Control Wiring	S						
U16	Ring Wire Terminals on Power Wiring	S						
U17	Wiring Diagram Inside Starter Unit Door	C						
U18	Pre-insulated Ring Terminals on all Control Wiring	C						
U19	Pre-insulated Ring Terminals on all Control Wiring, except for Freedom Starter Terminals	C						
U20	Wiremarkers for Power Wiring	C						

① Minimum unit size required (refer to Replacement Unit pages).

② Consult factory for spacing.

F2100 Structure Parts

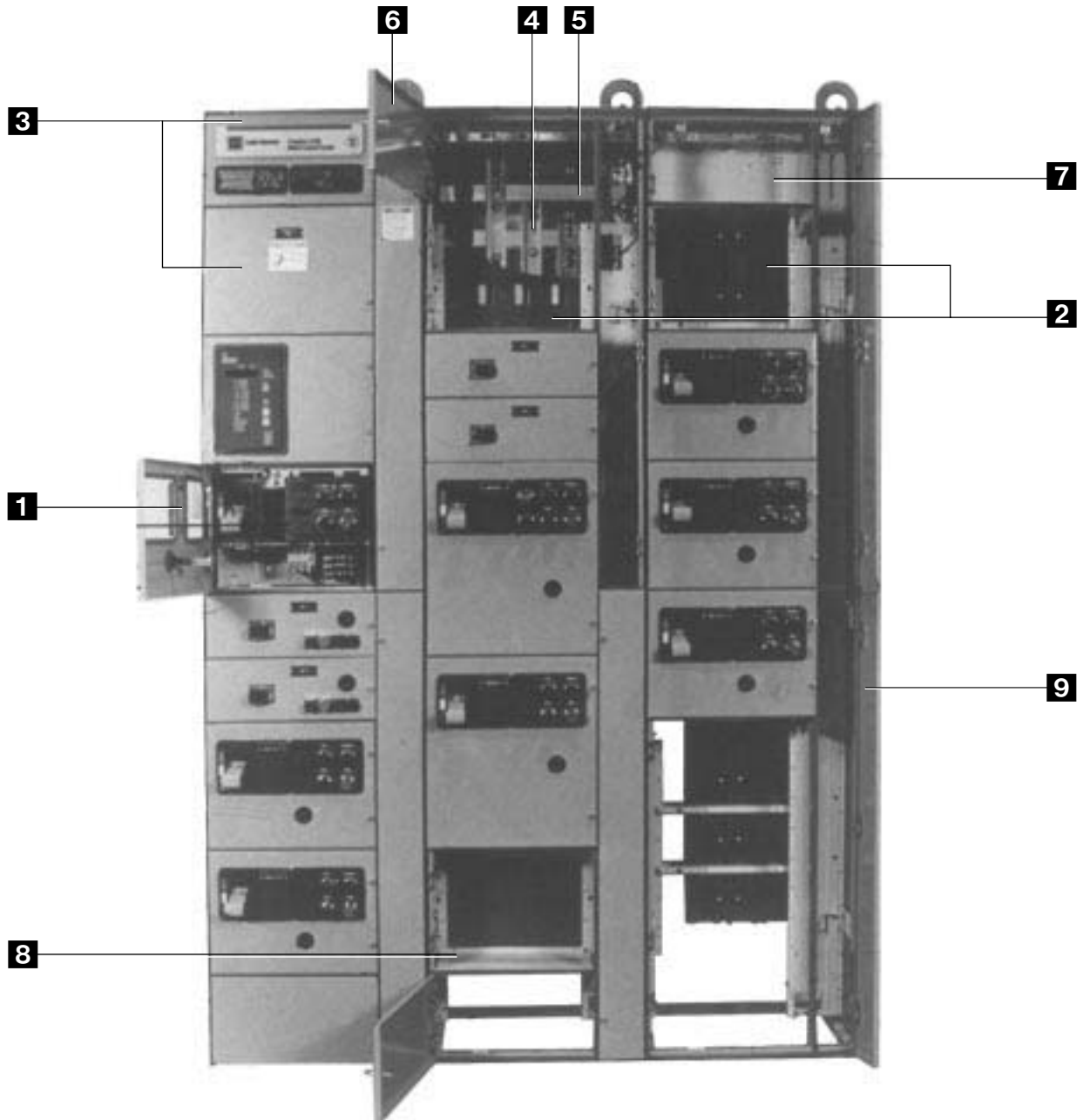


Table 25. Structure Parts

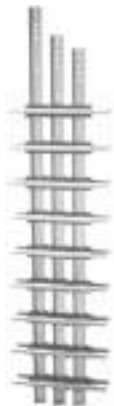
Reference	Description	Page
1	Blank Unit Door	20
2	Shutter Kit	20
3	Sheet Metal Covers Touch-up Paint Kit	20 20
4	Vertical Bus Bar Vertical Bus Barrier Kits Vertical Bus Insulation Kit	20 20 20
5	Horizontal Bus Bar	21

Reference	Description	Page
6	Horizontal Wireway Door	21
7	Horizontal Bus Barriers	21
8	Divider Pan/Guide Rails	21
9	Vertical Wireway Door Horizontal to Vertical Bus Connection Kit Horizontal Bus Insulator Kit Horizontal Bus Splice Kit Door Mounting Hardware Kit	21 22 22 22 22

F2100 Structure Parts

Vertical Bus Bar 4

65,000 ampere rms bus bracing.

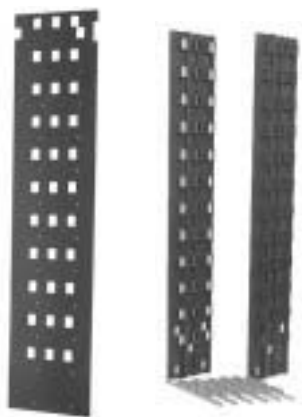


Vertical Bus Bar

Table 26. Vertical Bus Bar — Copper Only

Ampere Rating	Mounting Type	Style Number
300	Front	4719A80G01
600	Front/Back-to-Back	4719A80G02
800	Front	4719A80G04
1200	Front	4719A80G05

Vertical Bus Barrier Kits 4



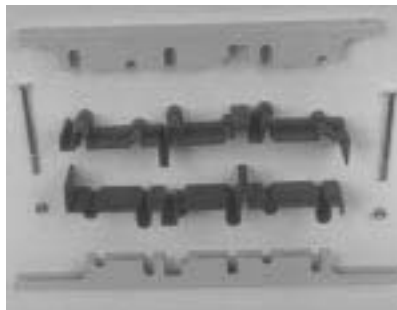
Standard Flat Barrier

Labyrinth Barrier

Table 27. Vertical Bus Barrier Kits

Description	Style Number
Standard flat barrier kit includes one flat barrier, 12 covers and clips.	4719A91G13
Labyrinth barrier kit includes front and rear barrier, bus supports and hardware (does not include shutters).	4719A91G14

Vertical Bus Insulation Kit 4



Vertical Bus Insulation Kit

Table 28. Vertical Bus Insulation Kit

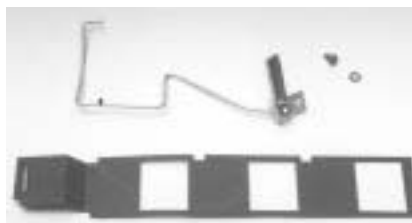
Description	Style Number
Kit includes 2 insulators, 2 mounting brackets and mounting hardware.	4719A91G12

Sheet Metal Covers with Mounting Hardware 3

Table 29. Sheet Metal Covers with Mounting Hardware

Description	Style Number
Side Sheets	
16-Inches (406.4 mm) Deep, Front Mounted	4719A91G31
21-Inches (533.4 mm) Deep, Front Mounted	4719A91G32
21-Inches (533.4 mm) Deep, Back-to-Back Mounted	4719A91G33
Rear Sheets	
20-Inches (508.0 mm) Wide x 90-Inches (2286.0 mm) High	4719A91G34
24-Inches (609.6 mm) Wide x 90-Inches (2286.0 mm) High	4719A91G35
Top Sheets	
20-Inches (508.0 mm) Wide x 16-Inches (406.4 mm) Front Mounted	4719A91G36
20-Inches (508.0 mm) Wide x 21-Inches (533.4 mm) Front Mounted	4719A91G37
20-Inches (508.0 mm) Wide x 21-Inches (533.4 mm) Back-to-Back Mounted	4719A91G38
24-Inches (609.6 mm) Wide x 16-Inches (406.4 mm) Front Mounted	4719A91G39
24-Inches (609.6 mm) Wide x 21-Inches (533.4 mm) Front Mounted	4719A91G40

Shutter Kit 2



Shutter Kit

Table 30. Shutter Kit

Description	Style Number
Kit includes shutter, spring loaded coupler and mounting screws.	4719A91G15

Blank Unit Door with Mounting Hardware 1

Table 31. Blank Unit Door with Mounting Hardware

Description	Style Number
6-Inches (152.4 mm) High x 15-1/2 Inches (393.7 mm) Wide	4719A91G20
12-Inches (304.8 mm) High x 15-1/2 Inches (393.7 mm) Wide	4719A91G21
18-Inches (457.2 mm) High x 15-1/2 Inches (393.7 mm) Wide	4719A91G22
24-Inches (609.6 mm) High x 15-1/2 Inches (393.7 mm) Wide	4719A91G23
30-Inches (762.0 mm) High x 15-1/2 Inches (393.7 mm) Wide	4719A91G24
36-Inches (914.4 mm) High x 15-1/2 Inches (393.7 mm) Wide	4719A91G25

Touch-up Paint Kit 3

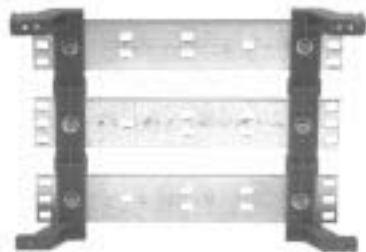
Table 32. Touch-up Paint Kit

Description	Style Number
Kit includes three spray cans of ANSI-61 Gray.	4719A91G10

F2100 Structure Parts

Horizontal Bus Bar 

65,000 ampere rms Bus Bracing.



Horizontal Bus Bar

Table 33. Horizontal Bus Bar — Tin-Plated Copper

Structures		Bar Size Inches (mm)	Bars/ Phase	Ampere Rating		Style Number
Number	Width Inches (mm)			UL (50°C)	NEMA (65°C)	
1	20 (508.0)	1/4 x 2 (6.4 x 50.8)	1	600	600	4719A97G28 4719A97G29 4719A97G30
2	40 (1016.0)					
3	60 (1524.0)					
1	20 (508.0)	1/4 x 2 (6.4 x 50.8)	1	—	800	4719A97G31 4719A97G32 4719A97G33
2	40 (1016.0)					
3	60 (1524.0)					
1	20 (508.0)	1/4 x 3 (6.4 x 76.2)	1	—	1000	4719A97G34 4719A97G35 4719A97G36
2	40 (1016.0)					
3	60 (1524.0)					
1	20 (508.0)	1/4 x 3 (6.4 x 76.2)	2	—	1200	4719A97G37 4719A97G38 4719A97G39
2	40 (1016.0)					
3	60 (1524.0)					
1	20 (508.0)	1/4 x 3 (6.4 x 76.2)	1	800	—	4719A97G40 4719A97G41 4719A97G42
2	40 (1016.0)					
3	60 (1524.0)					
1	20 (508.0)	1/4 x 2-1/2 (6.4 x 63.5)	2	1200	—	4719A97G43 4719A97G44 4719A97G45
2	40 (1016.0)					
3	60 (1524.0)					

Horizontal Wireway Door Kit 



Horizontal Wireway Door kit

Table 34. Horizontal Wireway Door Kit

Description Inches (mm)	Style Number
9 (228.6) High x 15-1/2 (393.7) Wide (Standard Kit of 2)	4719A91G18
(1) 15 (381.0) High x 15-1/2 (393.7) Wide, (1) 3 (76.2) High	4719A91G19

Horizontal Bus Barrier Kit 



Horizontal Bus Barrier Kit

Table 35. Horizontal Bus Barrier Kit

Description Inches (mm)	Style Number
9 (228.6) High, Front Mounted	4719A91G02
15 (381.0) High, Front Mounted	4719A91G03
15 (381.0) High, Rear Mounted	4719A91G04

Kit includes divider pan, horizontal and vertical barriers, junction piece, and mounting hardware.

Divider Pan/Guide Rails with Mounting Hardware 



Divider Pan/Guide Rails with Mounting Hardware

Table 36. Divider Pan/Guide Rails with Mounting Hardware

Description	Style Number
Divider Pan/Guide Rails with mounting hardware.	4719A91G05

Vertical Wireway Door Kit 



Vertical Wireway Door Kit

Table 37. Vertical Wireway Door Kit

Description Inches (mm)	Style Number
Kit includes 4 x 45 (101.6 x 1143.0) door, hinges, hinge pins and mounting hardware.	4719A91G17

F2100 Structure Parts

Horizontal to Vertical Bus Connection Kit



Horizontal to Vertical Bus Connection Kit

Table 38. Horizontal to Vertical Bus Connection Kit

Description	Horizontal Bus		Vertical Bus		Style Number
	Ampere Rating	Bars/Phase	Ampere Rating	Material	
Kit includes bus spacers with mounting hardware.	600	1	300	Cu	4719A97G64
			600	Cu	4719A97G65
	800	2	300	Cu	4719A97G72
			600	Cu	4719A97G73
			800	Cu	4719A97G74
	1200	3	300	Cu	4719A97G80
			600	Cu	4719A97G81
			800	Cu	4719A97G82
			1200	Cu	4719A97G84

Horizontal Bus Splice Kit

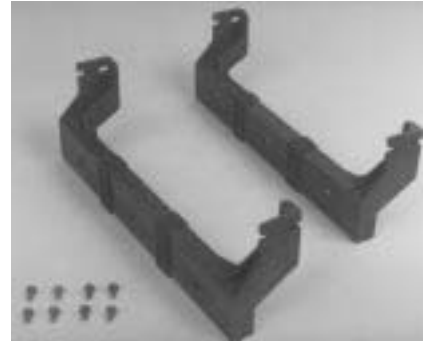


Horizontal Bus Splice Kit

Table 39. Horizontal Bus Splice Kit — Tin-Plated Copper

Description	Bus Ampere Rating		Bus Size Inches (mm)	Bars/Phase	Style Number
	UL (50°C)	NEMA (65°C)			
Kit includes bus splice plates with mounting hardware.	600	600	2 (50.8)	1	4719A97G86
	—	800	2 (50.8)	1	4719A97G87
	800	—	3 (76.2)	1	4719A97G88
	—	1000	3 (76.2)	1	4719A97G89
	1000	1200	3 (76.2)	2	4719A97G90
	1200	—	2-1/2 (63.5)	2	4719A97G91

Horizontal Bus Insulator Kit



Horizontal Bus Insulator Kit

Table 40. Horizontal Bus Insulator Kit

Description	Style Number
Kit includes 2 insulators with mounting hardware.	4719A91G11

Door Mounting Hardware Kit



Door Mounting Hardware Kit

Table 41. Door Mounting Hardware Kit

Description	Style Number
Kit includes 2 hinges, hinge pins and (2) 1/4 turn latches.	4719A91G26

F2100 Unit Parts

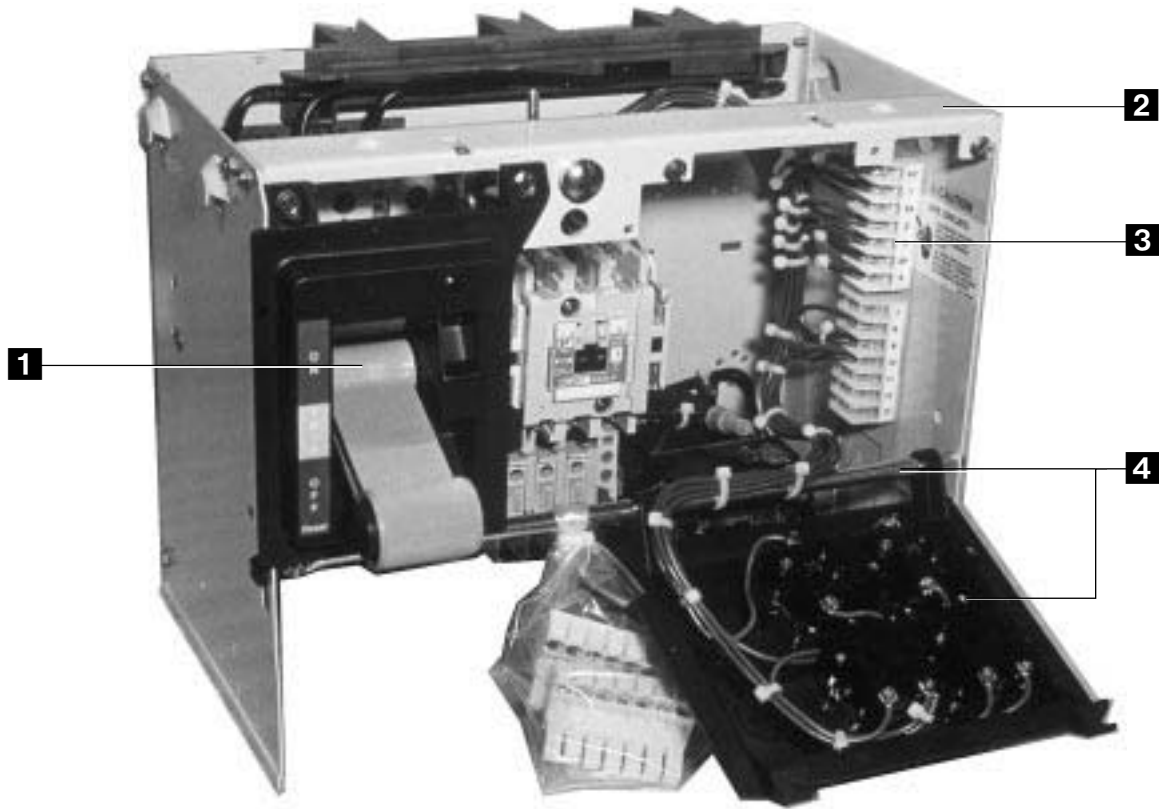


Table 42. Unit Parts

Reference	Description	Page
1	Operating Handle Mechanism Overload Reset Button and Reset Rod Ext. Kit	23 23
2	Unit Drawout Top Rail	24
3	Terminal Blocks	24

Reference	Description	Page
4	Control Transformers Primary/Secondary Fuse Holder Kit Device Panel/Pivot Tube	24 24 24

Operating Handle Mechanism Kit 1

Kit includes operating arm, adjustable linkage, and mounting hardware.

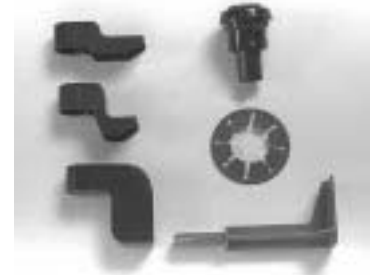


Operating Handle Mechanism Kit

Table 43. Operating Handle Mechanism Kit

Description	Style Number
Circuit Breaker Units	
FB/MCP	4719A92G43
KB	4719A92G05
HFD/HMCP	4719A88G01
HMCPE	4700A99G69
HLD	4700A99G65
HJD/HKD	4719A89G01
LB	4719A92G06
MA/MC	4719A92G07
NB	4719A92G08
FCL	4719A92G44
LCL	4719A92G45
HFD/HMCP (6-Inch Unit)	4719A92G56
Fusible Switch Units	
30/60/100A K Switch	5A10098G01
200A K Switch	5A10098G03
400A K Switch	5A10098G05

Overload Reset Button and Reset Rod Extension Kit 1



Overload Reset Button and Reset Rod Extension Kit

Table 44. Overload Reset Button and Reset Rod Extension Kit

Description	Style Number
For Freedom starters, the kit includes reset button, retainer, and adapter.	4719A92G58

F2100 Unit Parts

Unit Drawout Top Rail



Unit Drawout Top Rail

Table 45. Unit Drawout Top Rail

Description	Style Number
Unit Top Rail with Hardware	4719A92G02

Terminal Blocks

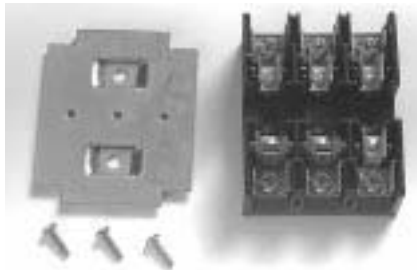


Terminal Blocks

Table 46. Terminal Blocks

Description	Style Number
White, 7 Circuit, Pull-apart	4719A92G57

Primary/Secondary Fuse Holder Kit



Primary/Secondary Fuse Holder Kit

Table 47. Primary/Secondary Fuse Holder Kit

Description	Style Number
Kit includes fuse block, mounting bracket and screws.	4719A92G59

Control Transformers (480/240V to 120V Single-Phase)

Table 48. Control Transformers (480/240V to 120V Single-Phase)

Description	Style Number
50 VA	4719A92G46
100 VA	4719A92G48
150 VA	4719A92G49
200 VA	4719A92G50
250 VA	4719A92G51
300 VA	4719A92G52
350 VA	4719A92G53
500 VA	4719A92G54

Device Panel/Pivot Tube with Mounting Hardware



Device Panel/Pivot Tube with Mounting Hardware

Table 49. Device Panel/Pivot Tube with Mounting Hardware

Description	Style Number
Device panel/pivot tube with mounting hardware.	4719A92G03

K-SW Clip Change-Over Information

Fuse Clip Kits are the parts you will need to order to change out the fuse clips on an order.

The kits include clip and hardware for the switch and fuse block. Refer to Vista for pricing.

Table 50. Fuse Clip Kits

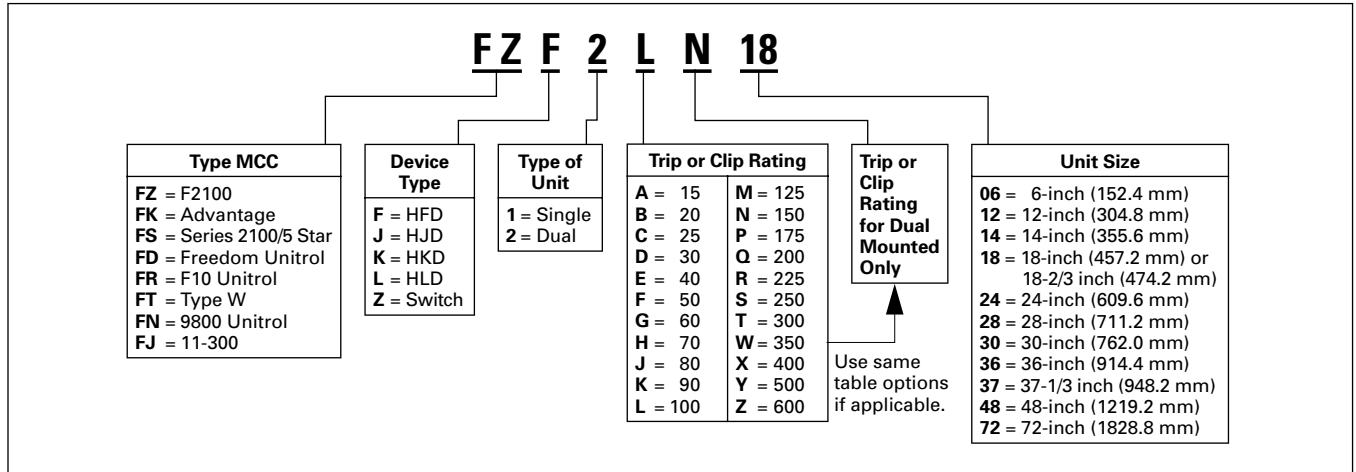
Need	Order Kit Number
30 Ampere 600V/R	
30A 250V/R	C351KC21R
30A 600V/J	C351KD71
30A 600V/R	C351KD22-61R
30A Form II	C351KD81
60 Ampere 600V/R	
60A 250V/R	C351KD22-61R
60A 600V/J	C351KD72
60A 600V/R	C351KD62R
60A Form II	C351KD82
100 Ampere 600V/R	
100A 250V/R	C351KE23-63
100A 600V/J	C351KE73
100A 600V/R	C351KE23-63
100A Form II	C351KE83
200 Ampere 600V/R	
200A 250V/R	C351KF24-64
200A 600V/J	C351KF74
200A 600V/R	C351KF24-64
200A Form II	C351KF84

How to Create a Catalog Number

After selecting the circuit device required, create a Dual Mounted feeder unit catalog number based on the following:

Note: Catalog number varies in length based on single or dual mounted unit.

Table 51. Catalog Numbering System Example



NEMA is the registered trademark and service mark of the National Electrical Manufacturers Association. UL is a registered trademark of Underwriters Laboratories Inc.

Replacement Feeder Units

Product Description

Each Feeder Unit consists of a single mounted 3-pole molded case circuit breaker or fusible switch (dual mounted are also available). Each unit includes a new wrapper, stab assembly, door, handle mechanism and customer specific disconnect device. They are shipped assembled and ready to install into the existing motor control center.

The following are simple steps to select and order a new feeder unit:

Step 1

Select the circuit device required from **Table 52** below.

Step 2

Verify the amount of space available.

Step 3

Create a catalog number using **Table 51** on **Page 25**.

Unit options and modifications for replacement feeder units:

For factory installed molded case circuit breaker modifications or additional unit options, contact the factory for prices and availability.

Table 52. Electrical Characteristics and Space Requirements of Molded Case Circuit Breaker and Fusible Switch Replacement Feeder Units — Inches (mm)

Device Type	Maximum Amperes	Interrupting Rating (kAIC)			Trip Rating or Clip	Freedom 2100 Series 2100/5 Star Advantage		Freedom Unitrol		F10		Type W		9800		11-300				
		240V	480V	600V		Single	Dual	Single	Dual ^①	Single	Dual ^①	Single	Dual	Single	Dual ^①	Single	Dual			
HFD	150	100	65	25	15															
					20															
					25															
					30															
					40															
					50															
					60															
					70															
					80	6 ^② (152.4)		6 ^② (152.4)						9 (228.6)						
					90	12 ^③ (304.8)	12 (304.8)	12 (304.8)	12 (304.8)	12 ^③ (304.8)	12 (304.8)	12 ^③ (304.8)	12 (304.8)	14 (355.6)	14 (355.6)	14 (355.6)	14 (355.6)			
					100															
					125	12 (304.8)	12 (304.8)	12 (304.8)	18 (457.2)	12 (304.8)	18 (457.2)	12 (304.8)	12 (304.8)	14 (355.6)	18 (457.2)	14 (355.6)	14 (355.6)			
					150	12 ^③ (304.8)						12 ^③ (304.8)		9 (228.6)						
HJD	250	100	65	25	175															
					200															
					225	18 (457.2)		24 (609.6)		18 (457.2)		18 (457.2)		18 (457.2)		14 (355.6)				
				250																
HKD	400	100	65	35	300															
					350															
					400	24 (609.6)		24 ^④ (609.6)		24 ^④ (609.6)		24 (609.6)		28 ^④ (711.2)		14 (355.6)				
HLD	600	100	65	35	500															
					600	24 (609.6)		24 ^④ (609.6)		24 ^④ (609.6)										
Fusible Switch	30	100	100	100	30	12 (304.8)	12 ^③ (304.8)	12 (304.8)	18 (457.2)	12 (304.8)	18 (457.2)	12 (304.8)	12 ^③ (304.8)	14 (355.6)	18 (457.2)	14 (355.6)	14 (355.6)			
	60	100	100	100	60	12 (304.8)	12 ^③ (304.8)	12 (304.8)	18 (457.2)	18 (457.2)	18 (457.2)	12 (304.8)	12 ^③ (304.8)	14 (355.6)	18 (457.2)	14 (355.6)	14 (355.6)			
	100	100	100	100	100	18 (457.2)		18 (457.2)		18 (457.2)		12 ^③ (304.8)		18 (457.2)		18 (457.2)	18-2/3 (474.2)			
	200	100	100	100	200	36 (914.4)		30 (762.0)		30 (762.0)		24 (609.6)		28 (711.2)		28 (711.2)				
	400	100	100	100	400	36 (914.4)		72 ^④ (1828.8)		48 ^④ (1219.2)		42 (1066.8)		42 ^④ (1066.8)		42 (1066.8)				
	600	100	100	100	600	48 (1219.2)		72 (1828.8)												

① Combined ampacity no greater than 150A for 12-inch (304.8 mm) height. For greater than 150A, 18-inch (457.2 mm) required.

② 100A maximum.

③ Available in 18-inch (457.2 mm) height.

④ Cable in/cable out, no stab assembly.

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Eaton Corporation
Cutler-Hammer business unit
1000 Cherrington Parkway
Moon Township, PA 15108-4312
USA
tel: 1-800-525-2000
www.cutler-hammer.eaton.com





Preventative Maintenance

Low Voltage Motor Control Center Inspection and Maintenance Schedule Template



Applicable instruction manual(s) should be read in entirety before performing maintenance and/or inspections on any equipment. Please follow any safety precautions outlined in these manuals.



When inspecting, repairing, and performing maintenance on motor control center, the fact that dangerous voltages may exist must be kept in mind. Precautions must be taken to insure that personnel do not come in contact with energized parts.



FAILURE TO DO SO COULD RESULT IN DEATH, PERSONAL INJURY, OR PROPERTY DAMAGE



Maintenance of control components requires that all power to these components be turned OFF by opening the branch circuit disconnect means and withdrawing the unit to the detent position or removing the unit entirely from the MCC. When units are fully inserted into the MCC, the line side of each disconnect is energized. Do not work on fixed units unless the main disconnect for the MCC is off.

This electrical control equipment is designed to be installed, operated, and maintained by adequately trained workmen. These instructions do not cover all details, variations, or combinations of the equipment, its storage, delivery, and installation, check-out, safe operation, or maintenance. Care must be exercised to comply with local, state, and national regulations, as well as safety practices, for this class of equipment. The maximum short circuit capability of the equipment should not be exceeded by connection to a source with higher capacity. If maintenance

or troubleshooting assistance is required, contact your nearest Eaton Sales office.

Frequency of Inspection and Maintenance

Preventative maintenance should be a program, a scheduled periodic action that begins with the installation of the equipment. At that time, specific manufacturer's instruction literature should be consulted, then stored for future reference. Follow-up maintenance should be at regular intervals, as frequently as the severity of duty justifies. Time interval of one week, or one month, or one year may be appropriate, depending on the duty. It is also desirable to establish specific check lists for each control, as well as logbook to record the history of incidents. A supply of renewal parts should be obtained and stored.

Qualified Personnel

For the purpose of inspecting and maintaining equipment, a qualified person must be trained in regard to the hazards inherent to working with electricity and the proper way to perform such work. Such an individual should be able to de-energize, clear and tag circuits in accordance with established safety practices. In addition, these individuals should have access to and be trained in the use of protective equipment, such as rubber gloves and flash clothes.



Low Voltage Motor Control Centers Inspection and Maintenance Schedule Template

Component Description	Sub-Component Description	Inspection & Maintenance Action	Corrective Action	Frequency	Special Inst / Remarks
Low Voltage MCC	Low Voltage MCC Assembly	Inspect Cable & Wire Connections	Tighten all Electrical connections.	Annually	Determine the cause of loose joint and correct.
Low Voltage MCC	Starters/ Contactors	Inspect Insulation and joints.	Mechanically clean to a bright finish or replace those terminations that have become discolored.	Annually	Look for signs of overheated joints, charred insulation, discolored terminals. Do Not use emery paper.
Low Voltage MCC	Interior Wiring	Inspect Component Wiring	Any temporary wiring should be removed or permanently secured and diagrams marked accordingly.	Annually	Wires and cables should be examined to eliminate any chafing against metal edges caused by vibration.
Low Voltage MCC	Cover Control/Unit Doors	Inspect Exterior	Repair if required.	Annually	Check all indicating lamps, mechanical flags, doors, latches and similar auxiliaries.
Low Voltage MCC	Starters/ Contactors	Inspect contact surfaces	Repair or replace as necessary.	Annually	Consult Instruction Leaflet 04306001E for over travel measurement instructions.
Low Voltage MCC	Low Voltage MCC Assembly	Visual inspections	Vacuum or wipe clean all exposed surfaces of the control component and the inside of its enclosure. Equipment may be blown clean with compressed air that is dry and free from oil.	Annually	Soot, smoke, or stained areas (other than inside arc chutes), or other unusual deposits, should be investigated and the source determined before cleaning is undertaken. It is essential that the foreign debris be removed from the control center, not merely rearranged. Control equipment should be clean and dry.
Low Voltage MCC	Breakers	Inspect Breakers	Exercise the breaker operating mechanism making sure it is opening and closing. A breaker showing signs of any one of these issues should be replaced. NEMA publication AB-4 for breaker maintenance.	Annually	Visually inspect circuit breakers for signs of discoloration, cracking, scorching, overheating or broken parts.



Low Voltage Motor Control Center

Lubrication Schedule

Component Description	Sub-Component Description	Inspection & Maintenance Action	Corrective Action	Frequency	Special Inst / Remarks
Motor Control Center	Motor Control Center	Lubrication	Assembly is designed so that lubrication is not required under normal conditions		



Parts List

General order: LPO0007343 Item: 001

Loc	Part number	Qty	Description
1	112B506H04	1	Document pocket 21W enclosure
1	1162D24G10	1	Bottom plate 21D enclosure
1	1162D89G02	1	Vertical/Horizontal Bus Barrier Subassembly
1	1491C01H03	1	Master Nameplate 2.7" x 6.75"
1	1491C79H03	1	Overload heater chart, Freedom series
1	30-42893-1	1	GO/Short Ckt Nameplate 2.7" x 6.75"
1	414A050H07	1	Screw lug #6-350MCM
1	414A050H10	1	Screw lug #6-350MCM for use on Ground Bus
1	4701A01G02	1	Enclosure 20.00W 21D 4VWW 9/9HWW
1	4702A26G07	1	Horizontal bus 600A Tin 20.00W 65K 65 degree C
1	4702A31G67	1	Ground bus 300A copper Tin plated 20.00W
1	4702A60G47	1	Dog bone 600 horizontal 1 bars/phase to 600A CUTN vertical
1	4702A89G17	1	Vertical bus 600A CUTN 65K Labyrinth, Isolated/Insulated with shutters
1	4711A14G02	-1	Deleted 9" horizontal wireway for 20.00W 4VWW enclosure
1	4711A14G04	1	9" Emblem door for 20.00W 4VWW enclosure
1	5676B77G01	1	Freedom emblem
1	5A11244G04	1	Seismic End cover assy 90H 21D
1	5A11324G09	1	Neutral bus 300A 20.00W copper Tin plated 65 degree C
1 C	1161D36H01	-1	Standard Divider Pan From Enclosure Assembly
1 C	3A73700G29	1	Unit assembly Main lugs
1 C	4714A26H22	1	Label, UL, MCC Unit Listing
1 D	4701A93G01	1	Blank door 1X 15.56 wide
1 F	10250ED1265-3	1	Selector Switch 3 position
1 F	10250T181L	1	Indicating light, Transformer type, 120VAC W/LED Bulb
1 F	10250T181L	1	Indicating light, Transformer type, 120VAC W/LED Bulb
1 F	10250T181L	1	Indicating light, Transformer type, 120VAC W/LED Bulb
1 F	10250T181L	1	Indicating light, Transformer type, 120VAC W/LED Bulb
1 F	10250T2	1	Contact block 1NO 1NO
1 F	10250TC19N	1	Indicating light lens, Amber
1 F	10250TC19N	1	Indicating light lens, Amber
1 F	10250TC19N	1	Indicating light lens, Amber
1 F	10250TC1N	1	Indicating light lens, Red
1 F	1161D43H01	1	Device panel 6 cutout
1 F	1162D31G01	1	Shutter Std
1 F	1428B04H08	1	Unit Nameplate 1" x 2.5"
1 F	1428B04H11	1	Custom Device Nameplate 1.8" x 0.58"
1 F	1428B04H11	1	Custom Device Nameplate 1.8" x 0.58"
1 F	1428B04H11	1	Custom Device Nameplate 1.8" x 0.58"
1 F	15220	3	Terminal block 7 circuit side mounted pull-apart
1 F	4701A85G10	1	GASKET KIT, RESET NEMA 2 AND 12

1 F	4710A21H01	1	Device nameplate RUN
1 F	4710A21H18	1	Device nameplate HAND-OFF-AUTO
1 F	4711A02G18	1	Door assembly
1 F	4714A26H22	1	Label, UL, MCC Unit Listing
1 F	5A11620G01	1	Unit assembly
1 F	6T3H508RPM406	1	Door mounted ETM, Eaton, 120VAC
1 F	AN16DN0AB	1	Starter Freedom NEMA size 1 110/120VAC 60Hz. coil
1 F	B321-2CW-012B	1	LED bulb natural light, use with colored lens
1 F	B321-2CW-012B	1	LED bulb natural light, use with colored lens
1 F	B321-2CW-012B	1	LED bulb natural light, use with colored lens
1 F	B321-2CW-012B	1	LED bulb natural light, use with colored lens
1 F	C0150E2AFB	1	CPT 150va 440/480-95/125VAC 50/60Hz.
1 F	C320KGS3	1	Electrical interlock Freedom 1NO 1NC size 1 or 2
1 F	C320KGT15	1	Electrical interlock Freedom 2NO 2NC size 1 or 2 top deck
1 F	D3PA3-A2	1	11pin Socket
1 F	D7PA2	2	D7PF series socket
1 F	D7PA4	1	D7PF series socket
1 F	D7PR2A	2	Control relay D7 2 pole 120VAC
1 F	D7PR4A	1	Control relay D7 4 pole 120VAC
1 F	H2008B-3	1	Heater pack Size 1 class 20
1 F	HMCP007C0C	1	Breaker HMCP 7 amp
1 F	J15220	1	Terminal block jumper
1 H	10250ED1265-3	1	Selector Switch 3 position
1 H	10250T181L	1	Indicating light, Transformer type, 120VAC W/LED Bulb
1 H	10250T181L	1	Indicating light, Transformer type, 120VAC W/LED Bulb
1 H	10250T181L	1	Indicating light, Transformer type, 120VAC W/LED Bulb
1 H	10250T181L	1	Indicating light, Transformer type, 120VAC W/LED Bulb
1 H	10250T2	1	Contact block 1NO 1NO
1 H	10250TC19N	1	Indicating light lens, Amber
1 H	10250TC19N	1	Indicating light lens, Amber
1 H	10250TC19N	1	Indicating light lens, Amber
1 H	10250TC1N	1	Indicating light lens, Red
1 H	1161D43H01	1	Device panel 6 cutout
1 H	1162D31G02	1	Shutter Int
1 H	1428B04H08	1	Unit Nameplate 1" x 2.5"
1 H	1428B04H11	1	Custom Device Nameplate 1.8" x 0.58"
1 H	1428B04H11	1	Custom Device Nameplate 1.8" x 0.58"
1 H	1428B04H11	1	Custom Device Nameplate 1.8" x 0.58"
1 H	15220	3	Terminal block 7 circuit side mounted pull-apart
1 H	4701A85G10	1	GASKET KIT, RESET NEMA 2 AND 12
1 H	4710A21H01	1	Device nameplate RUN
1 H	4710A21H18	1	Device nameplate HAND-OFF-AUTO
1 H	4711A02G18	1	Door assembly

1 H	4714A26H22	1	Label, UL, MCC Unit Listing
1 H	5A11620G01	1	Unit assembly
1 H	6T3H508RPM406	1	Door mounted ETM, Eaton, 120VAC
1 H	AN16DN0AB	1	Starter Freedom NEMA size 1 110/120VAC 60Hz. coil
1 H	B321-2CW-012B	1	LED bulb natural light, use with colored lens
1 H	B321-2CW-012B	1	LED bulb natural light, use with colored lens
1 H	B321-2CW-012B	1	LED bulb natural light, use with colored lens
1 H	B321-2CW-012B	1	LED bulb natural light, use with colored lens
1 H	C0150E2AFB	1	CPT 150va 440/480-95/125VAC 50/60Hz.
1 H	C320KGS3	1	Electrical interlock Freedom 1NO 1NC size 1 or 2
1 H	C320KGT15	1	Electrical interlock Freedom 2NO 2NC size 1 or 2 top deck
1 H	D3PA3-A2	1	11pin Socket
1 H	D7PA2	2	D7PF series socket
1 H	D7PA4	1	D7PF series socket
1 H	D7PR2A	2	Control relay D7 2 pole 120VAC
1 H	D7PR4A	1	Control relay D7 4 pole 120VAC
1 H	H2008B-3	1	Heater pack Size 1 class 20
1 H	HMCP007C0C	1	Breaker HMCP 7 amp
1 H	J15220	1	Terminal block jumper
1 K	1162D31G01	1	Shutter Std
1 K	4703A22G11	1	Unit assembly dual feeder breaker
1 K	4703A22G92	1	Door assembly dual feeder breaker
1 KL	1428B04H08	1	Unit Nameplate 1" x 2.5"
1 KL	4714A26H22	1	Label, UL, MCC Unit Listing
1 KL	624B100G02	1	Lug Kit
1 KL	HFD3020	1	Breaker HFD 20 amp
1 KR	1428B04H08	1	Unit Nameplate 1" x 2.5"
1 KR	4714A26H22	1	Label, UL, MCC Unit Listing
1 KR	624B100G02	1	Lug Kit
1 KR	HFD3020	1	Breaker HFD 20 amp
1 M	1162D31G01	1	Shutter Std
1 M	4703A22G11	1	Unit assembly dual feeder breaker
1 M	4703A22G92	1	Door assembly dual feeder breaker
1 ML	1428B04H08	1	Unit Nameplate 1" x 2.5"
1 ML	4714A26H22	1	Label, UL, MCC Unit Listing
1 ML	624B100G02	1	Lug Kit
1 ML	HFD3025	1	Breaker HFD 25 amp
1 MR	1428B04H08	1	Unit Nameplate 1" x 2.5"
1 MR	4714A26H22	1	Label, UL, MCC Unit Listing
1 MR	624B100G02	1	Lug Kit
1 MR	HFD3030	1	Breaker HFD 30 amp
2	1162D24G11	1	Bottom plate 21D enclosure
2	1162D89G02	1	Vertical/Horizontal Bus Barrier Subassembly

2 F	BAB1020	1	Panelboard breaker BAB 1P 20A
2 F	BAB1020	1	Panelboard breaker BAB 1P 20A
2 F	BAB1020	1	Panelboard breaker BAB 1P 20A
2 F	BAB1020	1	Panelboard breaker BAB 1P 20A
2 F	BAB1020	1	Panelboard breaker BAB 1P 20A
2 F	BAB1020	1	Panelboard breaker BAB 1P 20A
2 F	BAB1020	1	Panelboard breaker BAB 1P 20A
2 F	BAB1020	1	Panelboard breaker BAB 1P 20A
2 F	BAB1020	1	Panelboard breaker BAB 1P 20A
2 HL	1428B04H08	1	Unit Nameplate 1" x 2.5"
2 HL	4714A26H22	1	Label, UL, MCC Unit Listing
2 HL	HFD3125L	1	Breaker HFD 125 amp
2 HR	1428B04H08	1	Unit Nameplate 1" x 2.5"
2 HR	4714A26H22	1	Label, UL, MCC Unit Listing
2 HR	HFD3175L	1	Breaker HFD 175 amp
2 M	1428B04H08	1	Unit Nameplate 1" x 2.5"
2 M	4714A26H22	1	Label, UL, MCC Unit Listing
2 M	84-32215-20	1	XFMR assembly 45KVA 480-120/208V 3Ph 4W 6X With Enclosure
2 ML	4714A26H22	1	Label, UL, MCC Unit Listing
3	1162D24G10	1	Bottom plate 21D enclosure
3	1162D89G02	1	Vertical/Horizontal Bus Barrier Subassembly
3	4701A01G02	1	Enclosure 20.00W 21D 4VWW 9/9HWW
3	4702A60G47	1	Dog bone 600 horizontal 1 bars/phase to 600A CUTN vertical
3	4702A70G26	1	Neutral bus splice kit 300A CUTN
3	4702A89G17	1	Vertical bus 600A CUTN 65K Labyrinth, Isolated/Insulated with shutters
3	5A11244G04	1	Seismic End cover assy 90H 21D
3	5A11324G09	1	Neutral bus 300A 20.00W copper Tin plated 65 degree C
3 B	1162D31G01	1	Shutter Std
3 B	4703A22G11	1	Unit assembly dual feeder breaker
3 B	4703A22G92	1	Door assembly dual feeder breaker
3 BL	1428B04H08	1	Unit Nameplate 1" x 2.5"
3 BL	4714A26H22	1	Label, UL, MCC Unit Listing
3 BL	624B100G02	1	Lug Kit
3 BL	HFD3080	1	Breaker HFD 80 amp
3 BR	1428B04H08	1	Unit Nameplate 1" x 2.5"
3 BR	4714A26H22	1	Label, UL, MCC Unit Listing
3 BR	624B100G02	1	Lug Kit
3 BR	HFD3080	1	Breaker HFD 80 amp
3 G	10250ED1265-3	1	Selector Switch 3 position
3 G	10250T181L	1	Indicating light, Transformer type, 120VAC W/LED Bulb
3 G	10250T181L	1	Indicating light, Transformer type, 120VAC W/LED Bulb
3 G	10250T2	1	Contact block 1NO 1NO
3 G	10250TC1N	1	Indicating light lens, Red

3 G	10250TC4N	1	Indicating light lens, Blue
3 G	1161D43H01	1	Device panel 6 cutout
3 G	1428B04H08	1	Unit Nameplate 1" x 2.5"
3 G	1428B04H11	1	Custom Device Nameplate 1.8" x 0.58"
3 G	1428B04H11	1	Custom Device Nameplate 1.8" x 0.58"
3 G	15220	3	Terminal block 7 circuit side mounted pull-apart
3 G	39-46142-2	1	Door assembly, 5X with device panel
3 G	42-5119	1	SVX9000 Output reactor
3 G	4710A21H18	1	Device nameplate HAND-OFF-AUTO
3 G	4714A26H22	1	Label, UL, MCC Unit Listing
3 G	89-937-1	1	Unit assembly, Unit, SVX9000, FR4, 500VAC Typ, 5X
3 G	B321-2CW-012B	1	LED bulb natural light, use with colored lens
3 G	B321-2CW-012B	1	LED bulb natural light, use with colored lens
3 G	C0150E2AFB	1	CPT 150va 440/480-95/125VAC 50/60Hz.
3 G	D7PA2	3	D7PF series socket
3 G	D7PR2A	3	Control relay D7 2 pole 120VAC
3 G	HMCP007C0C	1	Breaker HMCP 7 amp
3 G	J15220	1	Terminal block jumper
3 G	OPTCK	1	SVX9000 Series Option Board Kit (EtherNet/IP)
3 G	SVXF15A1-4A1B1	1	SVX9000 Variable 480V Max 4.3 Max
3 M	10250ED1265-3	1	Selector Switch 3 position
3 M	10250T181L	1	Indicating light, Transformer type, 120VAC W/LED Bulb
3 M	10250T181L	1	Indicating light, Transformer type, 120VAC W/LED Bulb
3 M	10250T2	1	Contact block 1NO 1NO
3 M	10250TC1N	1	Indicating light lens, Red
3 M	10250TC4N	1	Indicating light lens, Blue
3 M	1161D43H01	1	Device panel 6 cutout
3 M	1428B04H08	1	Unit Nameplate 1" x 2.5"
3 M	1428B04H11	1	Custom Device Nameplate 1.8" x 0.58"
3 M	1428B04H11	1	Custom Device Nameplate 1.8" x 0.58"
3 M	15220	3	Terminal block 7 circuit side mounted pull-apart
3 M	39-46142-2	1	Door assembly, 5X with device panel
3 M	42-5119	1	SVX9000 Output reactor
3 M	4710A21H18	1	Device nameplate HAND-OFF-AUTO
3 M	4714A26H22	1	Label, UL, MCC Unit Listing
3 M	89-937-1	1	Unit assembly, Unit, SVX9000, FR4, 500VAC Typ, 5X
3 M	B321-2CW-012B	1	LED bulb natural light, use with colored lens
3 M	B321-2CW-012B	1	LED bulb natural light, use with colored lens
3 M	C0150E2AFB	1	CPT 150va 440/480-95/125VAC 50/60Hz.
3 M	D7PA2	3	D7PF series socket
3 M	D7PR2A	3	Control relay D7 2 pole 120VAC
3 M	HMCP007C0C	1	Breaker HMCP 7 amp
3 M	J15220	1	Terminal block jumper

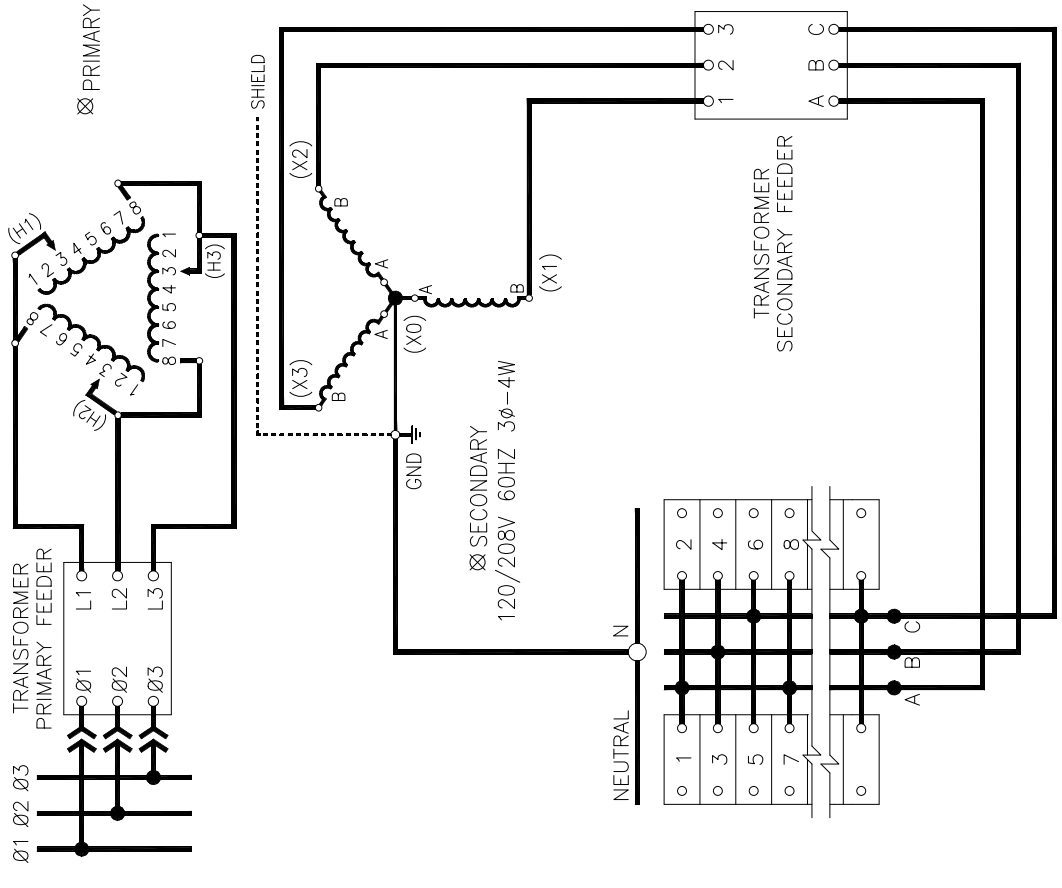
3 M	OPTCK	1	SVX9000 Series Option Board Kit (EtherNet/IP)
3 M	SVXF15A1-4A1B1	1	SVX9000 Variable 480V Max 4.3 Max
	10250ED1265-3	4	Selector Switch 3 position
	10250T181L	12	Indicating light, Transformer type, 120VAC W/LED Bulb
	10250T2	4	Contact block 1NO 1NO
	10250TC19N	6	Indicating light lens, Amber
	10250TC1N	4	Indicating light lens, Red
	10250TC4N	2	Indicating light lens, Blue
	112B506H04	1	Document pocket 21W enclosure
	1161D36H01	-1	Standard Divider Pan From Enclosure Assembly
	1161D43H01	4	Device panel 6 cutout
	1162D24G10	2	Bottom plate 21D enclosure
	1162D24G11	1	Bottom plate 21D enclosure
	1162D31G01	4	Shutter Std
	1162D31G02	1	Shutter Int
	1162D89G02	3	Vertical/Horizontal Bus Barrier Subassembly
	1165D70H04	1	Half height front to rear barrier
	1427B96H01	4	Vertical bus brace extension for 24.00W enclosure
	1428B04H08	14	Unit Nameplate 1" x 2.5"
	1428B04H11	10	Custom Device Nameplate 1.8" x 0.58"
	1491C01H03	1	Master Nameplate 2.7" x 6.75"
	1491C79H03	1	Overload heater chart, Freedom series
	15220	12	Terminal block 7 circuit side mounted pull-apart
	30-42893-1	1	GO/Short Ckt Nameplate 2.7" x 6.75"
	39-46142-2	2	Door assembly, 5X with device panel
	3A73700G29	1	Unit assembly Main lugs
	414A050H07	1	Screw lug #6-350MCM
	414A050H10	1	Screw lug #6-350MCM for use on Ground Bus
	42-5119	2	SVX9000 Output reactor
	4701A01G02	2	Enclosure 20.00W 21D 4VWW 9/9HWW
	4701A85G10	2	GASKET KIT, RESET NEMA 2 AND 12
	4701A93G01	1	Blank door 1X 15.56 wide
	4702A26G07	1	Horizontal bus 600A Tin 20.00W 65K 65 degree C
	4702A31G67	1	Ground bus 300A copper Tin plated 20.00W
	4702A60G47	3	Dog bone 600 horizontal 1 bars/phase to 600A CUTN vertical
	4702A70G26	2	Neutral bus splice kit 300A CUTN
	4702A89G17	3	Vertical bus 600A CUTN 65K Labyrinth, Isolated/Insulated with shutters
	4703A22G11	3	Unit assembly dual feeder breaker

4703A22G92	3	Door assembly dual feeder breaker
4710A21H01	2	Device nameplate RUN
4710A21H18	4	Device nameplate HAND-OFF-AUTO
4711A02G18	2	Door assembly
4711A14G02	-1	Deleted 9" horizontal wireway for 20.00W 4VWW enclosure
4711A14G04	1	9" Emblem door for 20.00W 4VWW enclosure
4714A26H22	16	Label, UL, MCC Unit Listing
5676B77G01	1	Freedom emblem
5A11244G04	2	Seismic End cover assy 90H 21D
5A11324G09	2	Neutral bus 300A 20.00W copper Tin plated 65 degree C
5A11324G17	1	Neutral bus 300A 24.00W copper Tin plated 65 degree C
5A11512G03	1	Unit assembly Panelboard 42Ckt 1Ph 3W 6X
5A11620G01	2	Unit assembly
624B100G02	6	Lug Kit
6T3H508RPM406	2	Door mounted ETM, Eaton, 120VAC
84-32215-20	1	XFMR assembly 45KVA 480-120/208V 3Ph 4W 6X With Enclosure
89-937-1	2	Unit assembly, Unit, SVX9000, FR4, 500VAC Typ, 5X
AN16DN0AB	2	Starter Freedom NEMA size 1 110/120VAC 60Hz. coil
B321-2CW-012B	12	LED bulb natural light, use with colored lens
BAB1020	42	Panelboard breaker BAB 1P 20A
C0150E2AFB	4	CPT 150va 440/480-95/125VAC 50/60Hz.
C320KGS3	2	Electrical interlock Freedom 1NO 1NC size 1 or 2
C320KGT15	2	Electrical interlock Freedom 2NO 2NC size 1 or 2 top deck
D3PA3-A2	2	11pin Socket
D7PA2	10	D7PF series socket
D7PA4	2	D7PF series socket
D7PR2A	10	Control relay D7 2 pole 120VAC
D7PR4A	2	Control relay D7 4 pole 120VAC
FV2A010H03	1	Steel bottom barrier for vertical bus
H2008B-3	2	Heater pack Size 1 class 20
HFD3020	2	Breaker HFD 20 amp
HFD3025	1	Breaker HFD 25 amp
HFD3030	1	Breaker HFD 30 amp
HFD3080	2	Breaker HFD 80 amp
HFD3125L	1	Breaker HFD 125 amp
HFD3175L	1	Breaker HFD 175 amp
HMCP007C0C	4	Breaker HMCP 7 amp
J15220	4	Terminal block jumper

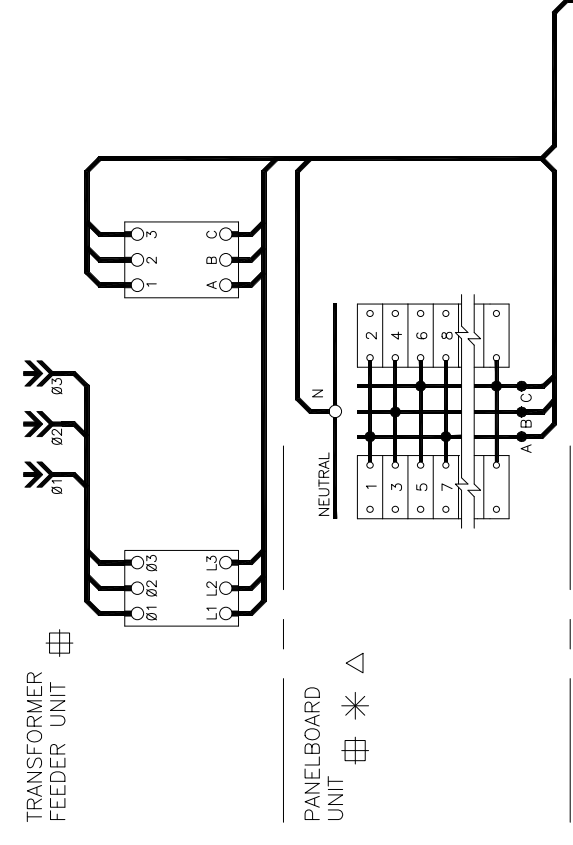
	OPTCK	2	SVX9000 Series Option Board Kit (EtherNet/IP)
	SVXF15A1-4A1B1	2	SVX9000 Variable 480V Max 4.3 Max



Wiring Diagrams



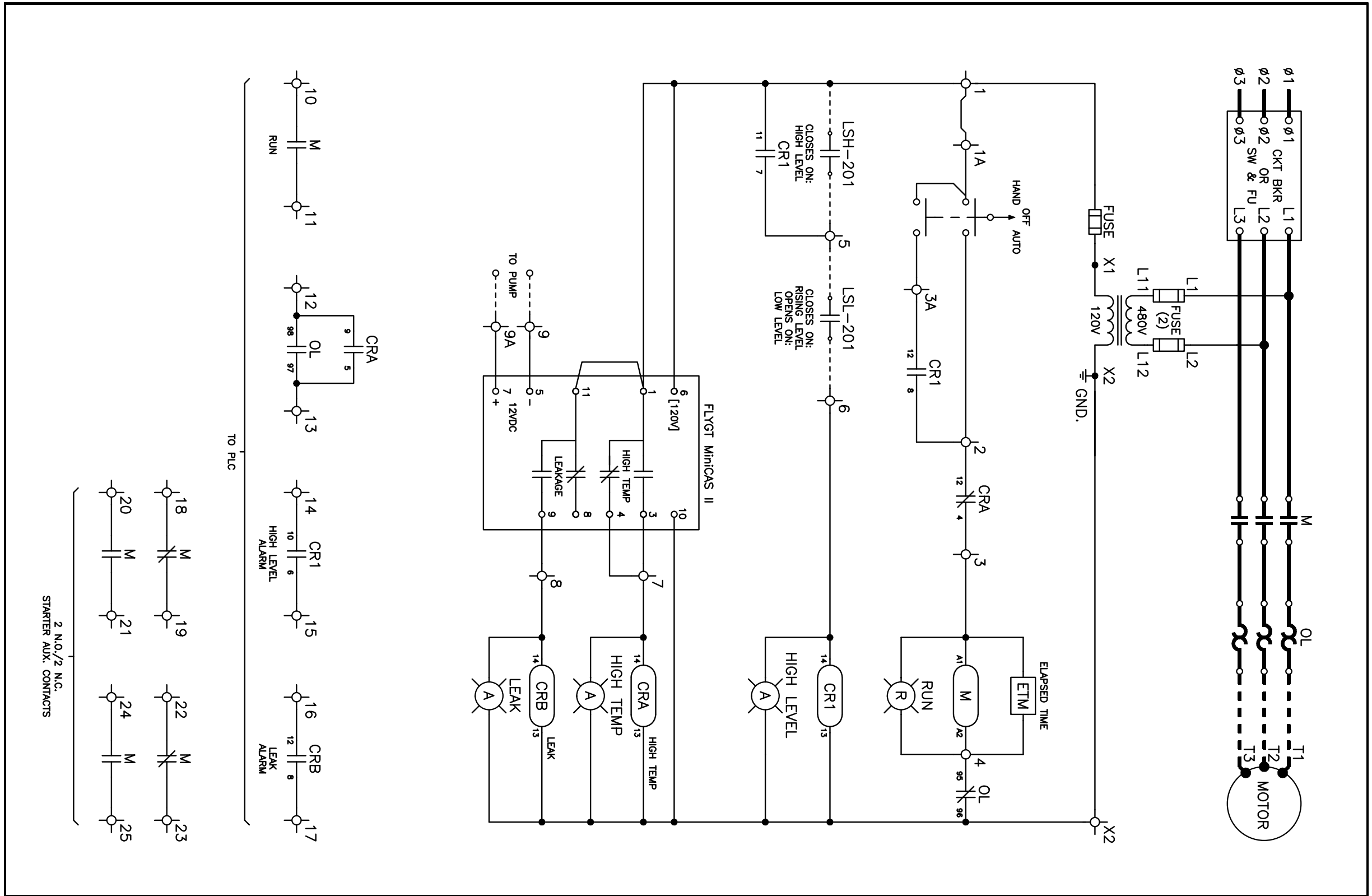
- △ -GFCI TYPE BREAKERS TO HAVE PIGTAILS CONNECTED TO NEUTRAL IN PANELBOARD
- ⊞ -SEE UNIT SPECIFICATION FORM FOR UNIT ARRANGEMENT
- * -SEE PANELBOARD LAYOUT FORM FOR BREAKER ARRANGEMENT
- ⊞ -PRIMARY AND SECONDARY WIRED PER TRANSFORMER NAMEPLATE



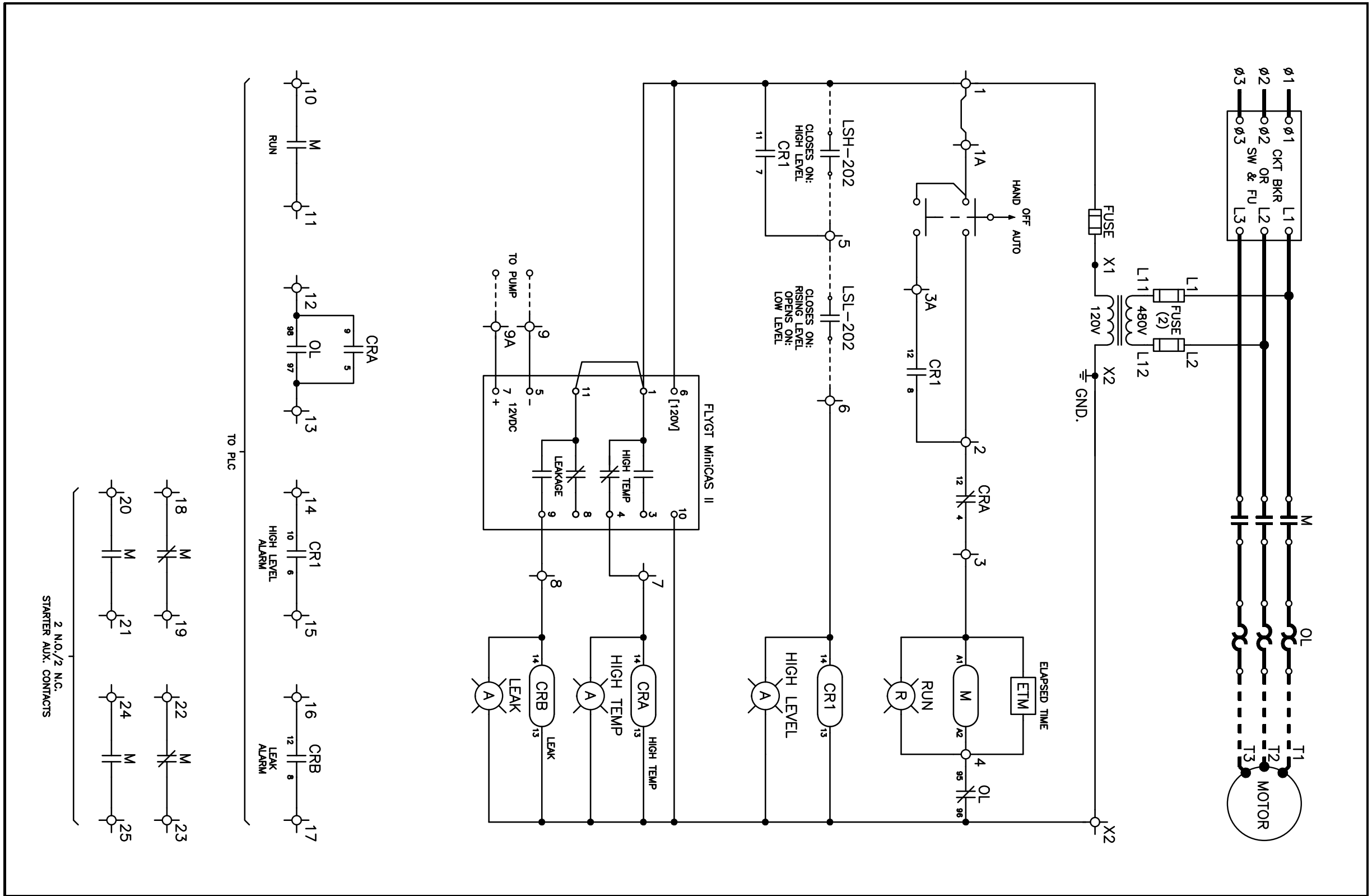
CONNECTION

SCHEMATIC

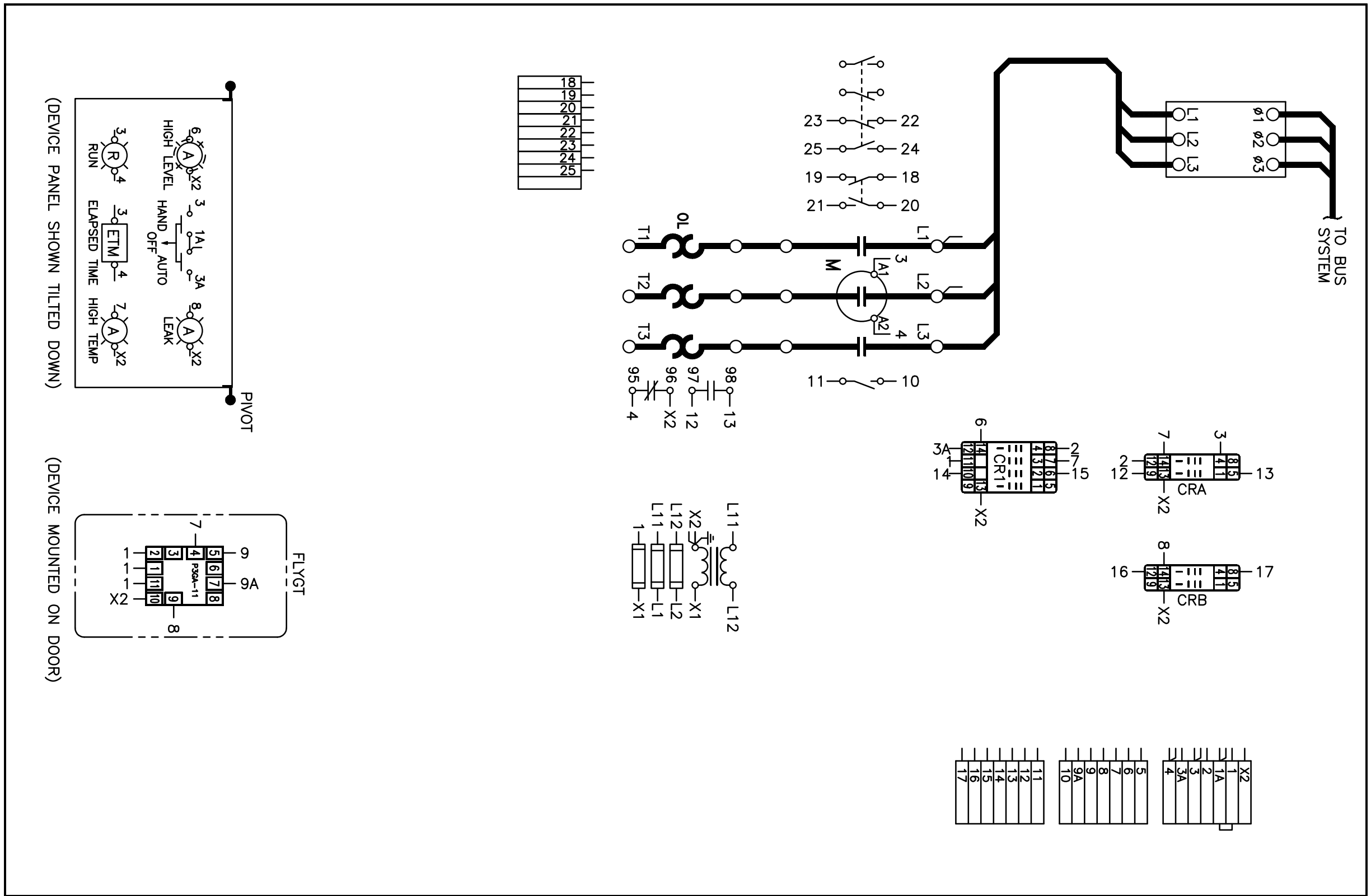
1	REVISION			DATE	2/16/2009	DFTR	THE INFORMATION ON THIS DOCUMENT WAS CREATED BY EATON CORPORATION. IT WAS DISCLOSED IN CONFIDENCE AND IS ONLY TO BE USED FOR THE PURPOSE WHICH IT WAS SUPPLIED.	
				DATE		APPD	TITLE	3φ-4W PANELBOARD, OPEN CORE XFMR, CIRCUIT BREAKERS OR SW & FU
				DATE		APPD	TYPE	MOTOR CONTROL CENTER
				REVISION	2		G.O.	STANDARD
				PRODUCT CODE	CC		DWG	5A10398
				FEDERAL ID NO			SHEET	1 OF 1
				DWG SIZE	A		SCHEME & CONN.	
							EATON	



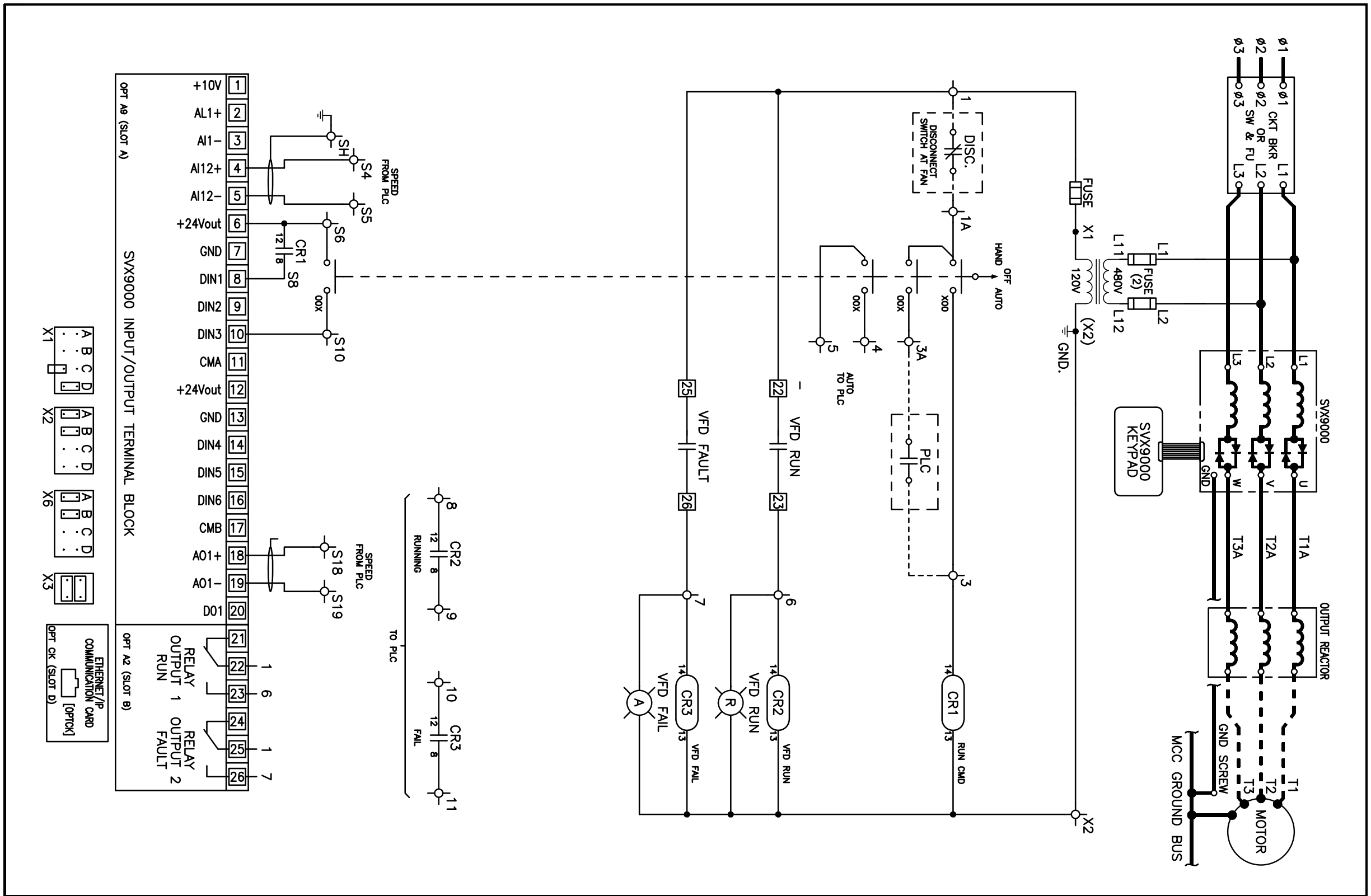
1	REVISION	2	DRAWING UPDATED A.E. HANKKINS 2/10/2012	3	DRAWING UPDATED FINAL AS-BUILT A.E. HANKKINS 5/30/2012	THE INFORMATION ON THIS DOCUMENT IS CREATED BY CUTLER-HAMMER. IT IS DISCLOSED IN CONFIDENCE AND IS ONLY TO BE USED FOR THE PURPOSE IN WHICH IT IS SUPPLIED		DFTFR A.E. HANKKINS	DATE 1/31/11	Eaton		TITLE CD-03 SUMP PUMP CONTROL [PUMP-201] INTERTIE 2 DIVERSION	
						FEDERAL ID NO	PRODUCT CODE CF	APPD	DATE	APPD	DATE	TYPE FREEDOM 2100	SCHEMATIC
						FEDERAL ID NO	PRODUCT CODE CF	REVISION 3	DWG SIZE A	G.O. LPO0007343	DWG WD-201	SHEET 1 OF 2	



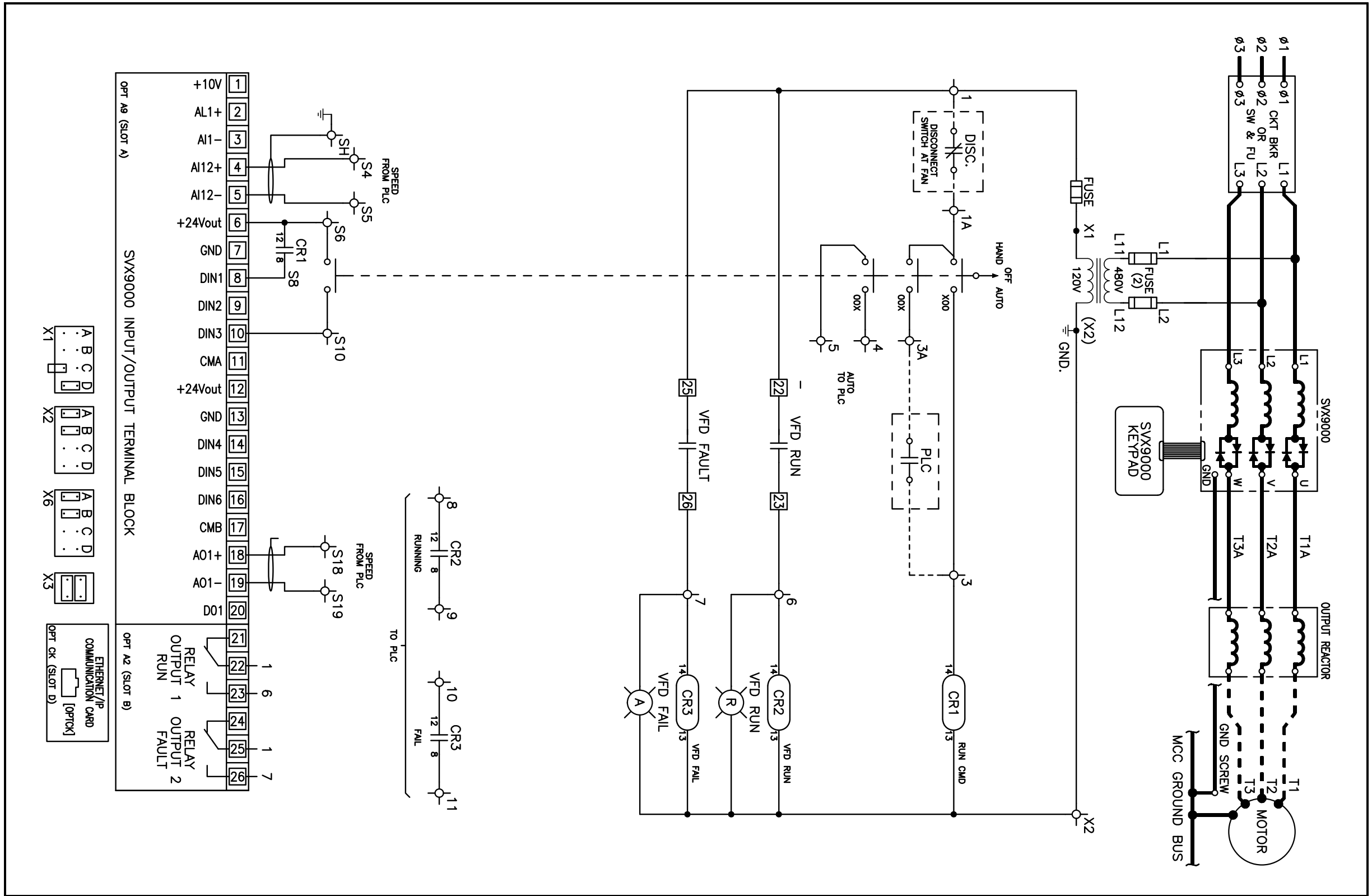
1	REVISION	2	DRAWING UPDATED A.E. HANKKINS 2/10/2012	3	DRAWING UPDATED FINAL AS-BUILT A.E. HANKKINS 5/30/2012	THE INFORMATION ON THIS DOCUMENT IS CREATED BY CUTLER-HAMMER. IT IS DISCLOSED IN CONFIDENCE AND IS ONLY TO BE USED FOR THE PURPOSE IN WHICH IT IS SUPPLIED	DFTFR	DATE	Eaton	TITLE CD-03 SUMP PUMP CONTROL [PUMP-202] INTERTIE 2 DIVERSION		
							A.E. HANKKINS	1/31/11				TYPE
						FEDERAL ID NO	PRODUCT CODE	REVISION	DWG SIZE	G.O.	DWG	SHEET
							CF	3	A	LPO0007343	WD-202	1 OF 2



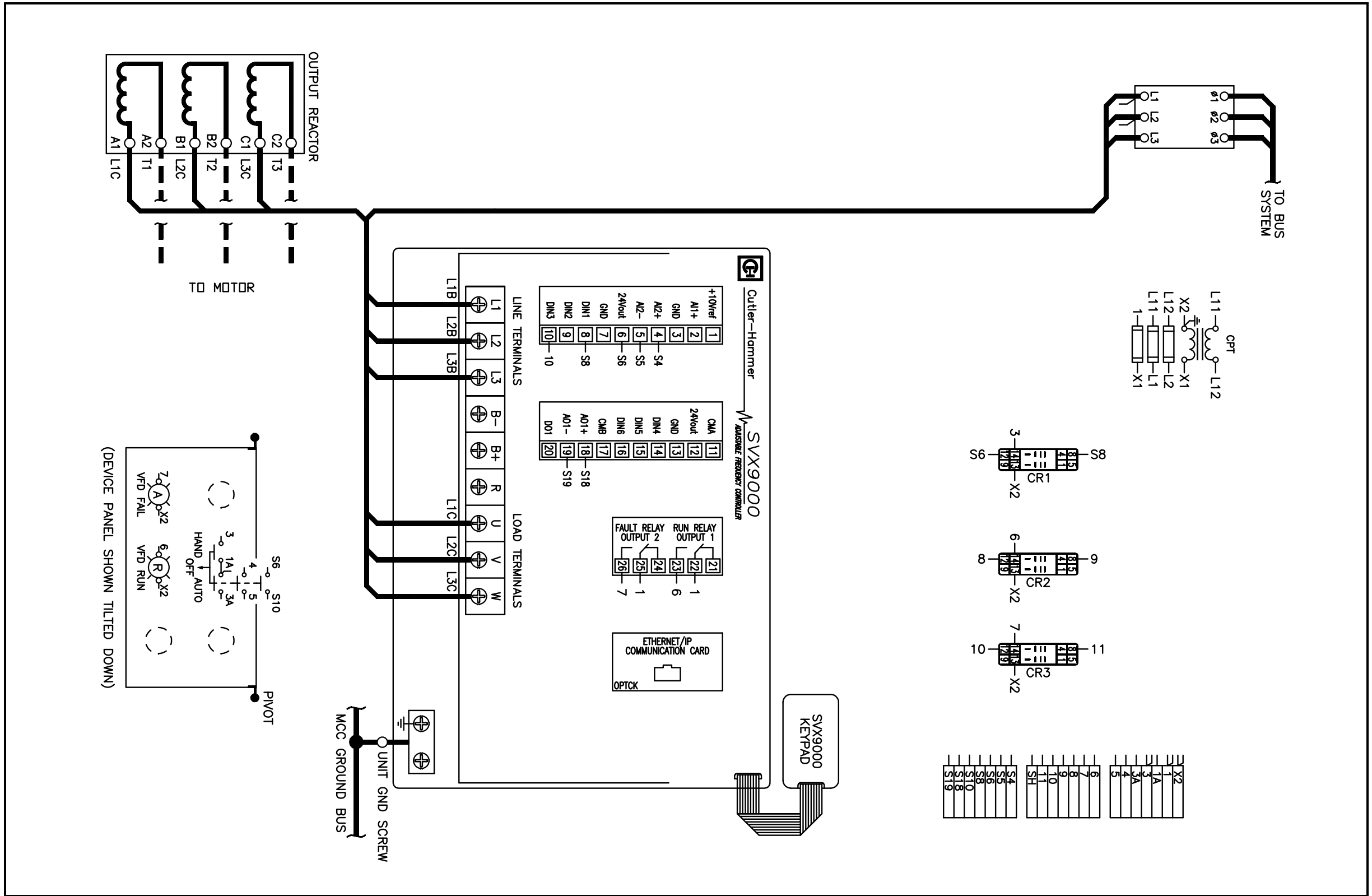
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						FEDERAL ID NO	PRODUCT CODE CF	APPD	DATE		APPD	DATE
						FEDERAL ID NO	PRODUCT CODE CF	REVISION 3	DWG SIZE A	G.O. LPO0007343	DWG WD-202	SHEET 2 OF 2



1	REVISION	DRAWING UPDATED A.E. HANKKINS 5/15/2012	DRAWING UPDATED FINAL AS-BUILT A.E. HANKKINS 5/24/2012	THE INFORMATION ON THIS DOCUMENT IS CREATED BY CUTLER-HAMMER. IT IS DISCLOSED IN CONFIDENCE AND IS ONLY TO BE USED FOR THE PURPOSE IN WHICH IT IS SUPPLIED		DFTR A.E. HANKKINS	DATE 1/31/11		TITLE CD-05 EXHAUST FAN VFD CONTROL [PUMP-730] INTERTIE 2 DIVERSION	
				FEDERAL ID NO	PRODUCT CODE	APPD	DATE		TYPE FREEDOM 2100	SCHMATIC
				CF	3	APPD	DATE		G.O. LPO0007343	DWG WD-730



1	REVISION	A.E. HANKKINS 5/15/2012	THE INFORMATION ON THIS DOCUMENT IS CREATED BY CUTLER-HAMMER. IT IS DISCLOSED IN CONFIDENCE AND IS ONLY TO BE USED FOR THE PURPOSE IN WHICH IT IS SUPPLIED	DFTR	DATE				
				A.E. HANKKINS	1/31/11				
				APPD	DATE	TITLE CD-05 EXHAUST FAN VFD CONTROL [PUMP-740] INTERTIE 2 DIVERSION			
2	DRAWING UPDATED	A.E. HANKKINS 5/15/2012	FEDERAL ID NO	PRODUCT CODE	REVISION	DWG SIZE	G.O.	DWG	SHEET
3	DRAWING UPDATED FINAL AS-BUILT	A.E. HANKKINS 5/24/2012		CF	3	A	LPO0007343	WD-740	1 OF 2

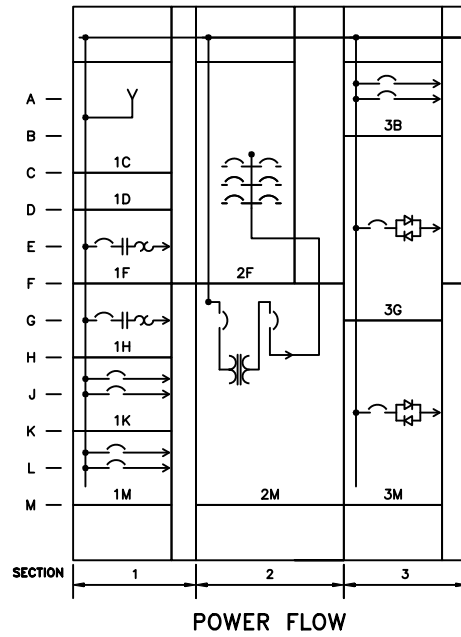
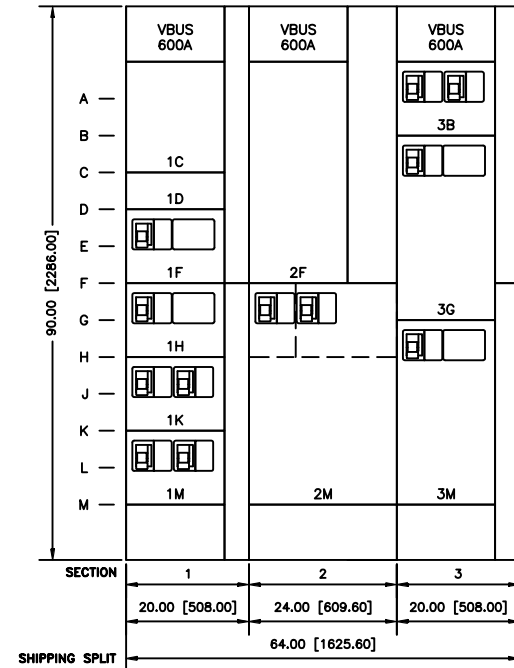


REVISION	1																				
	2	DRAWING UPDATED	A.E. HANKKINS	5/15/2012																	
	3	DRAWING UPDATED FINAL AS-BUILT	A.E. HANKKINS	5/24/2012																	
				THE INFORMATION ON THIS DOCUMENT IS CREATED BY CUTLER-HAMMER. IT IS DISCLOSED IN CONFIDENCE AND IS ONLY TO BE USED FOR THE PURPOSE IN WHICH IT IS SUPPLIED				DFTR A.E. HANKKINS		DATE 1/31/11		EATON									
								APPD		DATE		TITLE CD-05 EXHAUST FAN VFD CONTROL [PUMP-740] INTERTIE 2 DIVERSION									
								APPD		DATE		TYPE FREEDOM 2100			CONNECTION						
				FEDERAL ID NO		PRODUCT CODE CF		REVISION 3		DWG SIZE A		G.O. LPO0007343		DWG WD-740		SHEET 3 OF 3					



Shop Drawings

DOOR LAYOUT DETAILS



POWER FLOW

NEG-ALT NUMBER: POID0923G004-0002
ITEM NUMBER: 001

P.O. NUMBER:

01	02
REVISION	
MMI UPDATED	
RELEASE TO MFG	
A.E. HANKINS	
5/10/2012	

Certified As-Built

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DFTR Austin Hankins	DATE 1/27/11
APPD	DATE
S.O.	



TITLE
INTERTIE 2 DIVERSION
MCC-1

TYPE
FREEDOM 2100 MOTOR CONTROL CENTER

ELEVATION

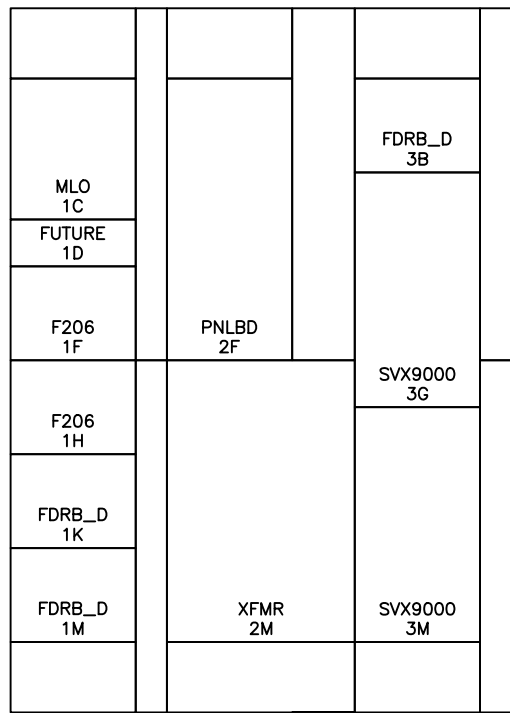
FEDERAL ID NO. 88725	PRODUCT CODE MCC	REVISION 02
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G.O.
LP00007343-001

DWG
ELEVATION

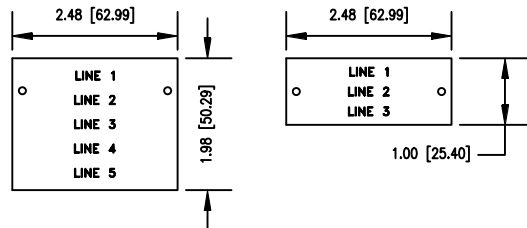
SHEET
1 OF 1

LOW VOLTAGE MCC UNIT SCHEDULE																							
SECTION NUMBER	CELL	DEVICE INFORMATION						PROTECTION INFO					UNIT DATA			TERMINATIONS							
		CIRCUIT NAMEPLATE	DEVICE TYPE	DEVICE MOUNTING (SEE NOTES)	DEVICE SIZE	POLES	KVAC RATING	BREAKER FRAME	RATING PLUG	TRIP AMPERES	STARTER NEMA SIZE	ACTUAL LOAD SIZE	FULL LOAD AMPERES	OVERLOAD (HEATER OR SOLID STATE CURRENT RANGE)	CPT SIZE	ADDITIONAL ACCESSORIES, FEATURES, & NOTES	DEVICE SPACE REQUIREMENT (INCHES)	CONTROL CABLE ENTRY DIRECTION	POWER CABLE ENTRY DIRECTION	TYPE (SEE NOTES)	PHASE SIZE	# PER PHASE	DETAILED DRAWING REFERENCE OR CATALOG NUMBER
1	C		MAIN LUGS MLO	F												18		TOP	M	#4-350	4		
1	D		DOOR (FUTURE)													6							
1	F	PMP-201	FVNR STARTER F206	D		3	65K	HMCP		7A (21-70)	1	2HP	3.40	H2008B-3	150VA	SELECTOR SWITCH, 3 POSITION, BLACK, HAND-OFF-AUTO LIGHT, 120VAC, XFMR TYPE, LED BULB, RED, RUN LIGHT, 120VAC, XFMR TYPE, LED BULB, AMBER, HIGH LEVEL LIGHT, 120VAC, XFMR TYPE, LED BULB, AMBER, LEAK LIGHT, 120VAC, XFMR TYPE, LED BULB, AMBER, HIGH TEMP METER, ETM (EATON), NON-RESETTABLE 120VAC RELAY, D7, 120VAC, 10A, 4 POLE 11PIN SOCKET: FLYGT MINI CAS II/FUS-120, 120VAC, 10A (2) RELAY, D7, 120VAC, 10A, 2 POLE AUXILIARY INTERLOCKS 2NO/2NC	12	EITHER	EITHER	M	#12-6 AWG	1	WD-201
1	H	PMP-202	FVNR STARTER F206	D		3	65K	HMCP		7A (21-70)	1	2HP	3.40	H2008B-3	150VA	SELECTOR SWITCH, 3 POSITION, BLACK, HAND-OFF-AUTO LIGHT, 120VAC, XFMR TYPE, LED BULB, RED, RUN LIGHT, 120VAC, XFMR TYPE, LED BULB, AMBER, HIGH LEVEL LIGHT, 120VAC, XFMR TYPE, LED BULB, AMBER, LEAK LIGHT, 120VAC, XFMR TYPE, LED BULB, AMBER, HIGH TEMP METER, ETM (EATON), NON-RESETTABLE 120VAC RELAY, D7, 120VAC, 10A, 4 POLE 11PIN SOCKET: FLYGT MINI CAS II/FUS-120, 120VAC, 10A (2) RELAY, D7, 120VAC, 10A, 2 POLE AUXILIARY INTERLOCKS 2NO/2NC	12	EITHER	EITHER	M	#12-6 AWG	1	WD-202
1	KL	V-501	FEEDER BREAKER LH FDRB_D	D		3	65K	HFD		20A						TRIP TYPE: THERMAL MAG	12		EITHER	M	#14-1/0	1	5599A85
1	KR	OHD-100	FEEDER BREAKER RH FDRB_D	D		3	65K	HFD		20A						TRIP TYPE: THERMAL MAG	12		EITHER	M	#14-1/0	1	5599A85
1	ML	LCP-700	FEEDER BREAKER LH FDRB_D	D		3	65K	HFD		25A						TRIP TYPE: THERMAL MAG	12		EITHER	M	#14-1/0	1	5599A85
1	MR	CRN-101	FEEDER BREAKER RH FDRB_D	D		3	65K	HFD		30A						TRIP TYPE: THERMAL MAG	12		EITHER	M	#14-1/0	1	5599A85
2	F	LP-1	PANELBOARD PNLBD	F	225A	42										PR. 1A, 3# 4W, 120/208V, 225A SEE PANELBOARD SCHEDULE 2F	36	EITHER					5A10397
2	HL	PRIMARY	FEEDER BREAKER XFMR PRIMARY	D		3	65K	HFD		125A						TRIP TYPE: THERMAL MAG	12		EITHER				5A10398
2	HR	SECONDARY	FEEDER BREAKER XFMR SECONDARY	D		3	65K	HFD		175A						TRIP TYPE: THERMAL MAG	12		EITHER				5A10398
2	M	XFMR LP-1	DISTRIBUTION TRANSFORMER XFMR	F	45 kVA											480-120/208VAC, 3# 4W, 60HZ, HIGH EFFICIENCY - ENERGY STAR	36	EITHER					5A10398
3	BL	MAU-710	FEEDER BREAKER LH FDRB_D	D		3	65K	HFD		80A						TRIP TYPE: THERMAL MAG	12		EITHER	M	#14-1/0	1	5599A85
3	BR	MAU-720	FEEDER BREAKER RH FDRB_D	D		3	65K	HFD		80A						TRIP TYPE: THERMAL MAG	12		EITHER	M	#14-1/0	1	5599A85



NAMEPLATE FEATURES

NAMEPLATE COLOR: BLACK / WHITE LETTERS
 NAMEPLATE ATTACHED WITH STAINLESS STEEL SELF TAPPING SCREWS.
 1", 3 LINE NAMEPLATE IS SUPPLIED AS STANDARD. 2", 5 LINE SUPPLIED WHEN LINES 4 & 5 HAVE VALUES.
 STANDARD CHARACTERS HEIGHT IS 0.1875 [4.76].
 17 CHARACTERS MAXIMUM ON LINES 1, 3, 4 & 5 (STANDARD HEIGHT).
 15 CHARACTERS MAXIMUM ON LINE 2 (STANDARD HEIGHT).



- NOTES:
 1) DEVICE MOUNTING: D=DRAWOUT, F=FIXED
 2) TERMINATION TYPE: M=MECHANICAL, C=CRIMP

NEG-ALT NUMBER: POID0923G004-0002
 ITEM NUMBER: 001

P.O. NUMBER:

01	02	03
MMI UPDATED RELEASE TO MFG A.E. HANKINS 5/10/2012	MMI UPDATED FINAL AS-BUILT A.E. HANKINS 5/24/2012	

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DFTR Austin Hankins	DATE 1/27/11
APPD	DATE
S.O.	

A-T-N Cutler-Hammer	
TITLE INTERTIE 2 DIVERSION MCC-1	
TYPE FREEDOM 2100 MOTOR CONTROL CENTER	UNIT SCHEDULE
G.O. LP00007343-001	DWG SCHEDULE1
FEDERAL ID NO. 88725	PRODUCT CODE MCC
REVISION 03	SHEET 1 OF 2

PANELBOARD SCHEDULE 2F

CKT	DESCRIPTION	TYPE	POLES	TRIP	TRIP	POLES	TYPE	DESCRIPTION	CKT
1		BAB	1	20	20	1	BAB		2
3		BAB	1	20	20	1	BAB		4
5		BAB	1	20	20	1	BAB		6
7		BAB	1	20	20	1	BAB		8
9		BAB	1	20	20	1	BAB		10
11		BAB	1	20	20	1	BAB		12
13		BAB	1	20	20	1	BAB		14
15		BAB	1	20	20	1	BAB		16
17		BAB	1	20	20	1	BAB		18
19		BAB	1	20	20	1	BAB		20
21		BAB	1	20	20	1	BAB		22
23		BAB	1	20	20	1	BAB		24
25		BAB	1	20	20	1	BAB		26
27		BAB	1	20	20	1	BAB		28
29		BAB	1	20	20	1	BAB		30
31		BAB	1	20	20	1	BAB		32
33		BAB	1	20	20	1	BAB		34
35		BAB	1	20	20	1	BAB		36
37		BAB	1	20	20	1	BAB		38
39		BAB	1	20	20	1	BAB		40
41		BAB	1	20	20	1	BAB		42

A B B
LP-1

CHASSIS TYPE: PRL 1A
 CIRCUITS: 42
 VOLTAGE: 120/208V
 3 PHASE 4 WIRE
 BUS RATING: 225A
 INTERRUPTING: 10K

NEG-ALT NUMBER: POID0923G004-0002
 ITEM NUMBER: 001

P.O. NUMBER:

01	02	03
REVISION	MMI UPDATED RELEASE TO MFG A.E. HANKINS 5/10/2012	MMI UPDATED FINAL AS-BUILT A.E. HANKINS 5/24/2012

Certified As-Built

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DFTR Austin Hankins	DATE 1/27/11
APPD	DATE
S.O.	

AT-N Cutler-Hammer	
TITLE INTERTIE 2 DIVERSION MCC-1	
TYPE FREEDOM 2100 MOTOR CONTROL CENTER	PANELBOARD
G.O. LP00007343-001	DWG PANELBOARD1
	SHEET 1 OF 1

FEDERAL ID NO. 88725	PRODUCT CODE MCC	REVISION 03
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DEVICE DESIGNATION

- A = A200
- F = FREEDOM
- T = IT
- V = VACUUM
- W = ADVANTAGE
- 0 = SINGLE SPEED, NON REVERSING
- 1 = SINGLE SPEED, REVERSING
- 3 = MULTI-MOTOR
- 4 = TWO SPEED, ONE WINDING, NON REVERSING
- 5 = TWO SPEED, TWO WINDING, NON REVERSING

ABBREVIATION LEGEND

- HP - HORSE POWER
- FLA - FULL LOAD AMPS
- KW - KILOWATTS
- CPT - CONTROL POWER TRANSFORMER
- WD - WIRING DIAGRAM
- CT - CURRENT TRANSFORMER
- AFD - ADJUSTABLE FREQUENCY DRIVE
- VFD - VARIABLE FREQUENCY DRIVE
- CB - CIRCUIT BREAKER
- BKR - BREAKER
- FDR - FEEDER
- SVM - SERVICE VOLTAGE MONITOR
- DS - DISCONNECT SWITCH

ADDITIONAL MCC NOTES

IF TIG WELDING MCC TO CHANNEL SILLS, THE BUCKETS SHOULD BE FULLY DISENGAGED FROM THE BUS (POWER & CONTROL). IF STITCH WELDING, THE BUCKETS SHOULD BE REMOVED FROM MCC.

NAMEPLATE FEATURES

NAMEPLATE COLOR: BLACK / WHITE LETTERS
 NAMEPLATE ATTACHED WITH STAINLESS STEEL SELF TAPPING SCREWS.

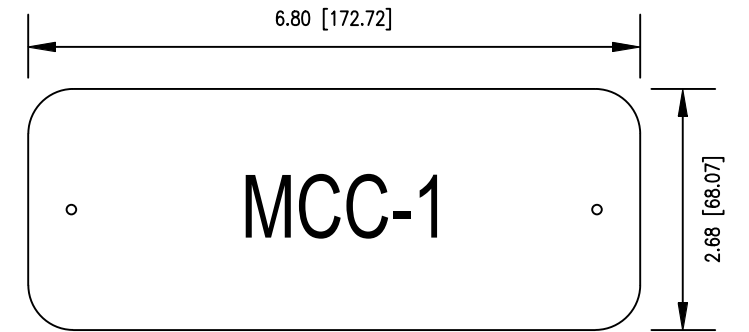
MASTER NAMEPLATE IS 6.80" [172.72] X 2.68" [68.07]
 3 LINES, STANDARD CHARACTERS HEIGHT IS 0.875 [22.23]
 17 CHARACTERS MAXIMUM ON EACH LINE.

STARTERS/CONTACTORS - F206 1

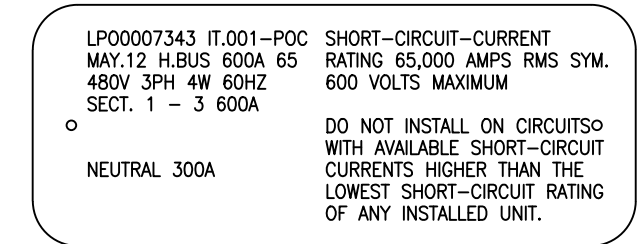
- 2 = FULL VOLTAGE, MAGNETIC
- 3 = SOLID STATE
- 4 = RESISTANCE
- 5 = ADJUSTABLE FREQUENCY CONTROLLERS
- 6 = REDUCED VOLTAGE AUTO XFMR, MAGNETIC
- 7 = REDUCED VOLTAGE PART WINDING, MAGNETIC
- 8 = REDUCED VOLTAGE WYE DELTA, MAGNETIC
- 9 = FULL VOLTAGE 2 SPEED, MAGNETIC

- 4 = FUSIBLE DISCONNECT SWITCH
- 5 = FULL VOLTAGE CONTACTOR/THERM. MAG./CURRENT LIMITER
- 6 = CIRCUIT BREAKER, HMCP OR THERM. MAG
- 7 = CIRCUIT BREAKER, HMCP OR THERM MAG/CURRENT LIMITER
- 8 = THERMAL MAG BREAKER WITH CONTACTOR
- 9 = FUSIBLE DISCONNECT SWITCH WITH CONTACTOR

NEMA STARTER/CONTACTOR SIZE - "2" "3" "4" "5" "6" "7" L = LOW RANGE



MASTER NAMEPLATE 1



GENERAL ORDER NAMEPLATE

SCHEMATIC DESIGNATION

- ⊕ - TERMINAL POINT
- ⊥ - N.O. CONTACT
- ⊥ - N.C. CONTACT
- ⊥ - N.O.T.C. ON-DELAY SWITCH
- ⊥ - N.C.T.O. ON-DELAY SWITCH
- ⊥ - N.O.T.O. OFF-DELAY SWITCH
- ⊥ - N.C.T.C. OFF-DELAY SWITCH
- ⊥ - N.O. THERMOSTAT
- ⊥ - N.C. THERMOSTAT
- ⊥ - N.O. FLOAT SWITCH
- ⊥ - N.C. FLOAT SWITCH
- ⊥ - N.O. PRESSURE SWITCH
- ⊥ - N.C. PRESSURE SWITCH
- ⊥ - N.O. FLOW SWITCH
- ⊥ - N.C. FLOW SWITCH
- ⊥ - N.O. LIMIT SWITCH
- ⊥ - N.C. LIMIT SWITCH
- MI - MECHANICALLY INTERLOCKED
- ▲ - REMOTE DEVICE
- ⊥ - TWO POSITION SWITCH
- ⊥ - THREE POSITION SWITCH
- ⊥ - FOUR POSITION SWITCH
- ⊥ - N.O. PUSHBUTTON
- ⊥ - N.C. PUSHBUTTON
- ⊥ - N.C. MAINTAINED PUSHBUTTON
- ⊥ - N.O. MAINTAINED PUSHBUTTON
- ⊥ - N.O. N.C. PUSHBUTTON
- ⊥ - MECH. INTERLOCKED PUSHBUTTON
- ⊥ - INDICATING LIGHT
- ⊥ - PUSH-TO-TEST LIGHT
- ⊥ - CONTROL POWER TRANSFORMER
- ⊥ - CURRENT TRANSFORMER
- ⊥ - FUSE
- ⊥ - DIODE
- ⊥ - SOLENOID
- ⊥ - GROUND
- ⊥ - SURGE SUPPRESSER
- ⊥ - 1 PHASE CAPACITOR
- ⊥ - METER
- ⊥ - COIL
- ⊥ - HEATER

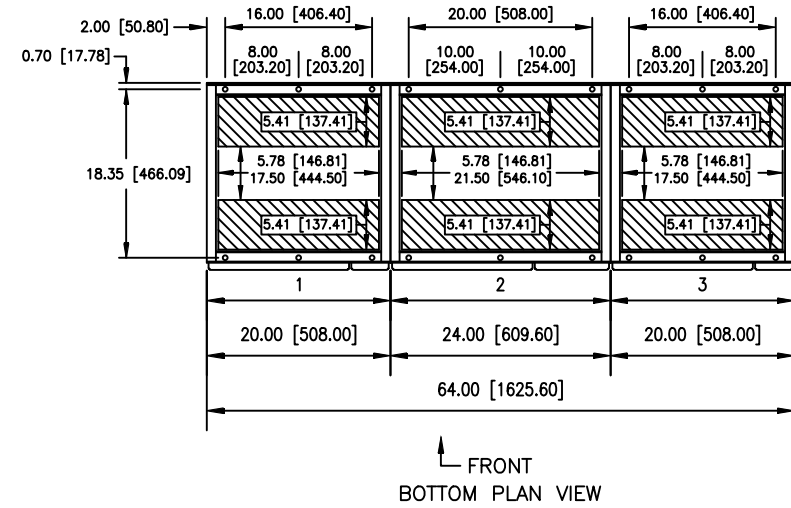
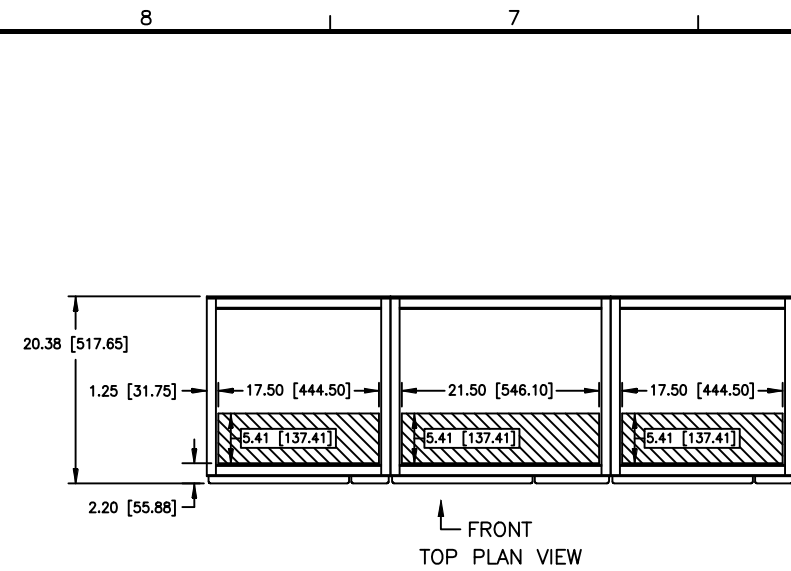
01	02
REVISION	MMI UPDATED RELEASE TO MFG A.E. HANKINS 5/10/2012

Certified As-Built
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FEDERAL ID NO.	PRODUCT CODE	REVISION
88725	MCC	02

NEG-ALT NUMBER: POID0923G004-0002 ITEM NUMBER: 001	
P.O. NUMBER:	
Cutler-Hammer	
TITLE: INTERTIE 2 DIVERSION MCC-1	
TYPE: FREEDOM 2100 MOTOR CONTROL CENTER	LEGEND
G.O. LP00007343-001	DWG LEGEND
	SHEET 1 OF 1



NOTE

- 1) ANCHOR BOLT CLEARANCE HOLE IS 0.53 [13.46] DIAMETER
- 2) MINIMUM LENGTH OF ANCHOR BOLT ABOVE GRADE 1.25 [31.75] (.38-16 GRADE 5 TORQUED AT 31lb-ft [43.4Nm])
- 3) APPROXIMATE WEIGHT OF EACH ENCLOSURE 400lb [181.434kg]

- AVAILABLE CONDUIT SPACE

GENERAL INFORMATION

CODES, STANDARDS AND CERTIFICATIONS

UL845, NEMA, NEC
 NEC ARTICLE 430, PART VIII, SECTIONS 92-98. NEMA STANDARD ICS 18,
 PART 1 AND UL STANDARD UL845, FILE# E47048
 MCC COMPLIES WITH UL845'S 2 METER RULE, WHEN BOTTOM OF MCC IS AT
 THE SAME LEVEL AS THE OPERATOR'S PLATFORM

GENERAL

SERVICE VOLTAGE: 480VAC
 FREQUENCY: 60
 SYSTEM: 3PH4W
 SERVICE FACTOR: 1.15
 CONTROL VOLTAGE: 120VAC
 CONTROL VOLTAGE SOURCE: IND CPT
 WIRING CLASS: 2B

ENCLOSURE FEATURES

TYPE: NEMA 12 DUST TIGHT
 CONFIGURATION: 21"D FRONT MT ONLY, 90"H
 PAINT FINISH: GRAY (ANSI-61) EXTERIOR AND WHITE INTERIOR, 1 EXTERIOR COAT
 HORIZONTAL WIRE WAY: 9" HIGH, TOP & BOTTOM
 BOTTOM PLATES
 CHANNEL SILLS WITH OUT END COVERS, DESIGNED FOR USB SEISMIC LOAD APPLICATION
 MCC IS SEISMIC LOAD QUALIFIED PROVIDED THE INSTRUCTIONS AND PROCEDURES ON DRAWING 5A11213 ARE FOLLOWED.
 MCC SEISMIC MOUNTING CONFIGURATION IS 3" FROM WALL

BUS FEATURES

BRACING: 65,000 AMPS RMS SYMMETRICAL
 HORIZONTAL AMPS: 600A
 HORIZONTAL MATERIAL: COPPER
 HORIZONTAL PLATING: TIN
 MAXIMUM TEMPERATURE RISE: 65°C OVER 40°C AMBIENT
 VERTICAL MATERIAL: COPPER
 VERTICAL PLATING: TIN
 VERTICAL BARRIER: LABYRINTH, ISOLATED/INSULATED WITH SHUTTERS
 GROUND SIZE: 0.25 X 1.00
 GROUND MATERIAL: COPPER
 GROUND PLATING: TIN
 GROUND LOCATION: TOP
 GROUND LUG PLACEMENT: INCOMING LINE
 GROUND LUG SIZE: 1-#6-350KCMIL
 GROUND LUG TYPE: SCREW
 NEUTRAL AMPS: 300A
 NEUTRAL MATERIAL: COPPER
 NEUTRAL PLATING: TIN
 NEUTRAL LOCATION: BOTTOM (ENTIRE LENGTH OF MCC)
 NEUTRAL LUG PLACEMENT: INCOMING LINE
 NEUTRAL LUG SIZE: 1-#6-350KCMIL
 NEUTRAL LUG TYPE: SCREW
 NEUTRAL INSULATION: HEAT SHRINK WRAP

WIRING FEATURES

CONTROL WIRE - 16 AWG, RED, UL MTW - CSA TEW-AWM
 POWER WIRE - BLACK, UL MTW - CSA TEW-AWM
 TERMINAL BLOCKS - STANDARD PULL-APART
 MOTOR OL PROTECTION CLASS - BI-METALLIC, CLASS 20 AMBIENT COMPENSATED.
 CONTROL WIRE HAS WIRE MARKERS AT EACH END

PILOT DEVICE FEATURES (IF SUPPLIED)

(SEE UNIT LISTING FOR DEVICE DETAILS)
 DEVICE TYPE: 10250T
 INDICATING LIGHT TYPE: 6V XFMR
 INDICATING BULB TYPE: LED

NEG-ALT NUMBER: POID0923G004-0002
 ITEM NUMBER: 001

P.O. NUMBER:

01	02
REVISION	REVISION
MMI UPDATED RELEASE TO MFG	A.E. HANKINS 5/10/2012

**Certified
As-Built**

This document accurately reflects the manufacturing details of this product when it shipped from the factory.

THE INFORMATION ON THIS DOCUMENT WAS CREATED BY CUTLER-HAMMER. IT WAS DISCLOSED IN CONFIDENCE AND IS ONLY TO BE USED FOR THE PURPOSE IN WHICH IT WAS SUPPLIED.

DFTF Austin Hankins	DATE 1/27/11
APPD	DATE
S.O.	

Cutler-Hammer	
TITLE INTERTIE 2 DIVERSION MCC-1	
TYPE FREEDOM 2100 MOTOR CONTROL CENTER	PLAN VIEW
G.O. LP00007343-001	DWG PLAN VIEW
REVISION 02	SHEET 1 OF 1

Seismic Requirements for Freedom, IT, Advantage and A200 Series 2100 Motor Control Centers

Mounting Requirements to Withstand UBC, California Building Code & International Building Code Seismic Loads for NEMA 1A, 2 & 12 Indoor & NEMA 3R Non-Walk In Structures.

The Cutler-Hammer Freedom, IT, Advantage and A200 Series 2100 MCC's N1A indoor & N3RNIW structures will safely withstand the UBC & California Building Code & International Building Code seismic loads provided that the following installation grid and instructions are followed :

- (1.) The foundation & wall material which will anchor and support the MCC shall provide a continuous and uniform supporting surface for the MCC frame members which will mount to them.
- (2.) Cutler-Hammer Motor Control Centers have been seismically qualified as a system. If other types of top entry, i.e. conduits, are necessary, attachments must be capable of accommodating a +/- seven-inch front-to-back and side-to-side cabinet motion (fourteen inches peak-to-peak), and a +/- three-inch vertical cabinet motion.

<i>Structure Mounting</i>	<i>Structure Placements</i>	<i>Structure Placements</i>
	- 3" Clearance From Walls	- 2 MCC's Mounted Back-to-Back
	- Mounting Next To A Wall	
STRUC. & END PLATE BOLTED OR WELDED	End Plate w/ Angle - (#5A11244G03, G04, G07*, G08*, G25**) Wall Mounting Brace - (#5A11244G13 thru G20) End Plate w/ Angle - (#5A11244G03, G04, G07*, G08*, G25**) End Plate - (#5A11244G01, G02, G05*, G06*, G24**)	2 Top Frame Braces - (#5A11244G21, G22, G23) End Plate w/ Angle - (#5A11244G03, G04, G07*, G08*, G25**) End Plate - (#5A11244G01, G02, G05*, G06*, G24**)
STRUC. & END PLATE WELDED	End Plate - (#5A11244G01, G02, G05*, G06*, G24**) Wall Mounting Brace - (#5A11244G13 thru G20) End Plate - (#5A11244G01, G02, G05*, G06*, G24**)	2 Top Frame Braces - (#5A11244G21, G22, G23) End Plate - (#5A11244G01, G02, G05*, G06*, G24**)

Layout Sheet Index:

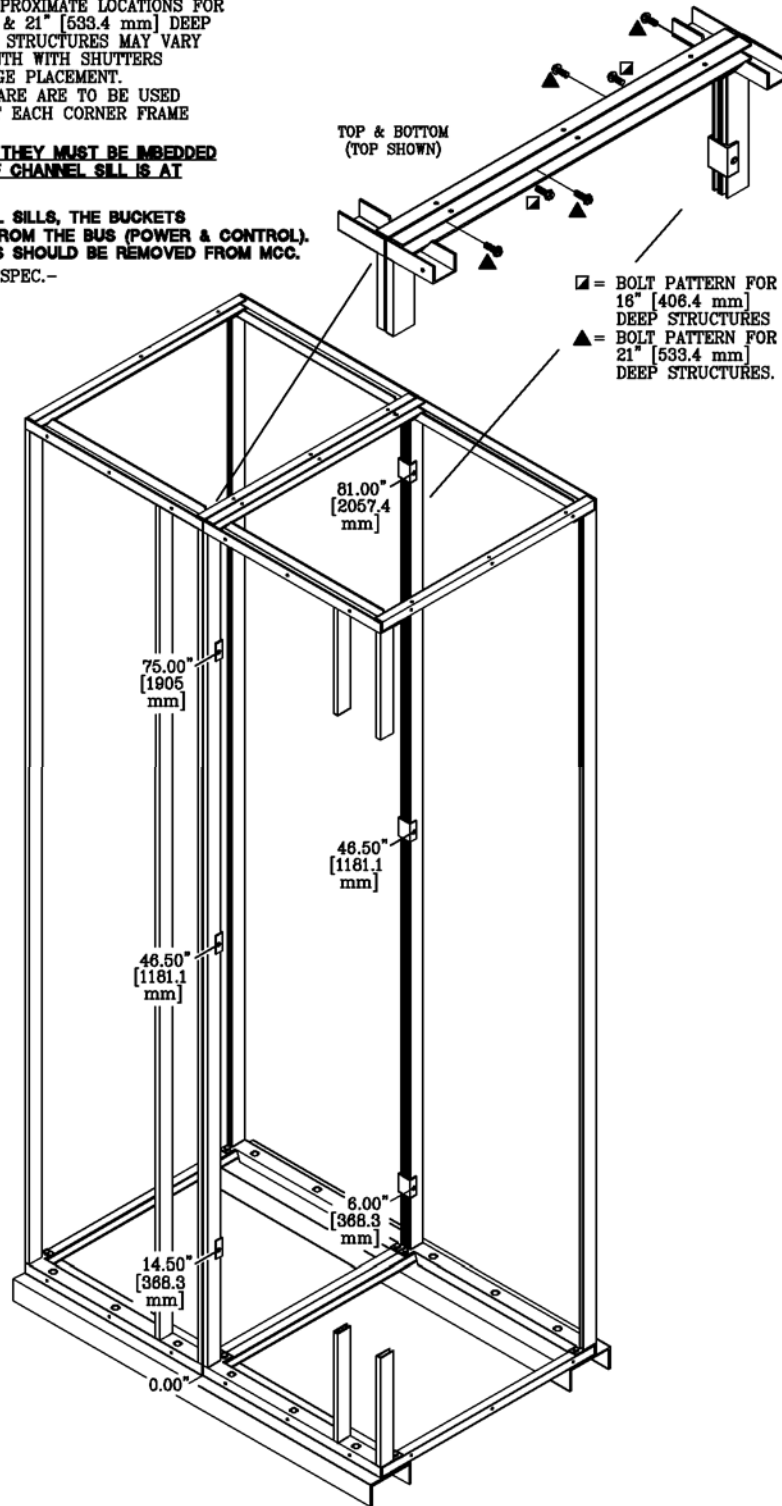
Layout Sheets Numbers for - Nema 1A, 2, 12 - - - Nema 3R Non Walk In

A.) Structure Shipping Split Information:	2	N/A	{ BEFORE CHANNEL SILL INSTALLATION SEE SHEET 2 NOTE 4 & SHEET 13 "CHANNEL SILL DETAIL"
B.) Channel Sill Information:	2	13	
C.) "Bolted / or Welded" Frame Requirements:	13	13	
D.) "Bolted" End Plate Requirements:	4, 6	14, 16	
E.) "Welded" End Plate Requirements:	5	15	
F.) Bolted/ Or Welded End Plate Requirements for "18 Pulse Clean Power Unit" Structure:	7	N/A	
G.) "Mounting Next To A Wall" Requirements:	8, 9	N/A	
H.) "2 MCC's Mounted Back-to-Back" Requirements:	10, 11, 12	N/A	

[] = Metric Conversions () = Assembly Part Numbers * = N3RNIW Parts Assembly ** = Assemblies with Ventilated Side Sheets N/A = Not Applicable	THE INFORMATION ON THIS DOCUMENT IS CREATED BY CUTLER-HAMMER. IT IS DISCLOSED IN CONFIDENCE AND IS ONLY TO BE USED FOR THE PURPOSE IN WHICH IT IS SUPPLIED	DTR K. BURNEY APPD R. A. MORRIS APPD K. BURNEY REVISION 15	DATE 07/02/09 DATE 07/02/09 DATE 07/02/09	DWG SIZE A	G.O. EAD038358	SHEET 1 OF 16
Cutler-Hammer		TITLE MCC SEISMIC MOUNTING REQ. INFO.				
FEDERAL ID NO PRODUCT CODE CC		TYPE MCC SEISMIC MOUNTING REQ. INFO.				

NOTES:

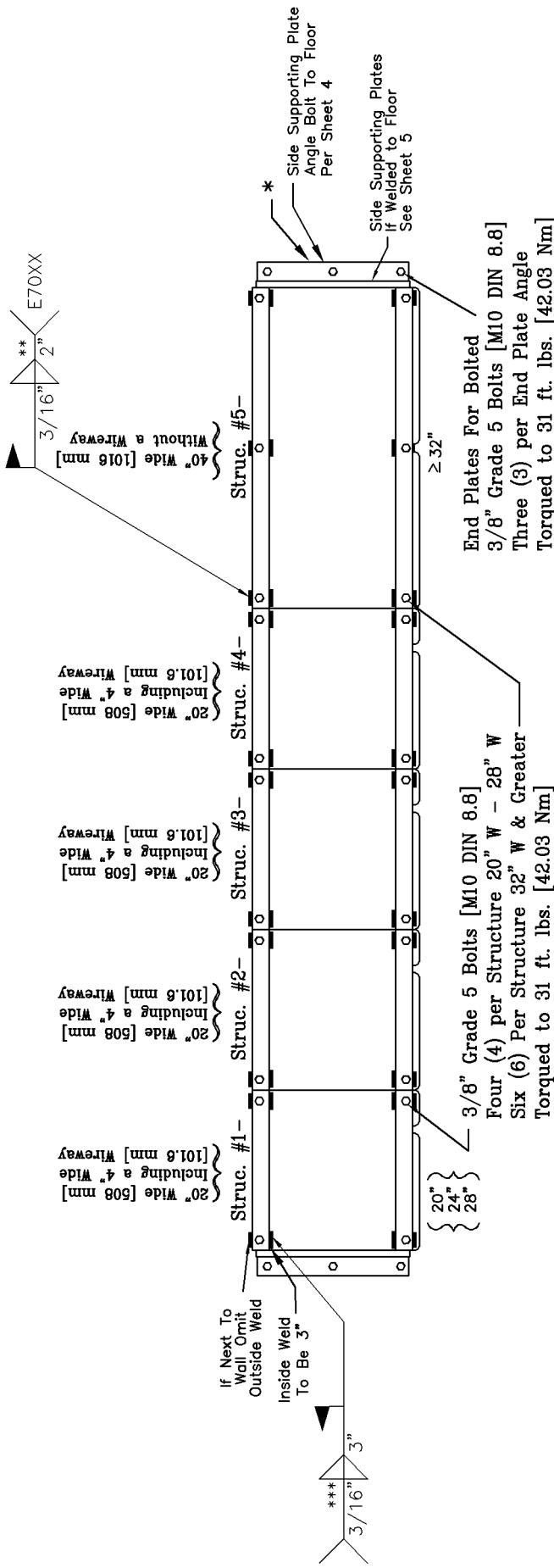
- 1.) THE TOP FRAMES ARE TO BE SCREWED TOGETHER, WITH EITHER 2 OR 4 SCREWS DEPENDING ON THE DEPTH OF THE STRUCTURES. (SHOWN ADJACENT)
- 2.) THE "C" CLIP DIMENSIONS ARE APPROXIMATE LOCATIONS FOR FRONT MOUNTED 18" [406.4 mm] & 21" [533.4 mm] DEEP STRUCTURES. THE BACK-TO-BACK STRUCTURES MAY VARY IN LOCATION BECAUSE OF LABYRINTH WITH SHUTTERS AND/OR REAR WIREWAY DOOR HINGE PLACEMENT.
- 3.) A MINIMUM OF 4 SETS OF HARDWARE ARE TO BE USED WITH EACH STRUCTURE; (1 SET AT EACH CORNER FRAME HOLE) WHEN REQUIRED.
- 4.) **F CHANNEL SILLS ARE REQUIRED THEY MUST BE IMBEDDED INTO THE FLOOR SO THE TOP OF CHANNEL SILL IS AT FLOOR LEVEL.**
- 4a) **IF TIG WELDING MCC TO CHANNEL SILLS, THE BUCKETS SHOULD BE FULLY DISENGAGED FROM THE BUS (POWER & CONTROL). IF STITCH WELDING, THE BUCKETS SHOULD BE REMOVED FROM MCC.**
- 5.) HORIZONTAL BUS SPLICE TORQUE SPEC.-
30 FT. LBS. [40.67 Nm]



NEMA 1A, 2 & 12

GENERAL INFORMATION

Cutler-Hammer		DATE 07/02/09		FAYETTEVILLE, NC	
TITLE MCC SEISMIC MOUNTING REQ. INFO.		DATE 07/02/09		SHEET 2	
TYPE		DATE 07/02/09		DWG 5A11213	
G.O. EAD038358		DWG SIZE A		SHEET 2	
FEDERAL ID NO CC		REVISION 15		G.O. EAD038358	
THE INFORMATION ON THIS DOCUMENT IS CREATED BY CUTLER-HAMMER. IT IS DISCLOSED IN CONFIDENCE AND IS ONLY TO BE USED FOR THE PURPOSE IN WHICH IT IS SUPPLIED		DFR K.BURNEY		DATE 07/02/09	
APPD R.A. MORRIS		APPD K.BURNEY		DATE 07/02/09	



NOTES:

* Weld or Bolt to Floor Per 5A11213 Sheet 4

**May Be Replaced With 3" Weld on The Outside When Interior Edge of Base Channel is Not Accessible.

Weld Per AWS D1.1

Gaskets May Exist Along The Bottom Supporting Frame. Some Gaskets May Interfer With the Welding Described in This Drawing. To Prevent Damage to Gaskets, Remove Gaskets Prior to Welding Then Re-Install Them After Welding is Completed.

Floor Plate

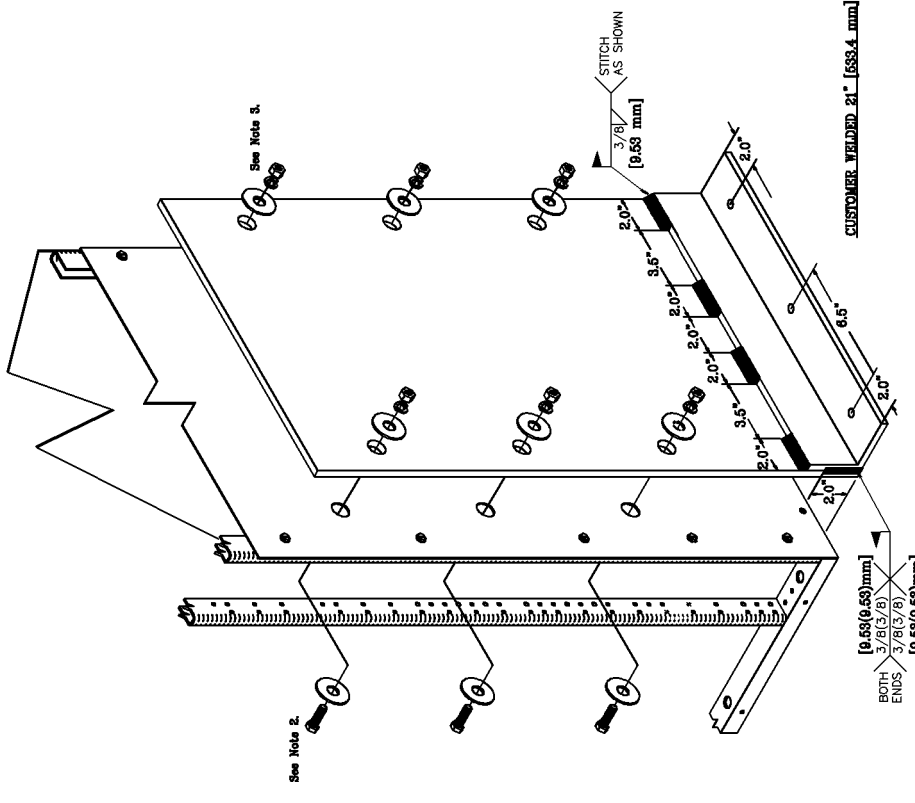
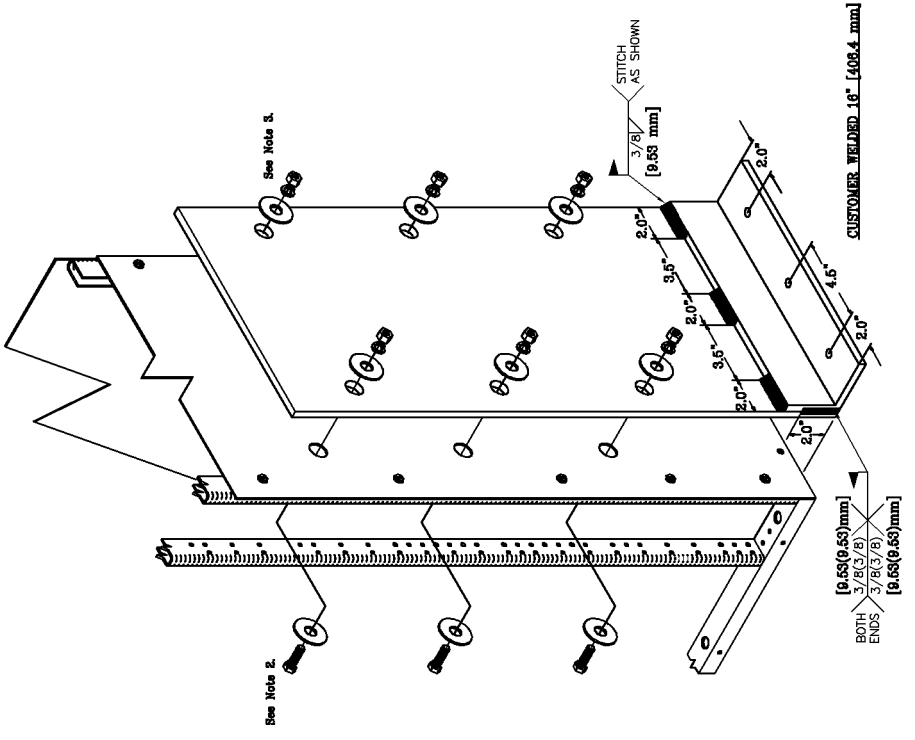
MCC Mounting Welds

Nema 1A, 2 & 12 Multiple Structure Layout
- Top View of Bottom Frame Bolt/Welded Layout
See sheet 14 of this packet for Bottom Frame Bolt Layout Dimensions.

Nema 1A, 2 & 12

THE INFORMATION ON THIS DOCUMENT IS CREATED BY CUTLER-HAMMER. IT IS DISCLOSED IN CONFIDENCE AND IS ONLY TO BE USED FOR THE PURPOSE IN WHICH IT IS SUPPLIED		DTR K.BURNEY	DATE 07/02/09	CUTLER-HAMMER FAYETTEVILLE, NC	
FEDERAL ID NO	PRODUCT CODE	APPD R.A. MORRIS	DATE 07/02/09	TITLE	MCC SEISMIC MOUNTING REQ. INFO.
CC	CC	APPD K.BURNEY	DATE 07/02/09	TYPE	
		REVISION	DWG SIZE	G.O.	SHEET
		15	A	EAD038358	3
				5A11213	

[Metric Conversions]



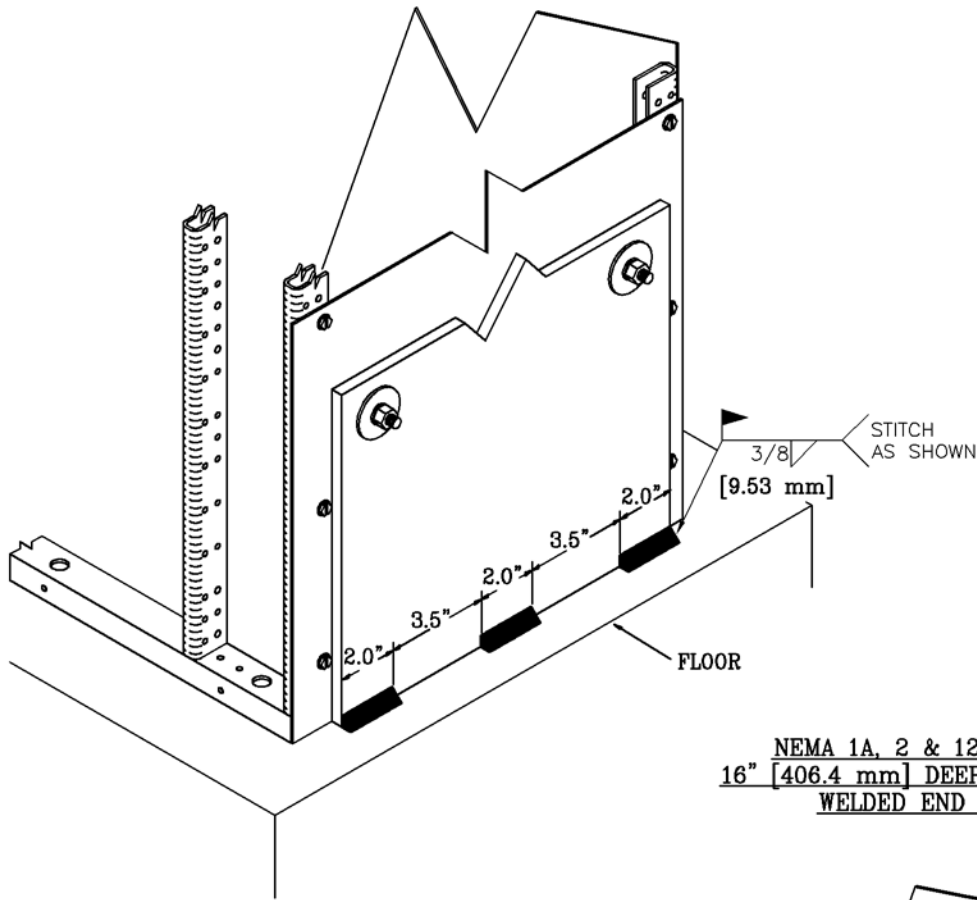
- Notes:**
- CUSTOMERS SEISMIC PLATE MOUNTING INSTRUCTIONS:
 - REMOVE SIDE SHEET SCREWS FROM BOTH END STRUCTURES OF THE LINE UP.
 - AGAINST THE EDGE OF THE PLATE ON THE FLOOR, UP THE SIDE SHEET. CENTERING THE PLATE IN BETWEEN THE SIDE SHEET SCREW HEADS.
 - IF HOLES ARE NOT SUPPLIED USING THE 6 PLATE HOLES AS A TEMPLATE, MARK EACH SIDE SHEET.
 - USE A 0.437 DIA. DRILL BIT.
 - THE HARDWARE USED MUST BE 3/8-16 GRADE 5 [M10 DIN 8.8] BOLTS.
 - TORQUE SPEC. 31 FT. LBS. [42.03 N m].
 - FOLLOW EITHER THE BOLTED OR WELDED REQUIREMENT FROM SHEET 4, & 5.
 - WELD PER AWS D1.1

**NEMA 1A, 2 & 12 INDOOR –
FOR CUSTOMER MOUNTED
SEISMIC PLATES:**

NEMA 1A, 2 & 12

THE INFORMATION ON THIS DOCUMENT IS CREATED BY CUTLER-HAMMER. IT IS DISCLOSED IN CONFIDENCE AND IS ONLY TO BE USED FOR THE PURPOSE IN WHICH IT IS SUPPLIED		DFR K.BURNEY	DATE 07/02/09	FATON Cutler-Hammer	FAYETTEVILLE, NC
FEDERAL ID NO		APPD R.A. MORRIS	DATE 07/02/09	TITLE MCC SEISMIC MOUNTING REQ. INFO.	
PRODUCT CODE CC	REVISION 15	APPD K.BURNEY	DATE 07/02/09	TYPE	
DWG SIZE A	DWG NO EAD038358			G.O.	SHEET 4
					5A11213

[Metric Conversion : 2.0" = 50.8 mm]
[3.5" = 88.9 mm]
[6.5" = 165.1 mm]

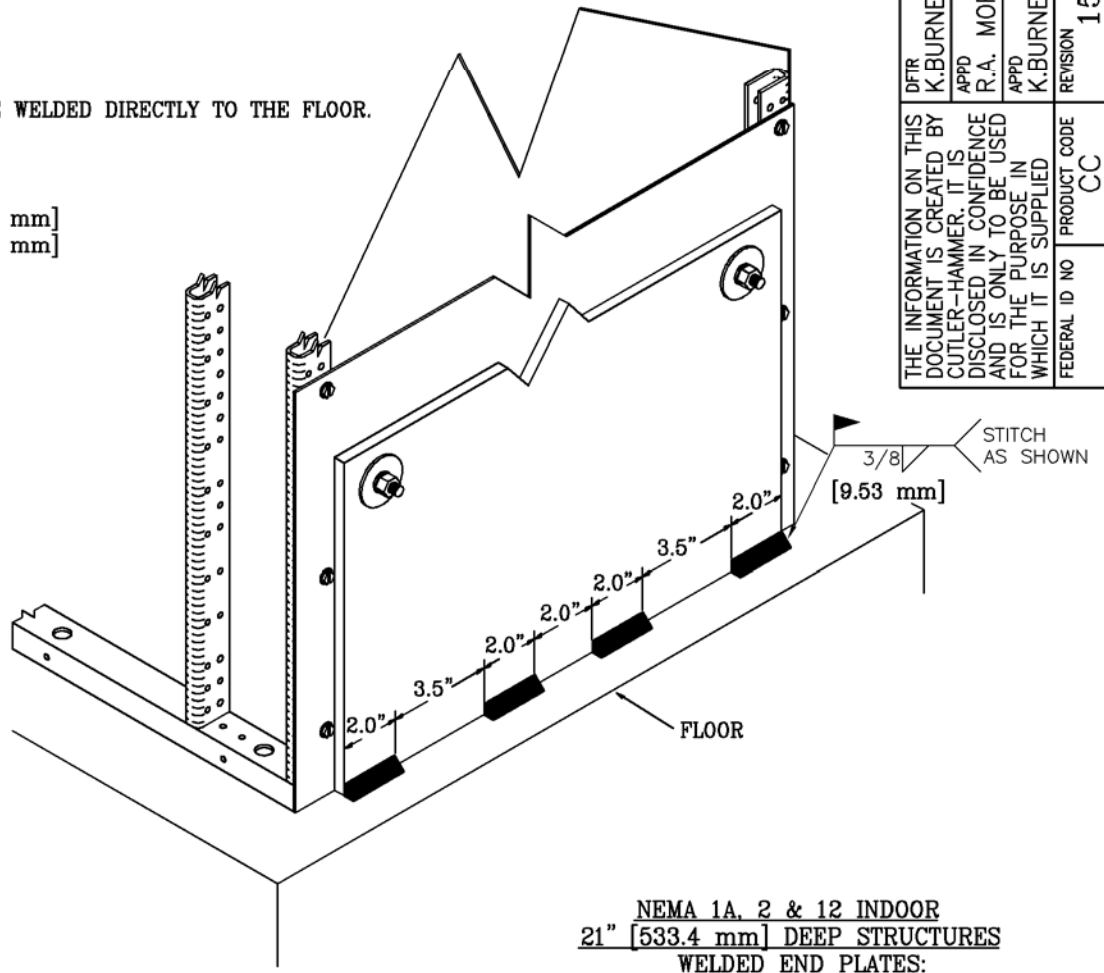


NEMA 1A, 2 & 12 INDOOR
 16" [406.4 mm] DEEP STRUCTURES
 WELDED END PLATES:

Notes:

- A.) THE ENDPLATES ARE TO BE WELDED DIRECTLY TO THE FLOOR.
- B.) WELD PER AWS D1.1

[Metric Conversion : 2.0"=50.8 mm]
 [3.5"=88.9 mm]



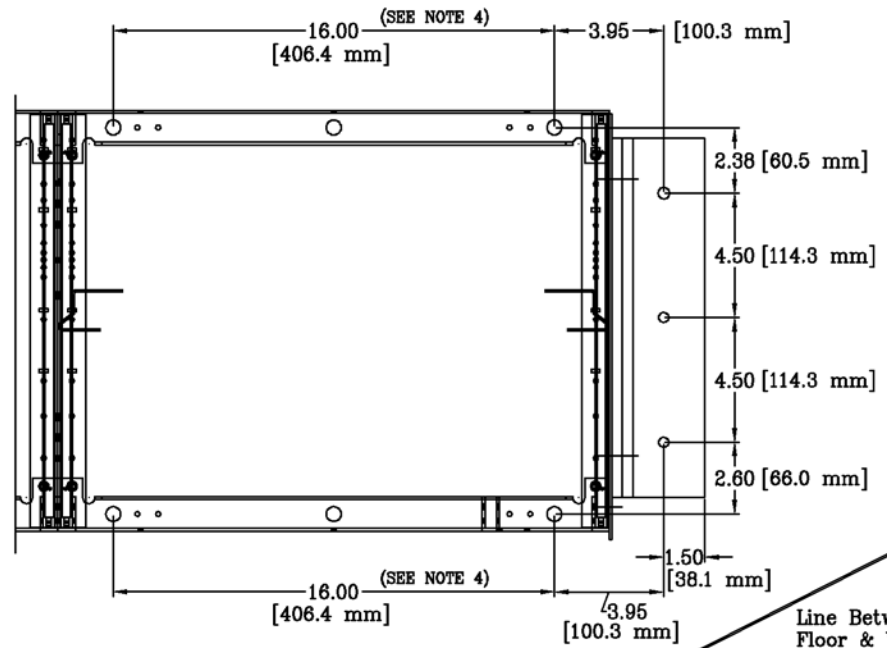
NEMA 1A, 2 & 12 INDOOR
 21" [533.4 mm] DEEP STRUCTURES
 WELDED END PLATES:

NEMA 1A, 2 & 12

FATOM Cutler-Hammer		FAYETTEVILLE, NC	
DATE 07/02/09		TITLE MCC SEISMIC MOUNTING REQ. INFO.	
DTR K.BURNEY		TYPE	
APPD R.A. MORRIS		DATE 07/02/09	
APPD K.BURNEY		DATE 07/02/09	
REVISION 15		DWG SIZE A	
THE INFORMATION ON THIS DOCUMENT IS CREATED BY CUTLER-HAMMER. IT IS DISCLOSED IN CONFIDENCE AND IS ONLY TO BE USED FOR THE PURPOSE IN WHICH IT IS SUPPLIED		G.O. EAD038358	
FEDERAL ID NO PRODUCT CODE CC		DWG 5A11213	
		SHEET 5	

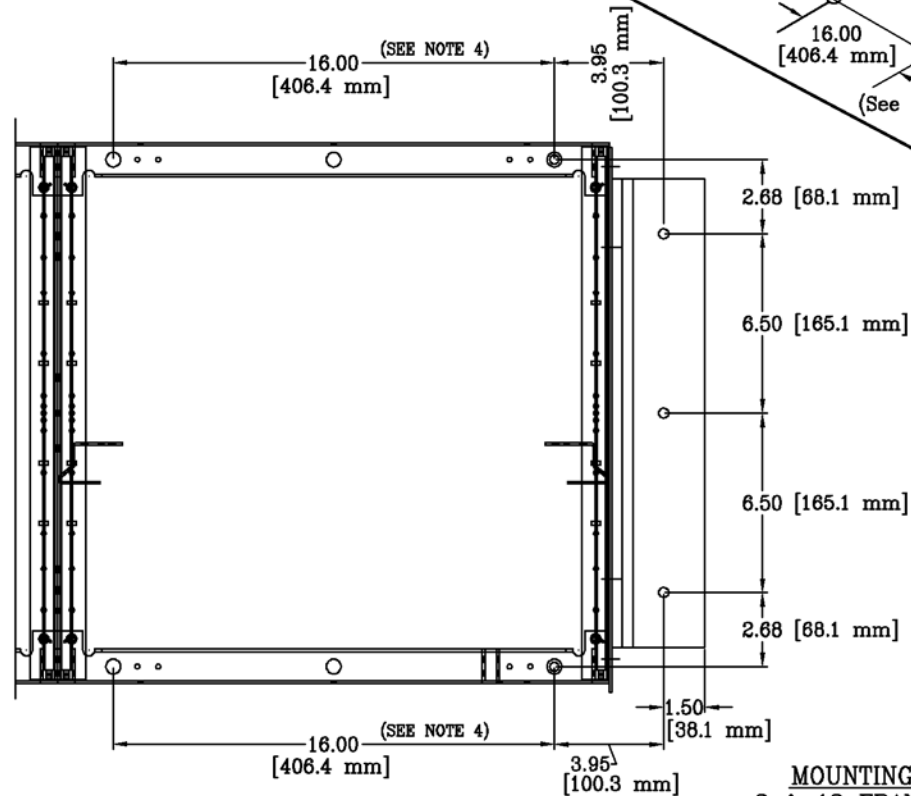
ADDITIONAL STRUCTURES ATTACH FROM THIS END

16" Dp. STRUCTURE FRONT

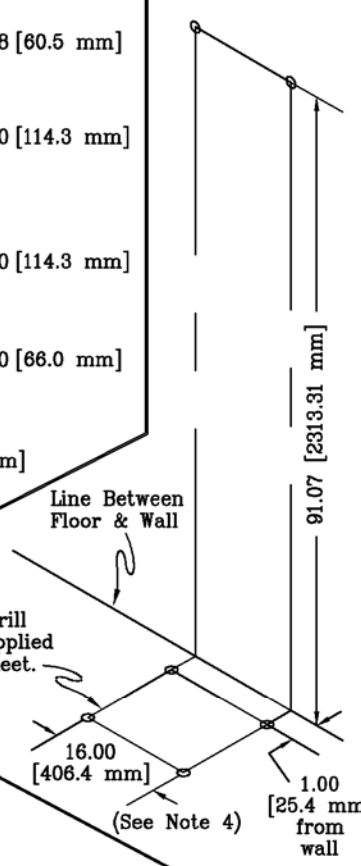


ADDITIONAL STRUCTURES ATTACH FROM THIS END

21" Dp. STRUCTURE FRONT



Wall Brace & Floor Drilling Pattern
(See Note 4 & 5)



- Notes:**
- 1.) ALL DIMENSIONS ARE REVERSED WHEN MOUNTING THE ENDPLATES AND MOUNTING ANGLES ON THE LEFT SIDE OF A STRUCTURE OR AN ENTIRE LINE-UP OF STRUCTURES.
 - 2.) ALL MOUNTING HOLES ARE FOR 3/8" DIA. GRADE 5 HARDWARE [M10 DIN 8.8].
 - 3.) SEE ACCOMPANYING FLOOR PLANS FOR ADDITIONAL DIMENSIONS.
 - 4.) THIS DIMENSION IS A VARIABLE, BASED ON THE STRUCTURE WIDTH.
 - 5.) DIMENSION IS BASED ON - THE DISTANCE FROM THE BOTTOM OF THE STRUCTURE OR THE TOP OF THE CHANNEL SILL.

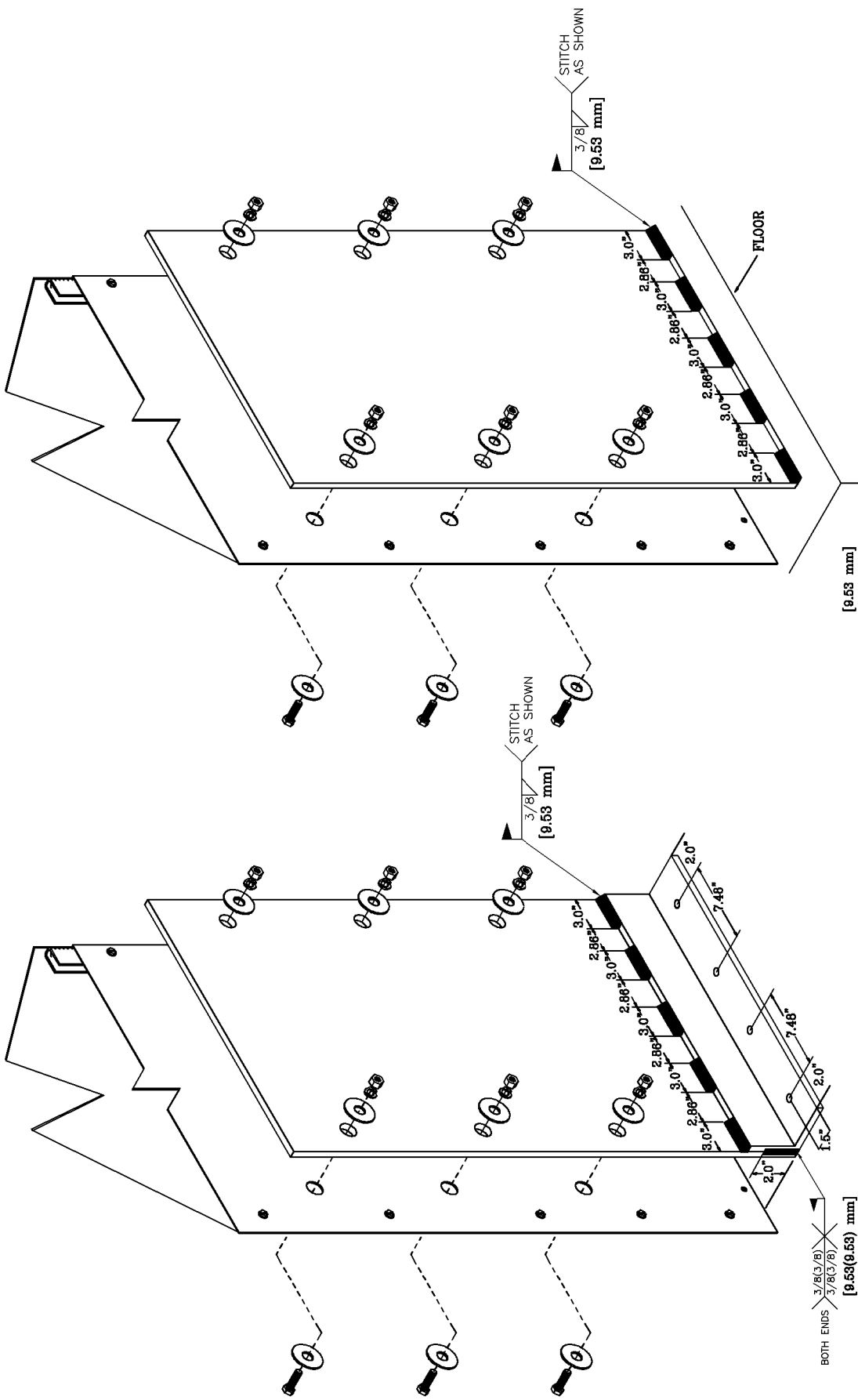
MOUNTING HOLES OF BOTH Nema 1A, 2 & 12 FRAME DEPTHS - 16" & 21" Deep STRUCTURE WITH SEISMIC END PLATES, END PLATE ANGLES AND WALL MOUNTING BRACES
See Sheet 17 & 18 for Additional Information.

NEMA 1A, 2 & 12

Autler-Hammer TITLE MCC SEISMIC MOUNTING REQ. INFO. TYPE DATE 07/02/09 REVISION 15 DWG SIZE A DWG EAD038358 G.O. 5A11213 SHEET 6		DATE 07/02/09 DATE 07/02/09 DATE 07/02/09	DFTD K.BURNEY APPD R.A. MORRIS APPD K.BURNEY	FAYETTEVILLE, NC MCC SEISMIC MOUNTING REQ. INFO. TYPE DATE 07/02/09 REVISION 15 DWG SIZE A DWG EAD038358 G.O. 5A11213 SHEET 6
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FEDERAL ID NO PRODUCT CODE CC



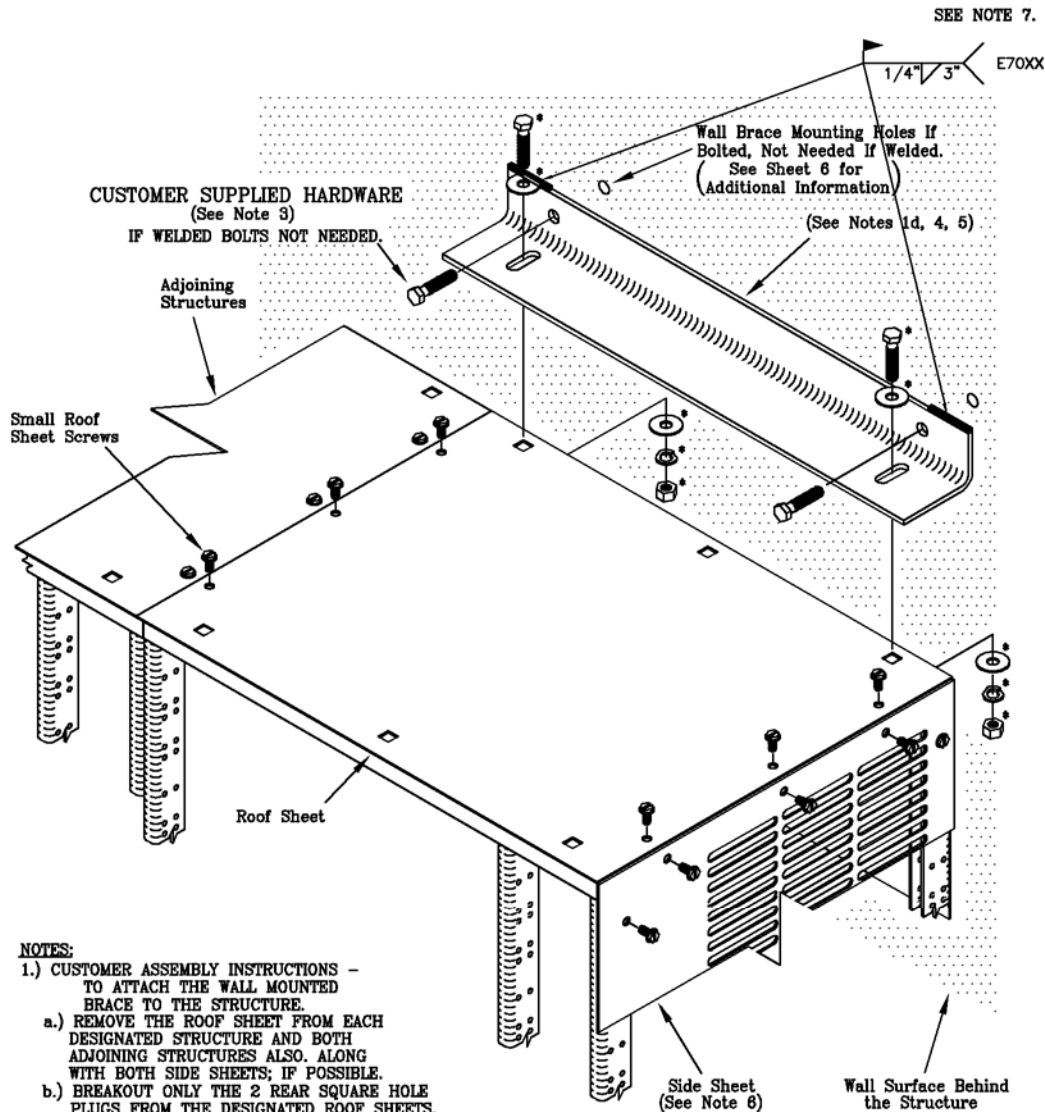
18 PULSE CLEAN POWER
 CUSTOMER WELDED 30.44" [773.2 mm]
 DEEP STRUCTURE SEISMIC PLATES.
 See Sheet 8 for Additional Information

[Metric Conversion : 2.0" = 50.8 mm]
 [3.0" = 76.2 mm]
 [3.36" = 85.34 mm]
 [7.48" = 189.99 mm]

NOTE:
 1) WELD PER AWS D1.1

DFR	K.BURNEY	DATE	07/02/09	FATON Cutler-Hammer	FAYETTEVILLE, NC
APPD	R.A. MORRIS	DATE	07/02/09	TITLE	MCC SEISMIC MOUNTING REQ. INFO.
APPD	K.BURNEY	DATE	07/02/09	TYPE	
FEDERAL ID NO	CC	REVISION	15	DWG SIZE	A
PRODUCT CODE	CC	DWG	EAD038358		SHEET
					7

NEMA 1A, 2 & 12



NOTES:

- 1.) CUSTOMER ASSEMBLY INSTRUCTIONS - TO ATTACH THE WALL MOUNTED BRACE TO THE STRUCTURE.
 - a.) REMOVE THE ROOF SHEET FROM EACH DESIGNATED STRUCTURE AND BOTH ADJOINING STRUCTURES ALSO. ALONG WITH BOTH SIDE SHEETS; IF POSSIBLE.
 - b.) BREAKOUT ONLY THE 2 REAR SQUARE HOLE PLUGS FROM THE DESIGNATED ROOF SHEETS.
 - c.) REPLACE THE DESIGNATED ROOF SHEETS USING ONLY THE 6 SMALL SIDE SCREWS. MAKE SURE TO REPLACE THE ROOF SHEET WITH THE WIDE EDGE FACING OR HANGING OVER THE DOOR SIDE OF THE STRUCTURE.
 - d.) PLACE THE "L" SHAPED BRACE ACROSS THE REAR OF THE STRUCTURE FROM LEFT TO RIGHT; AS SHOWN, LINE UP THE 2 SQUARE ROOF SHEET HOLES WITH THE SLOTS IN THE "L" SHAPED BRACE. (SEE SHEET 18 FOR MULTIPLE STRUCTURE LAYOUTS)
 - e.) SEE THE * SYMBOL TO SHOW THE ASSEMBLY OF THE BOLTS, FLAT WASHERS, LOCKWASHERS AND NUTS. (TORQUE SPECIFICATIONS ARE 28 ft. lbs. [37.96 Nm])
 - f.) IF A LIFTING EYE PRESS NUT IS PRESENT IN THE FRAME, REMOVAL IS NOT REQUIRED OR RECOMMENDED. ONLY USE THE BOLT AND FLAT WASHER THROUGH THE TOP OF THE "L" SHAPED BRACE AND TORQUE DOWN THE BOLT.
 - g.) AFTER THE DESIGNATED STRUCTURES "L" BRACES ARE COMPLETELY MOUNTED & TORQUED, TO BOTH THE STRUCTURE AND THE WALL, CAN THE ADJOINING STRUCTURES ROOF SHEETS AND SIDE SHEETS BE RE-ASSEMBLED.
- 2.) THE SUPPLIED HARDWARE (BOLTS) ARE 3/8-16 GRADE 5. [THE METRIC EQUIVALENT IS - M10 DIN 8.8]
- 3.) THE CUSTOMER SUPPLIED HARDWARE SHOULD BE 3/8-16 GRADE 5 [M10 DIN 8.8]
- 4.) THE STRUCTURE MAY BE PLACED, A MINIMUM DISTANCE OF 0.06" [1.54 mm] AND A MAXIMUM DISTANCE OF 0.94" [23.87 mm], FROM A REAR WALL. THIS DISTANCE IS MEASURED FROM THE STRUCTURES BACK SHEET SCREW HEADS TO THE 90° BENT FLANGE OF THE WALL MOUNTED BRACE.
- 5.) THE STRUCTURE SHOULD BE AS PARALLEL AS POSSIBLE TO THE REAR WALL; TO REDUCE DEFLECTION UPON A SEISMIC OCCURANCE.
- 6.) THE STRUCTURE MAY OR MAY NOT BE SUPPLIED WITH A VENTILATED SIDE SHEET. (A VENTILATED SIDE SHEET IS SHOWN)
- 7.) ANGLE IS WELDED (AT BOTH ENDS) TO POWER HOUSE STEEL SIDE WALL.
- 8.) WELD PER AWS D1.1

Nema 1A, 2 & 12 -
Customer Assembly View
of a Front Mounted Only
Structure (Wall Brace)
with Structure Mounted
Next to a Wall.

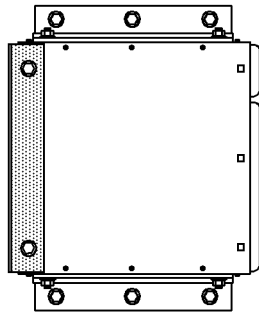
Multiple Structure Assembly Views
are on Layout Sheet 9

WELDED OR BOLTED TO WALL

Nema 1A, 2 & 12

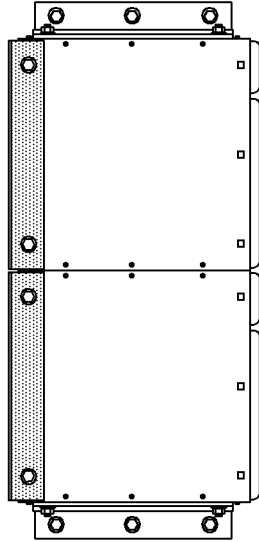
F.T.M. Cutler-Hammer		FAYETTEVILLE, NC	
DTR	DATE	TITLE	TYPE
K.BURNEY	07/02/09	MCC SEISMIC MOUNTING REQ. INFO.	
APPD	DATE		
R.A. MORRIS	07/02/09		
APPD	DATE		
K.BURNEY	07/*02/09		
REVISION	DWG SIZE	G.O.	SHEET
15	A	EAD038358	8
FEDERAL ID NO		PRODUCT CODE	
CC		CC	

DWG 5A11213



Struc. #1

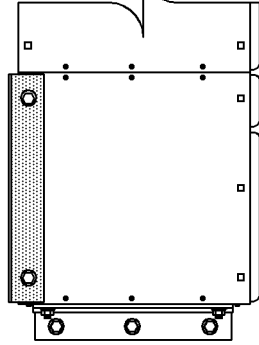
Layout for 1 Structure*



Struc. #1

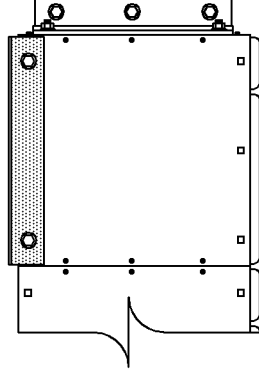
Struc. #2

Layout for 2 Structures*



Struc. #1

Layout for 3 to 6 Structures*



Struc. #1

Struc. #2

Struc. #3

Struc. #4

Struc. #5

Struc. #6

Struc. #7

Struc. #8

Struc. #9

Struc. #10

Struc. #11

Struc. #12

Struc. #13

Struc. #14

Struc. #15

Struc. #16

Struc. #17

Struc. #18

Struc. #19

Struc. #20

Struc. #21

Struc. #22

Struc. #23

Struc. #24

Struc. #25

Struc. #26

Struc. #27

Struc. #28

Struc. #29

Struc. #30

Struc. #31

Struc. #32

Struc. #33

Struc. #34

Struc. #35

Struc. #36

Struc. #37

Struc. #38

Struc. #39

Struc. #40

Struc. #41

Struc. #42

Struc. #43

Struc. #44

Struc. #45

Struc. #46

Struc. #47

Struc. #48

Struc. #49

Struc. #50

Struc. #51

Struc. #52

Struc. #53

Struc. #54

Struc. #55

Struc. #56

Struc. #57

Struc. #58

Struc. #59

Struc. #60

Struc. #61

Struc. #62

Struc. #63

Struc. #64

Struc. #65

Struc. #66

Struc. #67

Struc. #68

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Struc. #70

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Struc. #92

Struc. #93

Struc. #94

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Struc. #101

Struc. #102

Struc. #103

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Struc. #125

Struc. #126

Struc. #127

Struc. #128

Struc. #129

Struc. #130

Struc. #131

Struc. #132

Struc. #133

Struc. #134

Struc. #135

Struc. #136

Struc. #137

Struc. #138

Struc. #139

Struc. #140

Struc. #141

Struc. #142

Struc. #143

Struc. #144

Struc. #145

Struc. #146

Struc. #147

Struc. #148

Struc. #149

Struc. #150

Struc. #151

Struc. #152

Struc. #153

Struc. #154

Struc. #155

Struc. #156

Struc. #157

Struc. #158

Struc. #159

Struc. #160

Struc. #161

Struc. #162

Struc. #163

Struc. #164

Struc. #165

Struc. #166

Struc. #167

Struc. #168

Struc. #169

Struc. #170

Struc. #171

Struc. #172

Struc. #173

Struc. #174

Struc. #175

Struc. #176

Struc. #177

Struc. #178

Struc. #179

Struc. #180

Struc. #181

Struc. #182

Struc. #183

Struc. #184

Struc. #185

Struc. #186

Struc. #187

Struc. #188

Struc. #189

Struc. #190

Struc. #191

Struc. #192

Struc. #193

Struc. #194

Struc. #195

Struc. #196

Struc. #197

Struc. #198

Struc. #199

Struc. #200

Struc. #201

Struc. #202

Struc. #203

Struc. #204

Struc. #205

Struc. #206

Struc. #207

Struc. #208

Struc. #209

Struc. #210

Struc. #211

Struc. #212

Struc. #213

Struc. #214

Struc. #215

Struc. #216

Struc. #217

Struc. #218

Struc. #219

Struc. #220

Struc. #221

Struc. #222

Struc. #223

Struc. #224

Struc. #225

Struc. #226

Struc. #227

Struc. #228

Struc. #229

Struc. #230

Struc. #231

Struc. #232

Struc. #233

Struc. #234

Struc. #235

Struc. #236

Struc. #237

Struc. #238

Struc. #239

Struc. #240

Struc. #241

Struc. #242

Struc. #243

Struc. #244

Struc. #245

Struc. #246

Struc. #247

Struc. #248

Struc. #249

Struc. #250

Struc. #251

Struc. #252

Struc. #253

Struc. #254

Struc. #255

Struc. #256

Struc. #257

Struc. #258

Struc. #259

Struc. #260

Struc. #261

Struc. #262

Struc. #263

Struc. #264

Struc. #265

Struc. #266

Struc. #267

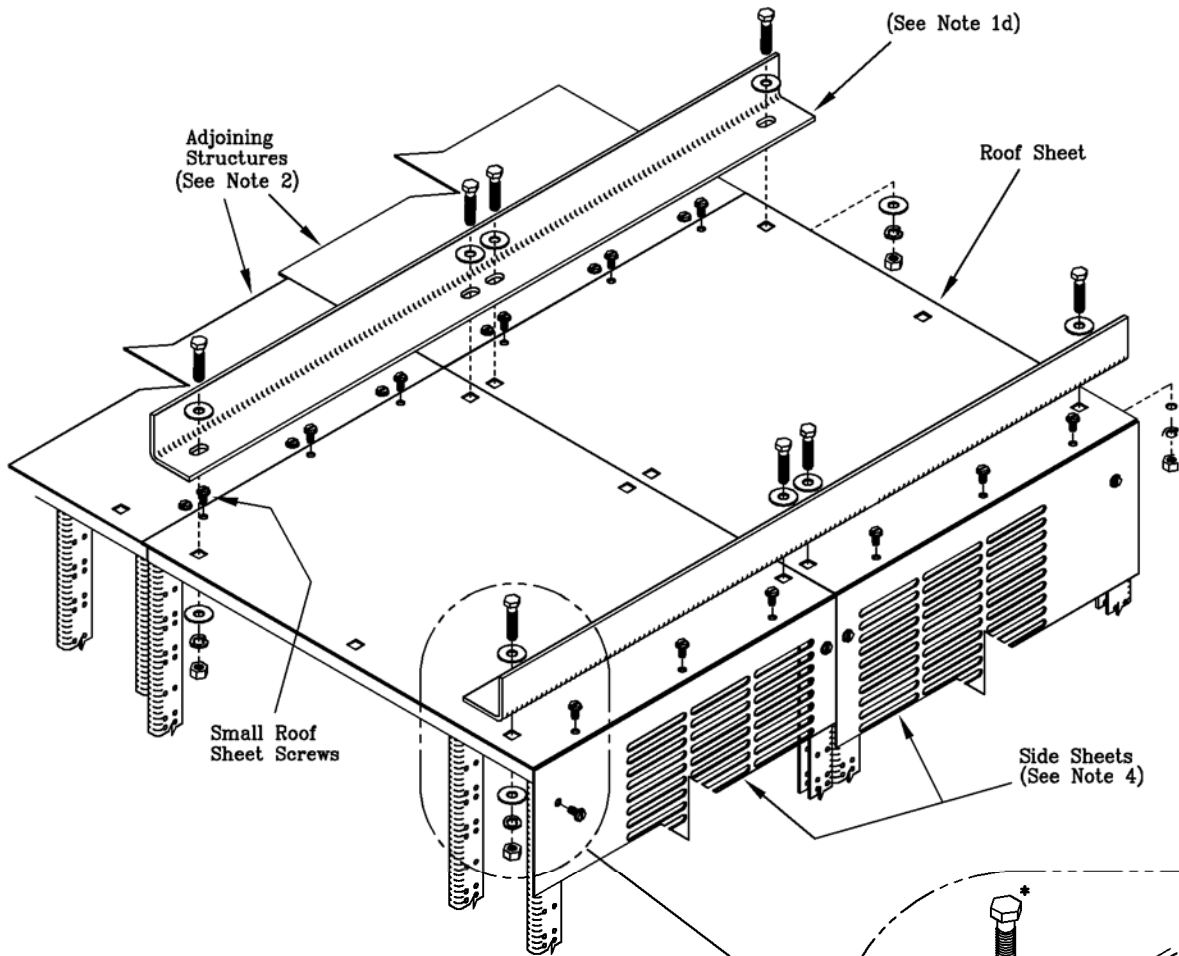
Struc. #268

Struc. #269

Struc. #270

Struc. #271

Struc. #272



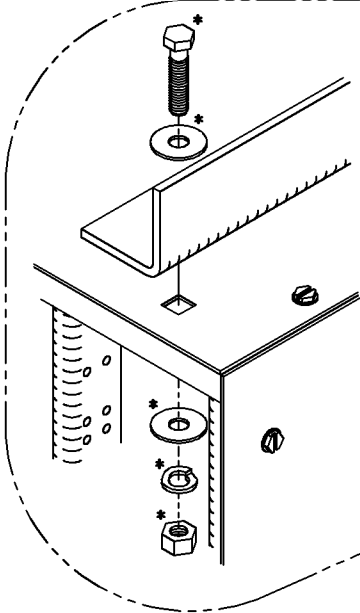
Nema 1A, 2 & 12

NOTES:

- 1.) CUSTOMER ASSEMBLY INSTRUCTIONS - TO ATTACH THE TOP FRAME BRACES.
 - a.) BOTH ROOF SHEETS FROM EACH DESIGNATED STRUCTURE PAIR (FRONT & REAR) MUST BE REMOVED, ALONG WITH THE LIFTING EYES. ALSO REMOVE THE ADJOINING STRUCTURES TWO ROOF SHEETS AND EACH ENDS SIDE SHEETS.
 - b.) BREAKOUT THE SQUARE HOLE PLUGS, FROM THE 4 CORNER HOLES, OF BOTH ROOF SHEETS.
 - c.) REPLACE EACH ROOF SHEET USING ONLY THE 6 SMALL SIDE SCREWS. MAKE SURE TO REPLACE EACH ROOF SHEET WITH THE WIDE EDGE FACING OR HANGING OVER THE DOOR SIDE OF EACH STRUCTURE.
 - d.) PLACE BOTH OF THE "L" SHAPED BRACES ACROSS THE STRUCTURE FROM FRONT TO BACK; AS SHOWN. LINE UP THE 4 SQUARE ROOF SHEET HOLES WITH THE SLOTS IN THE "L" SHAPED BRACE. (SEE SHEET 20 FOR MULTIPLE STRUCTURE LAYOUTS)
 - e.) USE THE DETAIL VIEW OF THIS DRAWING, FOR THE ASSEMBLY ORDER OF THE BOLTS, FLAT WASHERS, LOCKWASHERS AND NUTS. (TORQUE SPEC. 28 FT. LBS. [37.96 Nm])
 - f.) IF A LIFTING EYE PRESS NUT IS PRESENT IN THE FRAME, REMOVAL IS NOT REQUIRED OR RECOMMENDED. ONLY USE THE BOLT AND FLAT WASHER THROUGH THE TOP OF THE "L" SHAPED BRACE AND TORQUE DOWN THE BOLT.
 - g.) AFTER EACH PAIR OF "L" BRACES ARE MOUNTED & TORQUED; CAN THE RE-ASSEMBLY OF THE ROOF SHEETS AND SIDE SHEETS TAKE PLACE.

BACK, A SMALL GAP IS LEFT INBETWEEN THE TWO FACING BACK SHEETS :
 THE GAP IS 0.23" [0.009 mm] FOR TWO ROWS OF 16" DEEP STRUCTURES;
 THE GAP IS 0.60" [0.023 mm] FOR TWO ROWS OF 21" DEEP STRUCTURES;
 THE GAP IS 0.42" [0.016 mm] FOR 1 ROW OF 16" DEEP AND
 1 ROW OF 21" DEEP STRUCTURES;
 (THESE DISTANCES ARE APPROXIMATIONS ONLY.)

[THE METRIC EQUIVALENT IS - M10 DIN 8.8]
 (VENTILATED SIDE SHEETS ARE SHOWN)

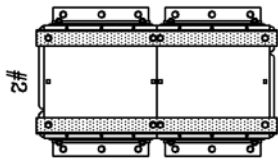


DETAIL VIEW
 (* = See Note 1e)
 Scale: 2X

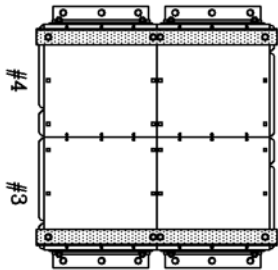
Nema 1A, 2 & 12 -
Customer Assembly View
of 2 Structures Mounted
Back-to-Back and
Top Frame Braces

Multiple Structure Assembly Views
 are on Layout Sheet 11 & Drilling
 Floor Plan Views are on Sheet 12

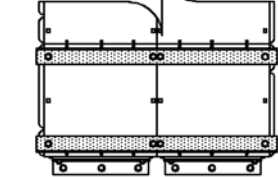
Cutler-Hammer		DATE 07/02/09 DFR K.BURNEY		DATE 07/02/09 APPD R.A.MORRIS		DATE 07/02/09 APPD K.BURNEY		DATE 07/02/09 REVISION 15		DATE 07/02/09 DFR K.BURNEY	
TITLE MCC SEISMIC MOUNTING REQ. INFO.		TYPE		G.O. EAD038358		DWG 5A11213		SHEET 10		FAYETTEVILLE, NC	
FEDERAL ID NO		PRODUCT CODE CC		THE INFORMATION ON THIS DOCUMENT IS CREATED BY CUTLER-HAMMER. IT IS DISCLOSED IN CONFIDENCE AND IS ONLY TO BE USED FOR THE PURPOSE IN WHICH IT IS SUPPLIED		REVISION 15		DWG SIZE A		G.O. EAD038358	



Two VC's #1 & 2 Laidout as 1 Bolted Back-to-Back Structure*

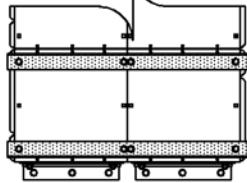


Four VC's #1 thru 4 Laidout as 2 Bolted Back-to-Back Structures*

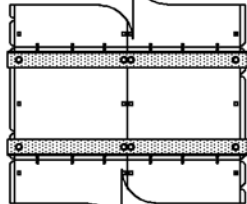


Laidout for 3 to 6 Structures*

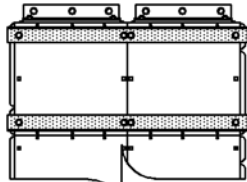
- #1 = 2 Front, 2 Structures Total
- #2 = 4 Front, 4 Structures Total
- #3 = 3 Front, 6 Structures Total
- #4 = 4 Front, 8 Structures Total
- #5 = 5 Front, 10 Structures Total
- #6 = 6 Front, 12 Structures Total



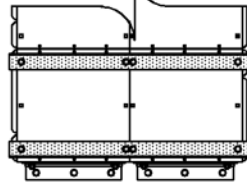
Laidout for 7 to 11 Structures*



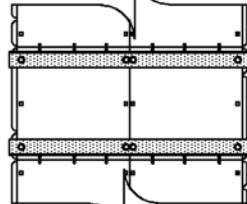
#4 + #5,6
#4 + #5,6,7
#4 + #5,6,7,8
#5 + #6,7,8,9
#5 + #7,8,9,10



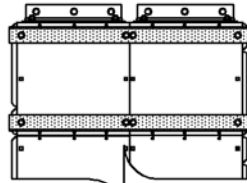
#7 = 7 Front, 14 Structures Total
#8 = 8 Front, 16 Structures Total
#9 = 9 Front, 18 Structures Total
#10 = 10 Front, 20 Structures Total
#11 = 11 Front, 22 Structures Total



Laidout for 12 to 16 Structures*



#5 + #6,7
#5 + #6,7,8
#5 + #6,7,8,9
#5 + #6,7,8,9,10
#6 + #7,8,9,10,11
#6 + #9,10,11,12
#6 + #10,11,12,13
#6 + #11,12,13,14
#6 + #12,13,14,15



#8 + #9,10,11 + #12 = 12 Front, 24 Structures Total
#9 + #10,11,12 + #13 = 13 Front, 26 Structures Total
#10 + #11,12,13 + #14 = 14 Front, 28 Structures Total
#11 + #12,13,14 + #15 = 15 Front, 30 Structures Total
#12 + #13,14,15 + #16 = 16 Front, 32 Structures Total

Top Structure View of the "Top Frame Braces" Assemblies Laidout for the Bolted Back-to-Back Structures.
Total Number of Structures are from 2 to 32 Front & Rear.

Notes:

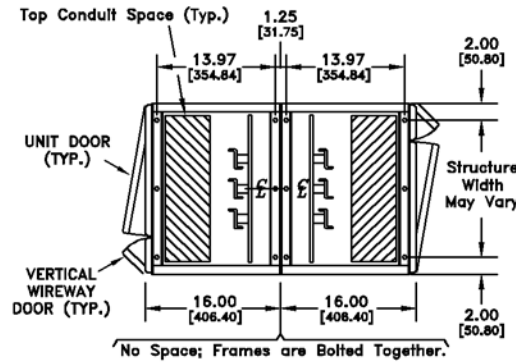
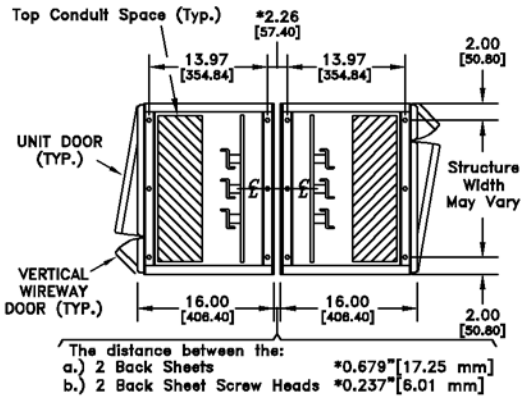
- 1.) There is a Maximum of 4 F.M.O. Structures (8 total) In-Between Two Structures with "Top Frame Braces" Mounted on Top of them.
- 2.) Structure line ups Exceeding 16 F.M.O. Structures are to follow Note 1.

NEMA 1A, 2 & 12

VC = Vertical Compartment (Structure)
F.M.O. = Front Mounted Only
* = End Plates & Angles are Shown for Clarity, They May or May Not Be Supplied.
^ = Wall Mounted Braces Are Shown Shaded.

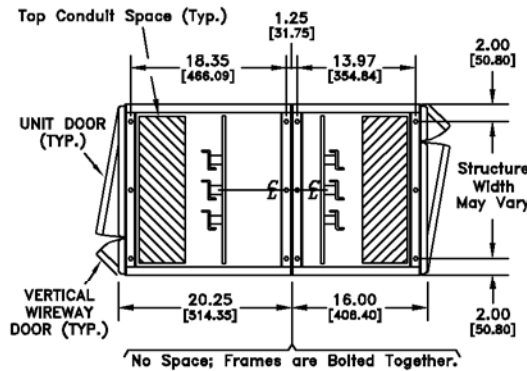
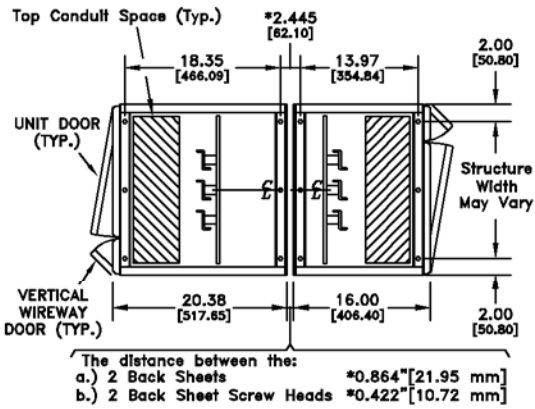
<p>THE INFORMATION ON THIS DOCUMENT IS CREATED BY CUTLER-HAMMER. IT IS DISCLOSED IN CONFIDENCE AND IS ONLY TO BE USED FOR THE PURPOSE IN WHICH IT IS SUPPLIED</p>		<p>DATE 07/02/09</p>	<p>DATE 07/02/09</p>	<p>DATE 07/02/09</p>	<p>DATE 07/02/09</p>	<p>DATE 07/02/09</p>	<p>DATE 07/02/09</p>	<p>DATE 07/02/09</p>	<p>DATE 07/02/09</p>	<p>DATE 07/02/09</p>	<p>DATE 07/02/09</p>
<p>DFTR K.BURNEY</p>	<p>APPD R.A.MORRIS</p>	<p>APPD K.BURNEY</p>	<p>REVISION 15</p>	<p>DWG SIZE A</p>	<p>G.O. EAD038358</p>	<p>DWG 5A11213</p>	<p>SHEET 11</p>	<p>■ ATON Cutler-Hammer</p>	<p>FAYETTEVILLE, NC</p>	<p>TITLE MCC SEISMIC MOUNTING REQ. INFO.</p>	<p>TYPE</p>

"FRONT MOUNTED ONLY/BACK-TO-BACK" STRUCTURE LAYOUTS FOR:



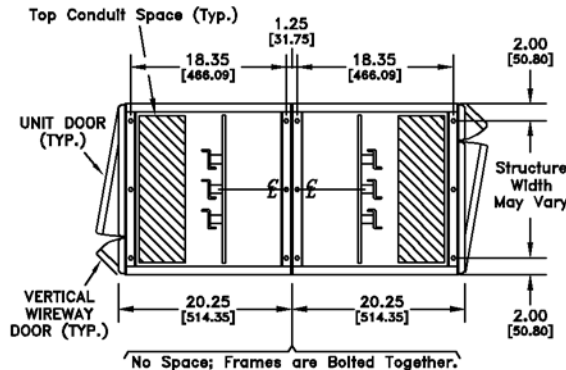
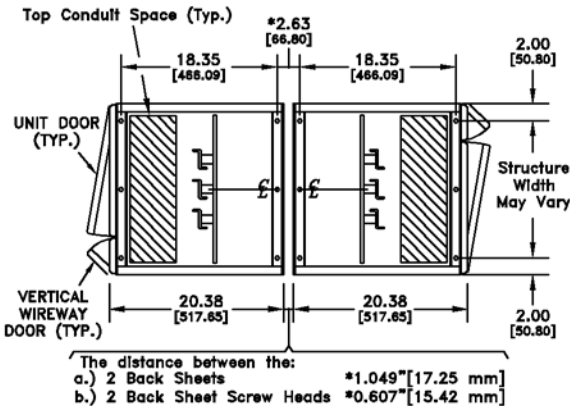
**DOUBLE 16" Dp.
STRUCTURES**

- Notes:**
 1.) FOR ADDITIONAL INFORMATION SEE THE STANDARD FLOOR PLAN DRAWING: 4710A30
 2.) * = APPROXIMATE DISTANCE



**ONE 16" & 21"
Dp. STRUCTURE**

- Notes:**
 1.) FOR ADDITIONAL INFORMATION SEE THE STANDARD FLOOR PLAN DRAWING: 4710A30 & 4710A31
 2.) * = APPROXIMATE DISTANCE



DOUBLE 21" Dp. STRUCTURES

- Notes:**
 1.) FOR ADDITIONAL INFORMATION SEE THE STANDARD FLOOR PLAN DRAWING: 4710A31
 2.) * = APPROXIMATE DISTANCE

General Notes:
 1.) FOR ADDITIONAL DRILLING/MOUNTING INFORMATION SEE SHEETS 14, 19 & 20.

Nema 1A, 2 & 12

Autler-Hammer		FAYETTEVILLE, NC	
DATE	DATE	TITLE	TYPE
07/02/09	07/02/09	MCC SEISMIC MOUNTING REQ. INFO.	
DFT	APPD		
K.BURNEY	R.A.MORRIS		
REVISION	DATE	G.O.	SHEET
15	07/02/09	EAD038358	12
FEDERAL ID NO		PRODUCT CODE	
CC		CC	

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Nema 1A, 2 & 12 - Drilling
 Pattern of 2 Structures: Front
 Mounted Only/Back-to-Back

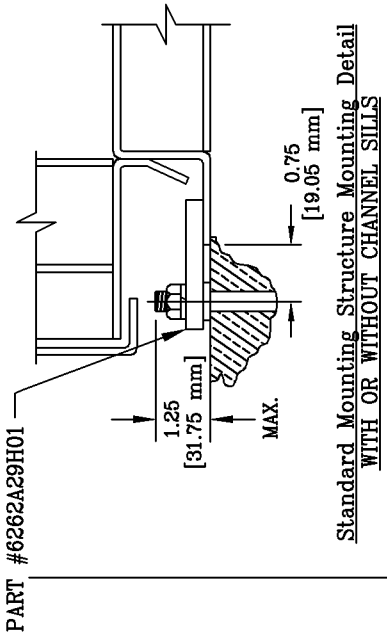
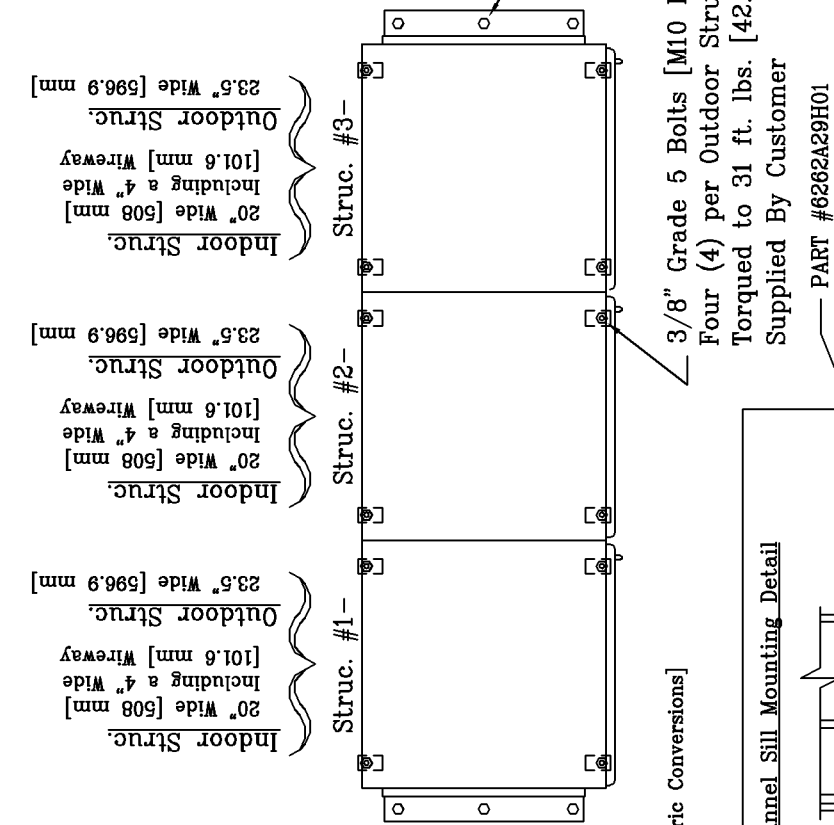
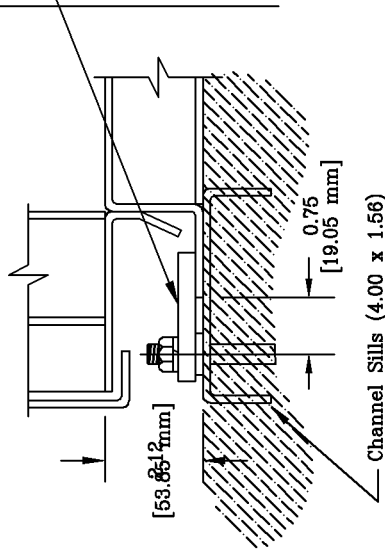


FIG. 1



[Metric Conversions]

Channel Sill Mounting Detail



Channel Sills (4.00 x 1.56)

Supplied Only When Specified.

[CHANNEL SILLS MUST BE IMBEDDED INTO THE FLOOR SO THAT THE TOP OF THE CHANNEL SILL IS AT FLOOR LEVEL]

FIG. 2

Nema 3R Non-Walk In Multiple Structure Layout
 -Top View of Bottom Frame Bolt Layout with View of Endplate Mounting Angles and Torque Specifications-
 See sheet 16 of this packet for Bottom Frame Bolt Layout Dimensions.

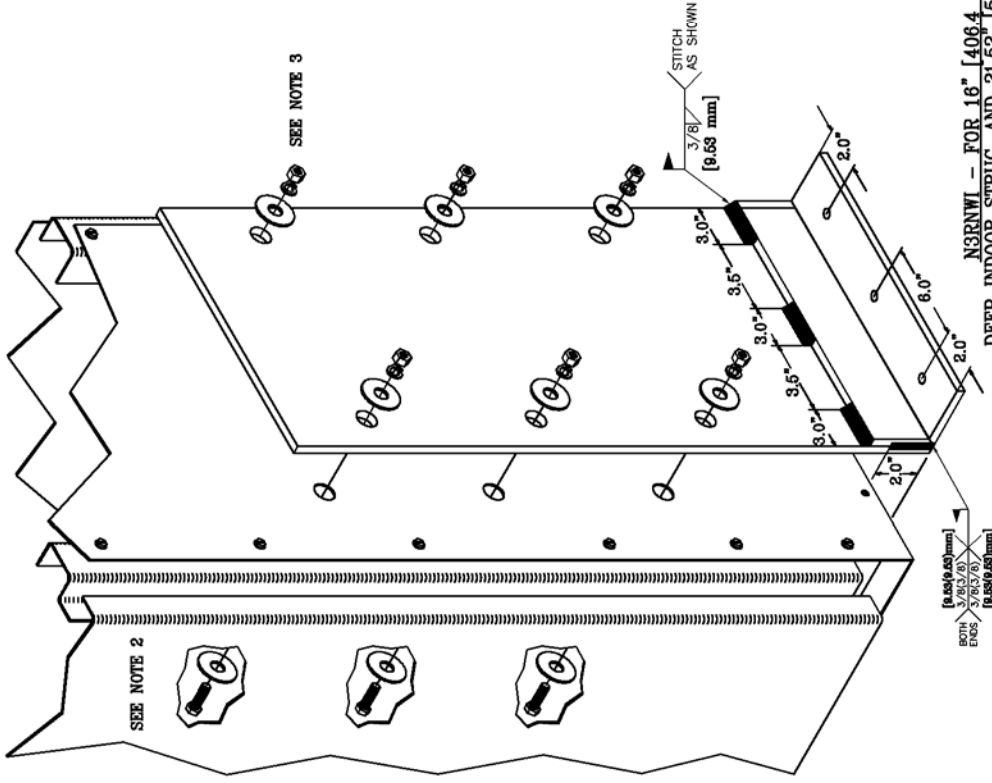
NEMA 3R NON-WALKIN

THE INFORMATION ON THIS DOCUMENT IS CREATED BY CUTLER-HAMMER. IT IS DISCLOSED IN CONFIDENCE AND IS ONLY TO BE USED FOR THE PURPOSE IN WHICH IT IS SUPPLIED	DTR K.BURNEY	DATE 07/02/09	FAYETTEVILLE, NC
FEDERAL ID NO	PRODUCT CODE CC	REVISION 15	DWG EAD038358
		DATE 07/02/09	TITLE MCC SEISMIC MOUNTING REQ. INFO.
		DATE 07/02/09	TYPE
		DATE 07/02/09	G.O.
		DWG SIZE A	SHEET 13

FAYETTEVILLE | **Cutler-Hammer**

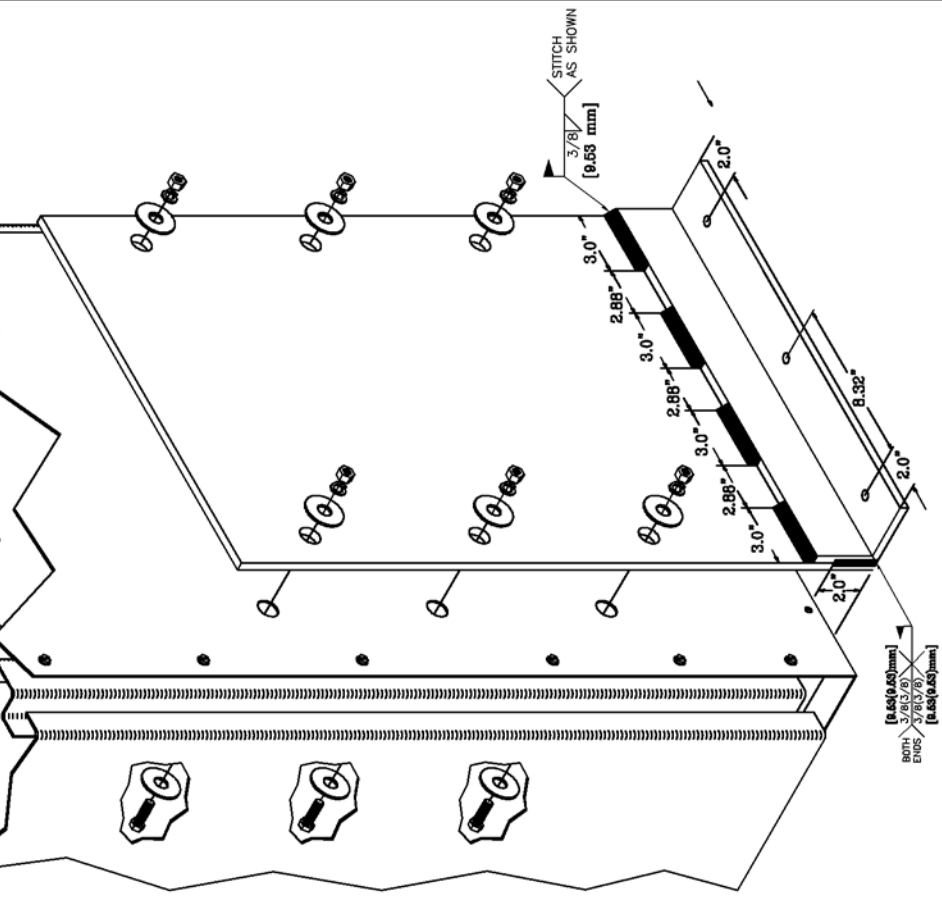
5A11213

[Metric Conversion : 2.0"=50.8 mm]
 [2.88"=73.2 mm]
 [3.0"=76.2 mm]
 [8.32"=211.3 mm]



N3RNWI - FOR 16" [406.4 mm]
 DEEP INDOOR STRUC. AND 21.92" [546.6 mm]
 DEEP OUTDOOR STRUC. - WELDED END PLATES:

[Metric Conversion : 2.0"=50.8 mm]
 [3.0"=76.2 mm]
 [3.5"=88.9 mm]
 [8.0"=152.4 mm]



N3RNWI - FOR 21" [533.4 mm]
 DEEP INDOOR STRUC. AND 26.15" [664.2 mm]
 DEEP OUTDOOR STRUC. - WELDED END PLATES:

Notes:

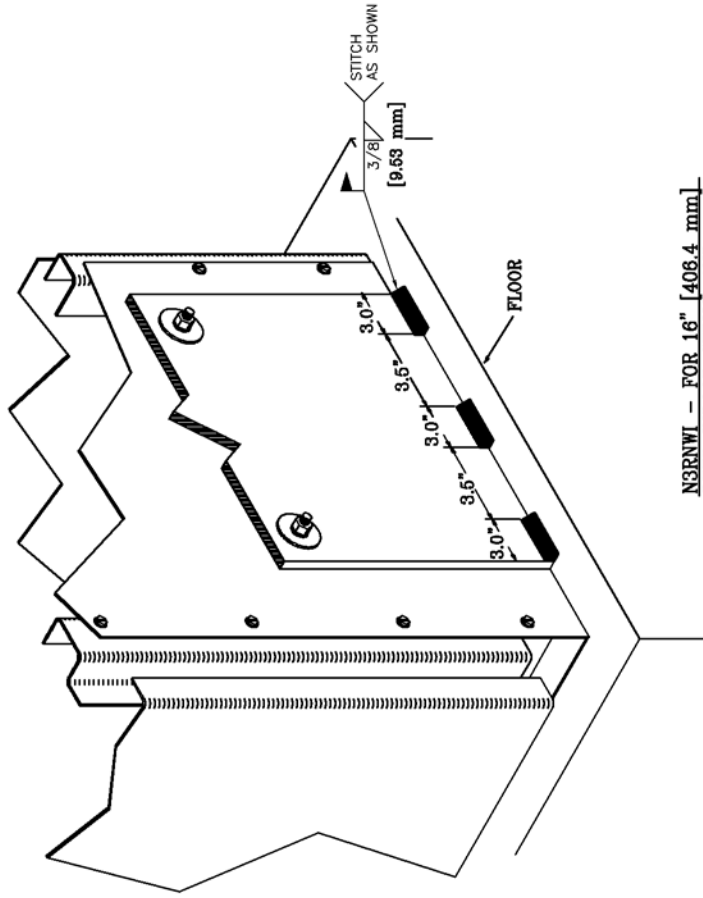
- 1.) CUSTOMERS SEISMIC PLATE MOUNTING INSTRUCTIONS:
 - a.) REMOVE THE 3 BOTTOM SIDE SHEET SCREWS FROM BOTH END STRUCTURES OF THE LINE UP.
 - b.) STAND THE EDGE OF THE PLATE ON THE FLOOR, UP AGAINST THE SIDE SHEET, CENTERING THE PLATE BETWEEN THE SIDE SHEET SCREW HEADS.
 - c.) USING THE 6 PLATE HOLES AS A TEMPLATE, MARK EACH SIDE SHEET.
 - d.) USE A 0.437 DIA. DRILL BIT.
- 2.) THE HARDWARE USED MUST BE 3/8-16 GRADE 5
- 3.) TORQUE SPEC. 31 FT. LBS. [42.03 N m] [M10 DIN 6.8] BOLTS.
- 4.) FOLLOW EITHER THE BOLTED OR WELDED REQUIREMENT FROM THIS SHEET & SHEET 15.
- 5.) WELD PER AWS D1.1

NEMA 3R NON-WALKIN

DFR	K.BURNEY	DATE	07/02/09
APPD	R.A.MORRIS	DATE	07/02/09
APPD	K.BURNEY	DATE	07/02/09
REVISION	15	DWG SIZE	A
FEDERAL ID NO	CC	PRODUCT CODE	
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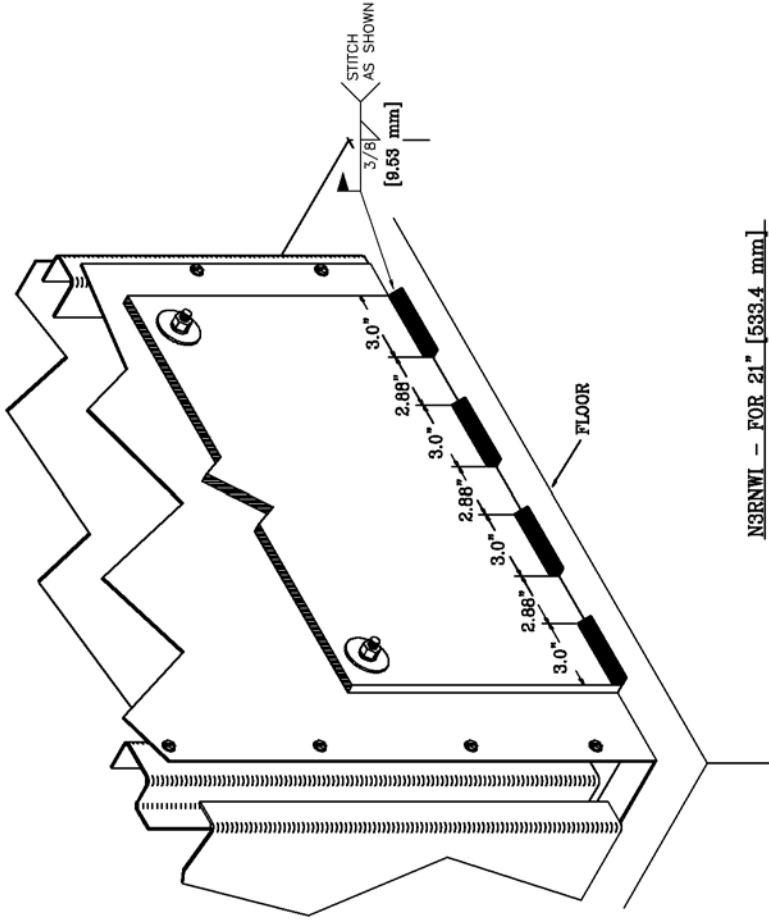
Cutler-Hammer	FAYETTEVILLE, NC
TITLE	MCC SEISMIC MOUNTING REQ. INFO.
TYPE	
G.O.	EAD038358
DWG	5A11213
SHEET	14

[Metric Conversion : 3.0"=76.2 mm]
[3.5"=88.9 mm]



N3RNWI - FOR 16" [406.4 mm]
DEEP INDOOR STRUC. AND
21.52" [548.8 mm] DEEP OUTDOOR
STRUC. - WELDED END PLATES:

[Metric Conversion : 2.88"=73.2 mm]
[3.0"=76.2 mm]



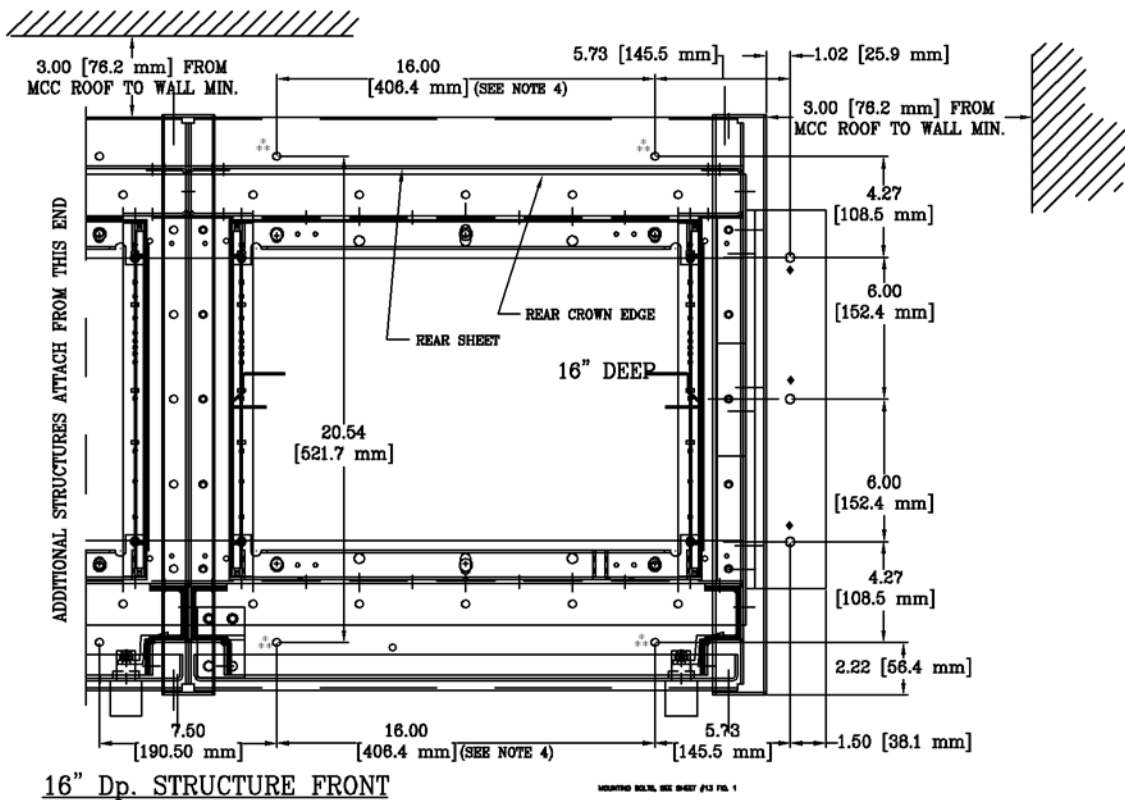
N3RNWI - FOR 21" [533.4 mm]
DEEP INDOOR STRUC. AND
26.15" [664.2 mm] DEEP OUTDOOR
STRUC. - WELDED END PLATES:

Notes:

- 1.) CUSTOMERS SEISMIC PLATE MOUNTING INSTRUCTIONS:
 - a.) REMOVE THE 3 BOTTOM SIDE SHEET SCREWS FROM BOTH END STRUCTURES OF THE LINE UP.
 - b.) STAND THE EDGE OF THE PLATE ON THE FLOOR, UP AGAINST THE SIDE SHEET. CENTERING THE PLATE IN BETWEEN THE SIDE SHEET SCREW HEADS.
 - c.) USING THE 6 PLATE HOLES AS A TEMPLATE, MARK EACH SIDE SHEET.
 - d.) USE A 0.437 DIA. DRILL BIT.
- 2.) THE HARDWARE USED MUST BE 3/8-16 GRADE 5
- 3.) TORQUE SPEC: 31 FT. LBS. [42.03 N m]
[M10 DIN 8.8] BOLTS
- 4.) FOLLOW EITHER THE BOLTED OR WELDED REQUIREMENT FROM THIS SHEET & SHEET 14 & 16.
- 5.) WELD PER AWS D1.1

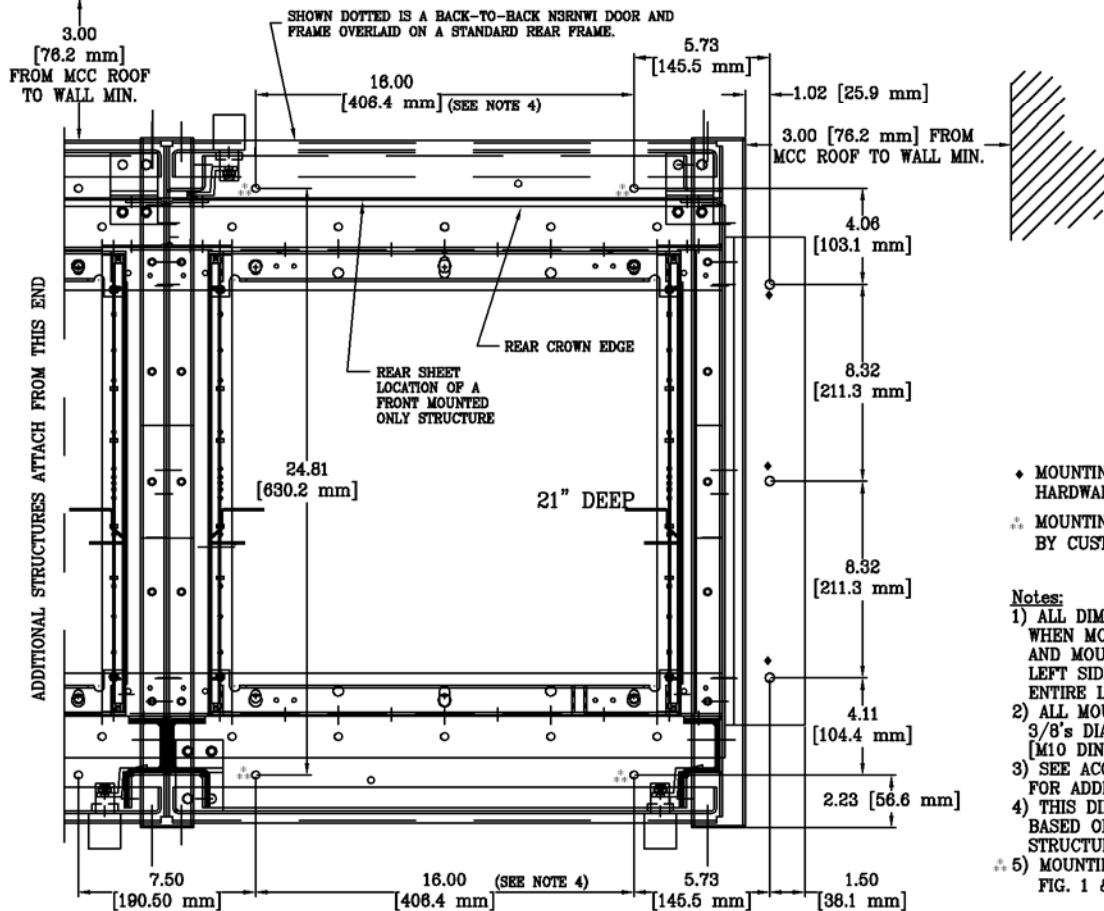
NEMA 3R NON - WALKIN

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FEDERAL ID NO		K.BURNEY	07/02/09	Cutter-Hammer	
PRODUCT CODE	CC	APPD	DATE	TITLE MCC SEISMIC MOUNTING REQ. INFO.	
REVISION	15	R.A.MORRIS	07/02/09	TYPE	
DWG SIZE	A	APPD	DATE	G.O.	
DWG NO	EAD038358	K.BURNEY	07/02/09	DWG	
SHEET	15	REVISION		5A11213	
				SHEET	
				15	



16" Dp. STRUCTURE FRONT

MOUNTING BOLT, SEE SHEET #13 FIG. 1



21" Dp. STRUCTURE FRONT

this View also Shows the Rear Door of a Back-to-Back Structure.

SHOWN DOTTED IS A BACK-TO-BACK N3RNWI DOOR AND FRAME OVERLAID ON A STANDARD REAR FRAME.

NEMA3R NON-WALKIN.

AT&T Cutler-Hammer		FAYETTEVILLE, NC	
DATE 07/02/09	DATE 07/02/09	TITLE MCC SEISMIC MOUNTING REQ. INFO.	TYPE
DFR K.BURNEY	APPD R.A.MORRIS	DATE 07/02/09	DATE 07/02/09
THE INFORMATION ON THIS DOCUMENT IS CREATED BY CUTLER-HAMMER. IT IS DISCLOSED IN CONFIDENCE AND IS ONLY TO BE USED FOR THE PURPOSE IN WHICH IT IS SUPPLIED	FEDERAL ID NO CC	PRODUCT CODE CC	REVISION 15
DWG SIZE A	DWG EAD038358	G.O. 5A11213	SHEET 16

- ♦ MOUNTING HOLES HARDWARE SUPPLIED BY CUSTOMER
- ☆ MOUNTING BOLT SUPPLIED BY CUSTOMER

- Notes:**
- 1) ALL DIMENSIONS ARE REVERSED WHEN MOUNTING THE ENDPLATES AND MOUNTING ANGLES ON THE LEFT SIDE OF A STRUCTURE OR AN ENTIRE LINE-UP OF STRUCTURES.
 - 2) ALL MOUNTING HOLES ARE FOR 3/8" DIA. GRADE 5 HARDWARE [M10 DIN 8.8].
 - 3) SEE ACCOMPANYING FLOOR PLANS FOR ADDITIONAL DIMENSIONS.
 - 4) THIS DIMENSION IS A VARIABLE, BASED ON THE INTERNAL STRUCTURE WIDTH.
 - ☆ 5) MOUNTING BOLTS, SEE SHEET #13 FIG. 1 & FIG. 2

MOUNTING HOLES OF BOTH N3RNWI FRAME DEPTHS (16" & 21" Deep INTERNAL STRUCTURE) WITH SEISMIC ENDPLATES AND MOUNTING ANGLES ATTACHED.



Safety

Safety and Tag-Out Procedures

Safety Procedures

1. General

Each piece of equipment has the potential for causing severe injury or possibly death if proper precautions are not followed closely. Person or persons working with this equipment should familiarize themselves with the individual equipment operator's manuals found in this O&M manual.

2. Operation and Maintenance Manual

See Manuals provided under Operational Procedures.

3. Cautions

- Use extreme caution when using a meter to measure voltages. Do not touch power terminal; shocks, burns or death could result.
- Excessive test voltages may result in damage to equipment. Do not perform dielectric tests at test voltages exceeding the ratings of the tested equipment.
- Failure to maintain the equipment could result in death, serious injury or product failure, and can prevent successful functioning of connected apparatus.

4. Warnings

- Heavy weights can cause death, serious injury or property damage.
- Do not exceed the values on any rating label. Exceeding the rating can cause personal injury or serious equipment damage.
- De-energize the conductors before making any line of auxiliary circuitry connections.
- Hazardous voltages can result in death, personal injury or property damage, use only recommended solvents for cleaning insulation materials.

5. Dangers

- Do not work on energized equipment, Always de-energize and ground the equipment before working on it.
 - ➔ Do not contact energized conductors.
 - ➔ Read instruction manuals, observe safety instructions, and use qualified personnel.

Safety and Tag-Out Procedures

Tag-Out Procedures

1. General

- a. Lockout/Tagout is required for servicing or maintenance on a machine or equipment where the unexpected energizing, startup or release of stored energy could occur and cause injury.
- b. If an energy-isolating device is capable of being locked out, it shall be locked out and tagged out at the same location.
- c. If an emergency-isolating device is not capable of being locked out, then tagout shall be used. (Measures such as barricades, flagging tape, etc may be used to provide an additional degree of safety.)
- d. Control devices or interlocks for electrical equipment may not be used as a substitute for lockout/tagout procedures.
- e. Lockout/tagout devices may only be applied or removed by the authorized employees who are performing the servicing or maintenance.

2. Backfeed

A backfeed is a very dangerous condition that can be present during maintenance of electrical power systems. Before work can begin, all sources of energy must be de-energized by performing a proper lockout/tagout for each source that affects the work location. There are many ways that backfeeds can occur, such as:

- Automatic transfer switch that operates to bring energy from an emergency generator.
- Control power in the same work location that has not been isolated.
- The closing of a tie switch or circuit breaker.
- Temporary power source such as a generator improperly tied into the electrical system.
- Induced voltage from energized adjacent circuits or lightning.

3. De-energize and Lockout/Tagout Procedure

A lockout/tagout procedure shall be accomplished in the following manner:

- a. Notify all affected employees. (Those whose job requires him or her to operate or use the machine or equipment to be serviced.)
- b. Shut the equipment down.
- c. Isolate all energy sources, including release of stored energy.
- d. Lock and tag all energy sources.
- e. A qualified employee shall attempt to restart the equipment to verify it is locked out.
- f. A qualified employee must check and verify that the machine or equipment parts, which are normally energized, are now de-energized. The test equipment shall be checked for proper operation immediately before and immediately after the test.
- g. Apply grounds as necessary.
- h. Capacitors or high capacitance elements shall be discharged and grounded if the stored electrical energy might endanger personnel.
- i. Locks & tags: All workers performing work on electrical equipment to have their personal lock on the equipment or a group lockbox. If circumstances dictate otherwise, then one worker must take responsibility for the safety of each group of workers. Any worker desiring to lockout must be allowed to do so.
- j. Work may begin.

4. Re-Energizing Equipment that has been Locked Out and Tagged

For returning machines or equipment to regular service:

- a.** A qualified employee shall inspect the work area to ensure that all non-essential items have been removed and that machine or equipment components are operationally intact.
- b.** A qualified employee shall inspect the work area to ensure that all employees have been safely positioned or removed.
- c.** Remove lockout/tagout devices.
- d.** Notify affected employees that lockout/tagout devices have been removed.



Documentation


Certified Production Test Report

Motor Control Centers

CERTIFICATION

Series 2100 Motor Control Centers are manufactured in compliance with UL 845, NEMA ICS 2, and Cutler-Hammer ISO 9000 certified Work Instructions for Inspection and Testing, as follows:

TEST	PASSED	N/A
DIELECTRIC: (POWER BUS @ 2.64KV, 1 SECOND) NEMA STANDARD	X	
MECHANICAL OPERATION OF DEVICES	X	
CONTROL WIRING CONTINUITY	X	
POLARITY OF INSTRUMENT TRANSFORMERS	X	
SEQUENCED PER SCHEMATICS	X	
VERIFICATION:	X	
EQUIPMENT/DEVICES VERIFICATION	X	
STRUCTURAL FIT, ALIGNMENT, OPERATION OF MOVING PARTS	X	
INSPECTION OF BUS CONNECTIONS	X	
WIRING CORRECT, NEATNESS, PROPER TERMINIATIONS	X	
FINISH, LABELS, TRIM	X	
Resistor and Transformer tap settings verified	X	

Tester Michael Prokay	Date 05/31/2012	CUTLER - HAMMER, 26850 SW Kinsman RD Wilsonville OR 97070		 Powering Business Worldwide
		This certifies that the above is based upon recorded factory tests made at this location.		
		MCC-1	Certified Test Report	
REVISION 1	DWG SIZE A	G.O. LPO0007343-001	DWG C00F5R4901	SHEET 1 of 1



Selling Policy

Effective: November 1, 2008 Page 1

Supersedes Selling Policy 25-000,
Pages 1-4, dated
February 20, 2006

DOMESTIC U.S.A. GENERAL TERMS AND CONDITIONS OF SALE

Distribution and Control Products and Services 25-000

TERMS AND CONDITIONS OF SALE

The Terms and Conditions of Sale set forth herein, and any supplements which may be attached hereto, constitute the full and final expression of the contract for the sale of products or services (hereinafter referred to as Product(s) or Services by Eaton Corporation (hereinafter referred to as Seller) to the Buyer, and supersedes all prior quotations, purchase orders, correspondence or communications whether written or oral between the Seller and the Buyer. Notwithstanding any contrary language in the Buyer's purchase order, correspondence or other form of acknowledgment, Buyer shall be bound by these Terms and Conditions of Sale when it sends a purchase order or otherwise indicates acceptance of this contract, or when it accepts delivery from Seller of the Products or Services. THE CONTRACT FOR SALE OF THE PRODUCTS OR SERVICES IS EXPRESSLY LIMITED TO THE TERMS AND CONDITIONS OF SALE STATED HEREIN. ANY ADDITIONAL OR DIFFERENT TERMS PROPOSED BY BUYER ARE REJECTED UNLESS EXPRESSLY AGREED TO IN WRITING BY SELLER. No contract shall exist except as herein provided.

Complete Agreement

No amendment or modification hereto nor any statement, representation or warranty not contained herein shall be binding on the Seller unless made in writing by an authorized representative of the Seller. Prior dealings, usage of the trade or a course of performance shall not be relevant to determine the meaning of this contract even though the accepting or acquiescing party had knowledge of the nature of the performance and opportunity for objection.

Quotations

Written quotations are valid for 30 days from its date unless otherwise stated in the quotation or terminated sooner by notice.

Verbal quotations, unless accepted, expire the same day they are made.

A complete signed order must be received by Seller within 20 calendar days of notification of award, otherwise the price and shipment will be subject to re-negotiation.

Termination and Cancellation

Any order may be terminated by the Buyer only by written notice and upon payment of reasonable termination charges, including all costs plus profit.

Seller shall have the right to cancel any order at any time by written notice if Buyer breaches any of the terms hereof, becomes the subject of any proceeding under state or federal law for the relief of debtors, or otherwise becomes insolvent or bankrupt, generally does not pay its debts as they become due or makes an assignment for the benefit of creditors.

Prices

All prices are subject to change without notice. In the event of a price change, the effective date of the change will be the date of the new price or discount sheet, letter or telegram. All quotations made or orders accepted after the effective date will be on the new basis. For existing orders, the price of the unshipped portion of an order will be the price in effect at time of shipment.

Price Policy – Products and Services

When prices are quoted as firm for quoted shipment, they are firm provided the following conditions are met:

1. The order is released with complete engineering details.
2. Shipment of Products are made, and Services purchased are provided within the quoted lead time.
3. When drawings for approval are required for any Products, the drawings applicable to those Products must be returned within 30* calendar days from the date of the original mailing of the drawings by Seller. The return drawings must be released for manufacture and shipment and must be marked "APPROVED" or "APPROVED AS NOTED." Drawing re-submittals which are required for any other reason than to correct Seller errors will not extend the 30-day period.

If the Buyer initiates or in any way causes delays in shipment, provision of Services or return of approval drawings beyond the periods stated above, the price of the Products or Services will be increased 1% per month or fraction thereof up to a maximum of 18 months from the date of the Buyer's order. For delays resulting in shipment or provision of Services beyond

18 months from the date of the Buyer's order, the price must be renegotiated.

Price Policy – BLS

Refer to Price Policy 25-050.

Minimum Billing

Orders less than \$1,000 will be assessed a shipping and handling charge of 5% of the price of the order, with a minimum charge of \$25.00 unless noted differently on Product discount sheets.

Taxes

The price does not include any taxes. Buyer shall be responsible for the payment of all taxes applicable to, or arising from, the transaction, the Products, its sale, value or use, or any Services performed in connection therewith regardless of the person or entity actually taxed.

TERMS OF PAYMENT

Products

Acceptance of all orders is subject to the Buyer meeting Seller's credit requirements. Terms of payment are subject to change for failure to meet such requirements. Seller reserves the right at any time to demand full or partial payment before proceeding with a contract of sale as a result of changes in the financial condition of the Buyer. Terms of Payment are either Net 30 days from the date of invoice of each shipment or carry a cash discount based on Product type. Specific payment terms for Products are outlined in the applicable Product discount schedules.

Services

Terms of payment are net within 30 days from date of invoice for orders amounting to less than \$50,000.00.

* 60 days for orders through contractors to allow time for their review and approval before and after transmitting them to their customers.

Terms of payment for orders exceeding \$50,000.00 shall be made according to the following:

1. Twenty percent (20%) of order value with the purchase order payable 30 days from date of invoice.
2. Eighty percent (80%) of order value in equal monthly payments over the performance period payable 30 days from date of invoice.

Except for work performed (i) under a firm fixed price basis or (ii) pursuant to terms of a previously priced existing contract between Seller and Buyer, invoices for work performed by Seller shall have added and noted on each invoice a charge of 3% (over and above the price of the work) which is related to Seller compliance with present and proposed environmental, health and safety regulations associated with prescribed requirements covering hazardous materials management and employee training, communications, personal protective equipment, documentation and record keeping associated therewith.

Adequate Assurances

If, in the judgment of Seller, the financial condition of the Buyer, at any time during the period of the contract, does not justify the terms of payment specified, Seller may require full or partial payment in advance.

Delayed Payment

If payments are not made in accordance with these terms, a service charge will, without prejudice to the right of Seller to immediate payment, be added in an amount equal to the lower of 1.5% per month or fraction thereof or the highest legal rate on the unpaid balance.

Freight

Freight policy will be listed on the Product discount sheets, or at option of Seller one of the following freight terms will be quoted.

F.O.B. – P/S – Frt./Ppd. and Invoiced

Products are sold F.O.B. point of shipment freight prepaid and invoiced to the Buyer.

F.O.B. – P/S – Frt./Ppd. and Allowed

Products sold are delivered F.O.B. point of shipment, freight prepaid and included in the price.

F.O.B. Destination – Frt./Ppd. and Allowed

At Buyer's option, Seller will deliver the Products F.O.B. destination freight prepaid and 2% will be added to the net price. The term "freight prepaid" means that freight charges will be prepaid to the accessible common carrier delivery point nearest the destination for shipments within the United States and Puerto Rico unless noted

differently on the Product discount sheets. For any other destination, contact Seller's representative.

Shipment and Routing

Seller shall select the point of origin of shipment, the method of transportation, the type of carrier equipment and the routing of the shipment.

If the Buyer specifies a special method of transportation, type of carrier equipment, routing or delivery requirement, Buyer shall pay all special freight and handling charges.

When freight is included in the price, no allowance will be made in lieu of transportation if the Buyer accepts shipment at factory, warehouse or freight station or otherwise supplies its own transportation.

Risk of Loss

Risk of loss or damage to the Products shall pass to Buyer at the F.O.B. point.

Concealed Damage

Except in the event of F.O.B. destination shipments, Seller will not participate in any settlement of claims for concealed damage.

When shipment has been made on an F.O.B. destination basis, the Buyer must unpack immediately and, if damage is discovered, must:

1. Not move the Products from the point of examination.
2. Retain shipping container and packing material.
3. Notify the carrier in writing of any apparent damage.
4. Notify Seller representative within 72 hours of delivery.
5. Send Seller a copy of the carrier's inspection report.

Witness Tests/Customer Inspection

Standard factory tests may be witnessed by the Buyer at Seller's factory for an additional charge calculated at the rate of \$2,500 per day (not to exceed eight (8) hours) per Product type. Buyer may final inspect Products at the Seller's factory for \$500 per day per Product type.

Witness tests will add one (1) week to the scheduled shipping date. Seller will notify Buyer fourteen (14) calendar days prior to scheduled witness testing or inspection. In the event Buyer is unable to attend, the Parties shall mutually agree on a rescheduled date. However, Seller reserves the right to deem the witness tests waived with the right to ship and invoice Products.

Held Orders

For any order held, delayed or rescheduled at the request of the Buyer, Seller may, at its sole option, (1) require payment to be based

on any reasonable basis, including but not limited to the contract price, and any additional expenses, or cost resulting from such a delay; (2) store Products at the sole cost and risk of loss of the Buyer; and/or (3) charge to the Buyer those prices under the applicable price policy. Payment for such price, expenses and costs, in any such event, shall be due by Buyer within thirty (30) days from date of Seller's invoice. Any order so held delayed or rescheduled beyond six (6) months will be treated as a Buyer termination.

Drawing Approval

Seller will design the Products in line with, in Seller's judgment, good commercial practice. If at drawing approval Buyer makes changes outside of the design as covered in their specifications, Seller will then be paid reasonable charges and allowed a commensurate delay in shipping date based on the changes made.

Drawing Re-Submittal

When Seller agrees to do so in its quotation, Seller shall provide Buyer with the first set of factory customer approval drawing(s) at Seller's expense. The customer approval drawing(s) will be delivered at the quoted delivery date. If Buyer requests drawing changes or additions after the initial factory customer approval drawing(s) have been submitted by Seller, the Seller, at its option, may assess Buyer drawing charges. Factory customer approval drawing changes required due to misinterpretation by Seller will be at Seller's expense. Approval drawings generated by Bid-Manager are excluded from this provision.

WARRANTY

Warranty For Products

Seller warrants that the Products manufactured by it will conform to Seller's applicable specifications and be free from failure due to defects in workmanship and material for one (1) year from the date of installation of the Product or eighteen (18) months from the date of shipment of the Product, whichever occurs first.

In the event any Product fails to comply with the foregoing warranty Seller will, at its option, either (a) repair or replace the defective Product, or defective part or component thereof, F.O.B. Seller's facility freight prepaid, or (b) credit Buyer for the purchase price of the Product. All warranty claims shall be made in writing.

Seller requires all non-conforming Products be returned at Seller's expense for evaluation unless specifically stated otherwise in writing by Seller.

This warranty does not cover failure or damage due to storage, installation, operation or maintenance not in conformance with Seller's recommendations and industry standard practice or due to accident, misuse, abuse or negligence. This warranty does not cover reimbursement for labor, gaining access, removal, installation, temporary power or any other expenses, which may be incurred in connection with repair or replacement.

This warranty does not apply to equipment not manufactured by Seller. Seller limits itself to extending the same warranty it receives from the supplier.

Extended Warranty for Products

If requested by the Buyer and specifically accepted in writing by Seller, the foregoing standard warranty for Products will be extended from the date of shipment for the period and price indicated below:

24 months – 2% of Contract Price
30 months – 3% of Contract Price
36 months – 4% of Contract Price

Special Warranty (In and Out) for Products

If requested by the Buyer and specifically accepted in writing by Seller, Seller will, during the warranty period for Products, at an additional cost of 2% of the contract price, be responsible for the direct cost of:

1. Removing the Product from the installed location.
2. Transportation to the repair facility and return to the site.
3. Reinstallation on site.

The total liability of Seller for this Special Warranty for Products is limited to 50% of the contract price of the particular Product being repaired and excludes expenses for removing adjacent apparatus, walls, piping, structures, temporary service, etc.

Warranty For Services

Seller warrants that the Services performed by it hereunder will be performed in accordance with generally accepted professional standards.

The Services, which do not so conform, shall be corrected by Seller upon notification in writing by the Buyer within one (1) year after completion of the Services.

Unless otherwise agreed to in writing by Seller, Seller assumes no responsibility with respect to the suitability of the Buyer's, or its customer's, equipment or with respect to any latent defects in equipment not supplied by Seller. This warranty does not cover damage to Buyer's, or its customer's, equipment, components or parts resulting in whole or in part from improper maintenance or operation or from their deteriorated condition. Buyer will, at its cost, provide Seller with unobstructed access to the defective Services, as well as adequate free working space in the immediate vicinity of the defective Services and such facilities and systems, including, without limitation, docks, cranes and utility disconnects and connects, as may be necessary in order that Seller may perform its warranty obligations. The conducting of any tests shall be mutually agreed upon and Seller shall be notified of, and may be present at, all tests that may be made.

Warranty for Power Systems Studies

Seller warrants that any power systems studies performed by it will conform to generally accepted professional standards. Any portion of the study, which does not so conform, shall be corrected by Seller upon notification in writing by the Buyer within six (6) months after completion of the study. All warranty work shall be performed in a single shift straight time basis Monday through Friday. In the event that the study requires correction of warranty items on an overtime schedule, the premium portion of such overtime shall be for the Buyer's account.

Limitation on Warranties for Products, Services and Power Systems Studies
THE FOREGOING WARRANTIES ARE EXCLUSIVE EXCEPT FOR WARRANTY OF TITLE. SELLER DISCLAIMS ALL OTHER WARRANTIES INCLUDING ANY IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.

CORRECTION OF NON-CONFORMITIES IN THE MANNER AND FOR THE PERIOD OF TIME PROVIDED ABOVE SHALL CONSTITUTE SELLER'S SOLE LIABILITY AND BUYER'S EXCLUSIVE REMEDY FOR FAILURE OF SELLER TO MEET ITS WARRANTY OBLIGATIONS, WHETHER CLAIMS OF THE BUYER ARE BASED IN CONTRACT, IN TORT (INCLUDING NEGLIGENCE OR STRICT LIABILITY) OR OTHERWISE.

Asbestos

Federal Law requires that building or facility owners identify the presence, location and quantity of asbestos containing material (hereinafter "ACM") at work sites. Seller is not licensed to abate ACM. Accordingly, for any contract which includes the provision of Services, prior to (i) commencement of work at any site under a specific Purchase Order, (ii) a change in the work scope of any Purchase Order, the Buyer will certify that the work area associated with the Seller's scope of work includes the handling of Class II ACM, including but not limited to generator wedges and high temperature gaskets which include asbestos materials. The Buyer shall, at its expense, conduct abatement should the removal, handling, modification or reinstallation, or some or all of them, of said Class II ACM be likely to generate airborne asbestos fibers; and should such abatement affect the cost of or time of performance of the work then Seller shall be entitled to an equitable adjustment in the schedule, price and other pertinent affected provisions of the contract.

Compliance with Nuclear Regulation

Seller's Products are sold as commercial grade Products not intended for application in facilities or activities licensed by the United States Nuclear Regulatory Commission for atomic purposes. Further certification will be required for use of the Products in any safety-related application in any nuclear facility licensed by the U.S. Nuclear Regulatory Commission.

Returning Products

Authorization and shipping instructions for the return of any Products must be obtained from Seller before returning the Products. When return is occasioned due to Seller error, full credit including all transportation charges will be allowed.

Product Notices

Buyer shall provide the user (including its employees) of the Products with all Seller supplied Product notices, warnings, instructions, recommendations and similar materials.

Force Majeure

Seller shall not be liable for failure to perform or delay in performance due to fire, flood, strike or other labor difficulty, act of God, act of any governmental authority or of the Buyer, riot, embargo, fuel or energy shortage, car shortage, wrecks or delays in transportation, or due to any other cause beyond Seller's reasonable control. In the event of delay in performance due to any such cause, the date of delivery or time for completion will be extended by a period of time reasonably necessary to overcome the effect of such delay.

Liquidated Damages

Contracts which include liquidated damage clauses for failure to meet shipping or job completion promises are not acceptable or binding on Seller, unless such clauses are specifically accepted in writing by an authorized representative of the Seller at its headquarters office.

Patent Infringement

Seller will defend or, at its option, settle any suit or proceeding brought against Buyer, or Buyer's customers, to the extent it is based upon a claim that any Product or part thereof, manufactured by Seller or its subsidiaries and furnished hereunder, infringes any United States patent, other than a claim of infringement based upon use of a Product or part thereof in a process, provided Seller is notified in reasonable time and given authority, information and assistance (at Seller's expense) for the defense of same. Seller shall pay all legal and court costs and expenses and court-assessed damages awarded therein against Buyer resulting from or incident to such suit or proceeding. In addition to the foregoing, if at any time Seller determines there is a substantial question of infringement of any United States patent, and the use of such Product is or may be enjoined, Seller may, at its option and expense: either (a) procure for Buyer the right to continue using and selling the Product; (b) replace the Product with non-infringing apparatus; (c) modify the Product so it becomes non-infringing; or (d) as a last resort, remove the Product and refund the purchase price, equitably adjusted for use and obsolescence. In no case does Seller agree to pay any recovery based upon its Buyer's savings or profit through use of Seller's Products whether the use be special or ordinary. The foregoing states the entire liability of Seller for patent infringement.

The preceding paragraph does not apply to any claim of infringement based upon: (a) any modification made to a Product other than by Seller; (b) any design and/or specifications of Buyer to which a Product was manufactured; or (c) the use or combination of Product with other products where the Product does not itself infringe. As to the above-identified claim situations where the preceding paragraph does not apply, Buyer shall defend and hold Seller harmless in the same manner and to the extent as Seller's obligations described in the preceding paragraph. Buyer shall be responsible for obtaining (at Buyer's expense) all license rights required for Seller to be able to use software products in the possession of Buyer where such use is required in order to perform any Service for Buyer.

With respect to a Product or part thereof not manufactured by Seller or its subsidiaries, Seller will attempt to obtain for Buyer, from the supplier(s), the patent indemnification protection normally provided by the supplier(s) to customers.

Compliance with OSHA

Seller offers no warranty and makes no representation that its Products comply with the provisions or standards of the Occupational Safety and Health Act of 1970, or any regulation issued thereunder. In no event shall Seller be liable for any loss, damage, fines, penalty or expenses arising under said Act.

Limitation of Liability

THE REMEDIES OF THE BUYER SET FORTH IN THIS CONTRACT ARE EXCLUSIVE AND ARE ITS SOLE REMEDIES FOR ANY FAILURE OF SELLER TO COMPLY WITH ITS OBLIGATIONS HEREUNDER.

NOTWITHSTANDING ANY PROVISION IN THIS CONTRACT TO THE CONTRARY, IN NO EVENT SHALL SELLER BE LIABLE IN CONTRACT, IN TORT (INCLUDING NEGLIGENCE OR STRICT LIABILITY) OR OTHERWISE FOR DAMAGE TO PROPERTY OR EQUIPMENT OTHER THAN PRODUCTS SOLD HEREUNDER, LOSS OF PROFITS OR REVENUE, LOSS OF USE OF PRODUCTS, COST OF CAPITAL, CLAIMS OF CUSTOMERS OF THE BUYER OR ANY SPECIAL, INDIRECT, INCIDENTAL OR CONSEQUENTIAL DAMAGES WHATSOEVER, REGARDLESS OF WHETHER SUCH POTENTIAL DAMAGES ARE FORESEEABLE OR IF SELLER HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES.

THE TOTAL CUMULATIVE LIABILITY OF SELLER ARISING FROM OR RELATED TO THIS CONTRACT WHETHER THE CLAIMS ARE BASED IN CONTRACT, IN TORT (INCLUDING NEGLIGENCE OR STRICT LIABILITY) OR OTHERWISE, SHALL NOT EXCEED THE PRICE OF THE PRODUCT OR SERVICES ON WHICH SUCH LIABILITY IS BASED.

Eaton Corporation.
1000 Cherrington Parkway
Moon Township, PA 15108
United States
Tel: 1-800-525-2000
Eaton.com

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M – UPRR GUIDELINES FOR TEMPORARY SHORING

GUIDELINES FOR TEMPORARY SHORING



EMAIL BEFORE YOU DIG
UP.COM/CBUD

EMERGENCIES
1-888-877-7267



CALL BEFORE YOU DIG
1-800-533-2891

EMERGENCIES
1-800-832-5452

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1. INTRODUCTION

1.1 PURPOSE

- a. The purpose of these guidelines is to inform public agencies, design engineers, contractors and inspectors of current Railroad standards and requirements concerning design and construction of temporary shoring.

1.2 SCOPE

- a. This guideline governs on the Railroad Right-of-Way. This includes the limits of property owned, controlled and/or operated upon by the Railroad.
- b. All requirements addressed within this document shall constitute minimum requirements for all projects or works on the Railroad Right-of-Way. The applicability of each requirement for any given project will be subjected to the Railroad's discretion.
- c. Where laws or orders of authority prescribe a higher degree of protection or restriction than specified herein, the higher degree so prescribed shall control.
- d. These guidelines supplement the current American Railway Engineering and Maintenance-of-Way Association (AREMA) Manual for Railway Engineering. For items covered within these guidelines and AREMA, the more restrictive shall control.
 - i. **It is the requirement for the Contractor and designer developing Railroad shoring systems to have a copy of the AREMA Manual. Visit www.arema.org to obtain the Manual for Railway Engineering.**
- e. These guidelines supersede all previous Railroad guidelines for temporary shoring and are subject to revision without notice.
- f. In addition to this guideline, all excavations shall also be governed by each individual Railroad requirements, Federal, State and Local laws, rules and regulations concerning construction safety.
- g. These guidelines are provided as a reference and cannot be taken as authority to construct without prior review and written approval of the Railroad. See [Section 2.9](#) for review process.

2. GENERAL CRITERIA

2.1 SAFETY & RAILROAD OPERATIONS

- a. Projects shall be designed such that construction activities and phasing will not compromise safety nor impact Railroad operations.
- b. Emergency Railroad phone numbers are to be obtained from a Railroad representative prior to the start of any work and shall be posted at the job site.

2.2 SHORING REMOVAL

- a. The Contractor is responsible for planning and executing all procedures necessary to construct, maintain and remove the temporary shoring system in a safe and controlled manner.

2.3 RAILROAD FLAGGING

- a. A flagman is required when any work is performed within 25 feet of track centerline. If the Railroad provides flagging or other services, the Contractor shall not be relieved of any responsibilities or liabilities as set forth in any document authorizing the work. No work is allowed within 50 feet of track centerline when a train passes the work site, and all personnel must clear the area within 25 feet of track centerline and secure all equipment when trains are present.

2.4 CALL BEFORE YOU DIG & EXISTING UTILITIES

- a. Call Before You Dig: Appropriate measures for the installation and protection of fiber optic, or other cables, shall be addressed in the plans and contract documents. For specific Railroad requirements and additional information refer to:

BNSF: www.bnsf.com or call 1-800-533-2891.

UPRR: www.up.com/cbud

- b. Relocation of utilities or communication lines not owned by the Railroad shall be coordinated with the respective utility owners. Utility relocation plans must then be submitted to the Railroad utility representative(s) for review and prior approval must be secured before work can proceed. The Railroad will not be responsible for costs associated with any utility, signal, or communication line relocation or adjustments.
- c. Abandonment of utilities must follow the [UPRR Guidelines For Abandonment of Subsurface Utility Structures](#) or the [BNSF Utility Accommodation Policy](#).

2.5 APPLICANT & CONTRACTOR RESPONSIBILITIES

- a. The Applicant and Contractor must verify with the Railroad's Local Representative their receipt of the latest version of these guidelines prior to developing Construction Documents.
- b. Construction shall NOT impact Railroad operations, functions and facilities:
 - i. The Applicant and Contractor shall develop design plans, including, without limitation, all procedures necessary to construct and maintain the proposed shoring project, which cause no interruption to Railroad operations during and after construction.
 - ii. Work shall also not impede drainage or other functions of the Railroad.
 - iii. Any rail traffic outages or curfews thought to be required for the installation or removal of any portions of a shoring system must be requested by submittal to the Railroad for prior consideration long in advance of mobilization and construction. Such requests may not be granted.
 - iv. Unapproved and unscheduled interruptions to Railroad operations may result in your removal from Railroad Right-of-Way, and your authorization to re-enter revoked.
- c. Railroad approved design and construction plans:
 - i. The Contractor shall install the temporary shoring system per the plans approved by the Railroad.
 - ii. Any deviation from the Railroad approved plans requires resubmittal and prior approval by the Railroad prior to proceeding with said deviation. Approval from the Railroad may not be granted.
- d. The Contractor must monitor the track, ground and shoring for movement. See [Section 2.6](#) for monitoring.
- e. The Applicant and Contractor shall be jointly responsible for the design, construction and performance of the temporary structure.
- f. The Contractor must review the temporary shoring plans to ensure that the proposed method of construction is compatible with the existing site and soil conditions. Removal of the shoring system must also be addressed.
- g. The Contractor must obtain a valid right of entry permit from the Railroad and comply with all Railroad requirements when working on Railroad property.
- h. The Contractor is responsible to protect the Railroad ballast and subballast from contamination.
- i. The Contractor shall comply with all State and Federal Laws, county or municipal ordinances and regulations which in any manner affect the work.
- j. All removed soils will become the responsibility of the Contractor and shall be disposed of outside the Railroad Right-of-Way according to the applicable Federal, State and Local regulations.

- k. The project engineer and the Contractor shall evaluate the quality of materials furnished and work performed.
- l. The Applicant, at its expense, shall be solely responsible for all costs, design, construction, future replacement, maintenance, and serviceability of the proposed shoring project, except as noted otherwise in the Construction & Maintenance (C & M) Agreement with the Railroad.
- m. The Applicant shall be responsible for obtaining all Federal, State, Local and other permits for construction of the shoring project.
 - i. The Engineer-of-Record shall be registered in the state of the project location. The Engineer-of-Record may be Applicant's in-house staff or a consultant retained by the Applicant. The Contractor shall not employ the Engineer-of-Record as the Contractor's Engineer-of-Record or as a specialty engineer, with the exception of design build projects.
- n. The Applicant and/or the Engineer-of-Record have the ultimate responsibility and liability for the Construction Documents and liability for damages to Railroad property during and after construction of the shoring.
- o. The Contractor is responsible to comply with the construction documents prepared by the Applicant. The Contractor shall comply with Railroad requirements stated in the C & M Agreement prior to the commencement of any construction. The Contractor shall develop work plans that ensure the track(s) remain open to train traffic per Railroad requirements as stated in the C & M Agreement and meet the requirements of the Railroad Right-of-Entry Agreement (if applicable).
- p. The Applicant and Contractor is responsible for the security and safety of all people including the general public and trespassers, and the protection of Railroad infrastructure within the limits of the proposed shoring project. Any damage to Railroad property such as track, signal equipment or structure could result in a train derailment. All damages must be reported immediately to the Railroad Local Representative and to the local Railroad Track Maintenance Representative.
- q. The Applicant and Contractor are required to meet all safety standards as defined by the Railroad, Federal Railroad Administration (FRA), Division of Occupational Safety and Health Administration (OSHA), Local, State and Federal Governments and the State Railroad Regulatory Body.

2.6 TRACK, GROUND & SHORING MONITORING:

The Contractor must monitor the track, ground and shoring for movement to ensure proper performance of the shoring system and the safe operation of trains. Record top of rail elevations and track alignment for the duration of the project. After the project is complete additional track and ground monitoring may be required as deemed necessary by the Railroad.

- a. Track & Ground Monitoring requirements: In addition to [Table 2](#):
 - For UPRR, see the [Union Pacific Railroad Guidelines for Track & Ground Monitoring](#).
 - For BNSF, subject to direction of the BNSF project engineer for the project
- ii. Deflection Limits ([Table 2](#)), [Section 3.8k](#), for both track and shoring deflection limits.
 - Displacements exceeding the limits defined in [Table 2](#) must be immediately reported to the Railroad. All work on the project must stop and the Railroad may take any action necessary to ensure safe passage of trains. The Contractor must immediately submit a corrective action plan to the Railroad for review and approval. The Railroad must review and approve the proposed repair procedure. The repair must be inspected by the Railroad before any work on the project can proceed.
- b. Any damage to Railroad property such as track, signal equipment or structure could result in a train derailment. All damage must be reported immediately to the Railroad representative in charge of the project and to the Railroad Track Maintenance Representative.

2.7 RAILROAD RIGHT-OF-WAY

- a. The Railroad Right-of-Way accommodates existing tracks, drainage systems, multiple utilities, access roads, Railroad support facilities and space for future track(s).
- b. The proposed project shall not limit existing or future Railroad operating capacity and utility accommodations within the Railroad Right-of-Way.
- c. Limits of Railroad Right-of-Way are to be located by the Applicant and identified on the plans.

2.8 CONSTRUCTION AND MAINTENANCE AGREEMENT

- a. Prior to construction on Railroad Right-of-Way, Applicants must have an executed a C & M Agreement with the Railroad.
- b. The C & M agreement shall, at a minimum, include a funding source, cost estimate, insurance and indemnification requirements, method of payment, responsibility for design, construction, ownership, maintenance and future replacement.
- c. The Applicant shall own, maintain and replace the proposed project at no cost to the Railroad and with no interruption to Railroad operations during construction, maintenance and future replacement of the structure.
- d. The Railroad shall, at its own expense, be responsible for ownership and maintenance of ballast and track components only.
- e. The Applicant shall provide, at no cost to the Railroad, traffic control and/or detours to allow occupation of the roadway by the Railroad or its contractor(s) to perform periodic inspections as required.
- f. The Applicant is responsible for performing the work in accordance with the terms specified in the C & M Agreement.

2.9 RAILROAD REVIEW PROCESS

- a. How to Communicate with the Railroad
 - i. All design and construction submittals shall be sent to the Railroad Representative who will pass them along for Railroad review.
- b. Railroad Compensation Agreement:
 - i. Prior to any review, the Railroad Local Representative shall receive written notice from the Applicant agreeing to pay all costs associated with the Railroad's (or its consultant's) review of the design plans, construction documents and construction monitoring phase. This is often referred to as the Preliminary Engineering Agreement (PE Agreement).
 - ii. The estimated costs of such PE Agreement shall not be the upper limit of the costs but will provide a guideline for budgeting purposes. Regardless, all actual costs incurred by the Railroad (or its consultants) during the review of design plans, construction documents, and construction monitoring submittals shall be fully recoverable from the Applicant.
- c. Railroad Review Duration
 - i. Review of design submittals and resubmittals by the Railroad (or its consultants) will require a minimum of 4 weeks each individual submission to the Railroad.
 - ii. To expedite the review process of the temporary shoring plans, drawings submitted to the Railroad shall be in accordance with these Guidelines. Otherwise, longer review times shall be expected.
 - iii. To avoid impacting the construction schedule, the Contractor should schedule submittals at least 4 to 6 months in advance.
 - iv. Partial, incomplete or inadequate designs will be rejected, thus delaying the approval.
 - v. Revised submittals will follow the same procedure as the initial submittal until all issues are resolved.

d. Applicant and Engineer of Record Review

- i. Before providing submittals for the Railroad to review, the applicant and or Engineer of Record must first review and approve the submittal for compliance with the project specifications, AREMA Manual, these Guidelines and structural capacity. Exceptions or proposed alternatives, if any, must be clearly communicated and identified for all submittals involved.
- ii. Drawings and calculations must be signed and stamped by a licensed professional engineer familiar with railway loadings and is licensed in the state where the shoring system is intended for use.

e. Construction May Commence Only When:

- i. The Contractor must not begin construction of any component of the shoring system affecting the Railroad Right-of-Way until written Railroad approval has been received.

2.10 APPROVAL EXPIRATION

- a. Written approval of Final Plans will be valid for two years from the date of approval by the Railroad unless otherwise provided in the C&M Agreement. If construction of the approved structure has not begun within this period, the Railroad shall have the right to perform a design review, at the cost of the Applicant, to confirm compliance with the Railroad's then-current Guidelines before a Railroad Right-of-Entry Agreement is issued to begin construction.

3. DESIGN

3.1 GENERAL DESIGN REQUIREMENTS

- a. Shoring Zones (see Figure 1 below):

- i. All dimensions are measured perpendicular to the centerline of track.
- ii. For ALL excavations within Zone A, shoring plans shall be accompanied by design calculations.
- iii. All shoring within the limits of Zone A must be placed prior to the start of excavation.

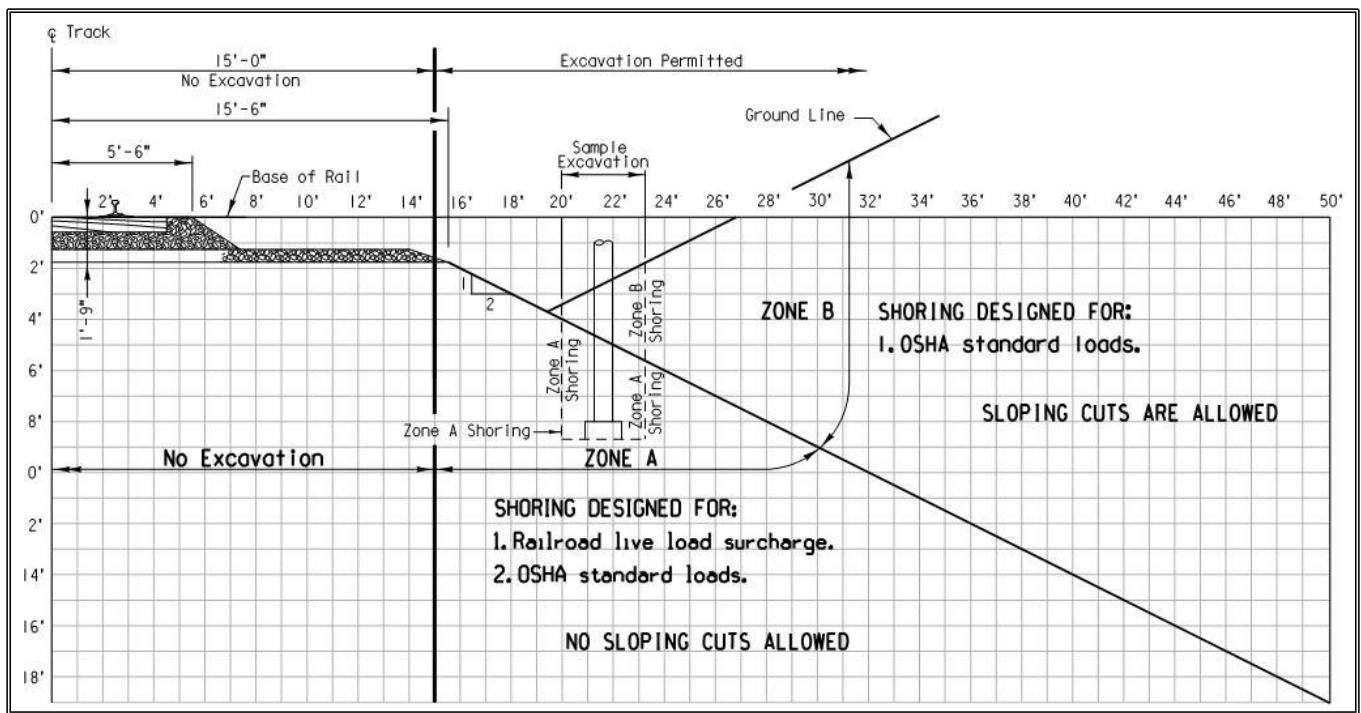


FIGURE 1

- b. Excavation Limits: No excavation shall be permitted closer than 15'-0" measured at a right angle from the centerline of track to the trackside of shoring system.
- c. Evaluate slope and stability conditions to ensure the Railroad embankment will not be adversely affected. Local and global stability conditions must also be evaluated.
- d. Lateral clearances must provide sufficient space for construction of the required Railroad ditches parallel to the standard Railroad roadbed section. The size of ditches will vary depending upon the flow and terrain and should be designed accordingly.
- e. Protect Open Excavations:
 - i. Any excavation, holes or trenches on the Railroad property shall be covered, guarded and/or protected. Handrails, fence, or other barrier methods must meet OSHA and FRA requirements. Temporary lighting may also be required by the Railroad to identify tripping hazards to train crewmen and other Railroad personnel.
- f. The most stringent project specifications shall be used of the Public Utilities Commission Orders, Department of Industrial Safety, OSHA, FRA, AREMA, BNSF, UPRR or other governmental agencies.
- g. Secondhand material is not acceptable unless the Engineer of Record submits a full inspection report which verifies the material properties and condition of the secondhand material. The report must be signed and sealed by the Engineer of Record.
- h. Shoring Removal:
 - i. All components of the shoring system are to be removed when the shoring is no longer needed to the extent that there is no impact to Railroad operations. All voids must be filled and compacted properly, and drainage facilities restored. See compaction requirements in [Section 3.5c](#).
 - ii. If the shoring cannot be completely removed, it shall be removed at least 3.0 feet below the final finished grade or at least 3.0 feet below the base of rail, whichever is lower, unless otherwise specified by the Railroad and only if approved by the Railroad.
 - iii. No traffic during unsupported excavations resulting from shoring removal.
- i. Soldier piles may be installed in predrilled holes if the requirements of [AREMA, Vol. 2, Ch. 8, Article 28.5.4.3](#) and the following are met:
 - i. Slurry and drilling fluid type materials are not acceptable as backfill for soldier piles in drilled holes.
 - ii. Concrete and flowable backfill may be used but might prevent removal of the embedded piles. If width of the drilled hole will be relied on for passive resistance, the concrete backfill shall have a minimum compressive strength of 3,000 psi, and a minimum coverage of at least 3.0 inches between the edge of the pile and drilled hole.
 - iii. Compacted pea gravel material is allowed as backfill if the groundwater level is below the bottom of the drilled hole, the diameter of the hole is at least 12 inches greater than the diagonal width of the pile, and the pea gravel is placed in successive lifts of 8 inches or less in thickness and either consolidated by vibrating the pile or being dry rodded between each lift. The design passive resistance shall be based on the lesser of that derived from either the surrounding subsurface soils or the pea gravel. The pea gravel shall be assumed to have a friction angle no greater than 34 degrees.
 - iv. Temporary or permanent casing is used to support the sides of the drilled hole for holes drilled within 25 feet from centerline of track, or 2 times the hole diameter plus 15 feet from centerline of track, whichever is greater. The thickness and strength of the steel casing shall be sufficient to support the loads described in [Section 3.7](#), and shall be specified on the plans.
- j. Tieback & Soil Nail Anchor Rods
 - i. Soil Nails are defined as drilled-in ground anchors that require ground and wall movement to occur before fully utilized, and Tiebacks are defined as tie rods and drilled-in ground anchors that are prestressed after installation.

- ii. Tiebacks & Soil Nails are not approved to permanently retain Railroad embankment supporting tracks.
 - iii. Tiebacks & Soil Nails installed below active tracks shall be cased during anchor installation.
 - iv. Tiebacks & Soil Nails shall be installed a minimum of 6 feet below base of rail, unless comprised of fiberglass or fully removed after the shoring is no longer needed. Additionally, the upper surface of the grouted tieback or soil nail shall be no less than 3.5 feet below base of rail.
 - v. Tiebacks & Soil Nails shall be designed for gravity placement of grout unless pressure grouting can be proven to not cause an unacceptable risk of track heave.
 - vi. For shoring that will extend above existing grade, which will result in the shoring being backfilled with compacted fill, settlement of the backfill, and associated impacts to shoring and adjacent structures, shall be evaluated. If tieback tie rods will be installed within the compacted backfill, the tie rods shall be placed in the bottom of pipe sleeves that have sufficient diameter to prevent vertical loading on the tie rods from backfill settlement. The pipe sleeves shall also have sufficient strength to support overburden backfill and surcharge loads.
 - vii. The contractor is responsible for providing an approved test method to verify the capacity of anchored or tieback systems. The manufacturers recommendations for testing must be satisfied. Systems which support the Railroad embankment will be considered high risk in determining the percentage of elements to be proof tested.
 - viii. Cement-grouted anchors tiebacks shall be installed, tested and stressed in accordance with the project specifications, AREMA requirements, FHWA-IF-99-015, Geotechnical Engineering Circular 4, Ground Anchors and Anchored Systems.
- k. The proximity of existing structures shall be evaluated when determining shoring installation methods. Installation of shoring by vibratory or impact hammers has the potential to cause dynamically induced subsidence of existing structures and track. The Railroad may dictate shoring installation methods as required on a case by case basis.

3.2 INFORMATION REQUIRED

- a. Plans and calculations shall be submitted, signed and stamped by a Licensed Professional Engineer familiar with Railroad loadings and who is licensed in the state where the shoring system is intended for use. See [Section 3.9](#) for requirements on plan submittals. In addition to plans and calculations, the following information is also required.
- b. Field Survey
 - i. The field survey shall be referenced to the centerline of track(s) and top of rail elevations. Existing grades and alignment of tracks and roads shall be surveyed. The location of existing utilities shall also be determined.
- c. Drainage
 - i. The drainage pattern of the site before and after construction should be analyzed and adequate drainage provisions should be incorporated into the plans and specifications. Consideration should be given to groundwater seepage as well as surface drainage.
 - ii. Drainage provisions for backfill should be compatible with the assumed water conditions in design.
- d. Geotechnical Report – See [Section 3.5](#), Subsurface Characterization.
- e. Assumed Loading – See [Section 3.7](#), Applied Loads and Calculations.
- f. Structural Design Calculations – See [Section 3.8](#), Structural Design Calculations.

3.3 DESIGN PROCEDURE

a. Shoring design should generally adhere to the following procedure:

Step 1) Determine proposed excavation location and depth.

Step 2) Establish subsurface and surface conditions at proposed shoring location. See [Section 3.5](#) for requirements.

Step 3) Select shoring type (see [Section 3.6](#))

Step 4) Determine Applied Loads

- Lateral Driving Pressures on back side of shoring, which would consist of the following:
 - Earth pressure (Active, At-Rest, Apparent) (see [Sections 3.7c.i, 3.7c.ii, and 3.7c.iii](#))
 - Surcharge pressures (see [Section 3.7c.iv](#))
 - Hydrostatic pressure (see [Section 3.7c.v](#))
- Lateral Resisting Pressures on the front side of shoring, which would consist of the following:
 - Passive earth pressure (see [Section 3.7d.i](#)).
 - Passive earth pressure reductions (e.g., seepage uplift) (see [Section 3.7d.ii](#))
 - Resisting loads from braces and tiebacks

Step 5) Perform Structural Design Calculations

- Perform stability analysis to establish the minimum embedment depth of shoring and anchor/brace loads (see [Section 3.8j](#)).
 - For complex shoring designs, perform global and basal heave stability analyses (see [Section 3.8j](#)).
- Verify deflection is within that allowable (see [Section 3.8k](#)).
- Verify strength of structural elements are not exceeded (see [Section 3.8i](#))

3.4 (Step 1) EXCAVATION LOCATION

a. See [Figure 1, Section 3.1b](#) for excavation limits.

b. Shoring systems should be located as far from the Railroad track and structures as possible.

3.5 (Step 2) SUBSURFACE CHARACTERIZATION

a. Subsurface exploration.

- i. Sufficient borings shall be made along the length of the structure to determine, with a reasonable degree of certainty, the subsurface conditions. Irregularities found during the initial soil boring program may dictate that additional borings be performed.
- ii. In general, borings should be performed within 50 feet of the planned location of shoring, or closer as necessary. If the planned shoring is longer than 250 feet in length, additional borings shall be performed along the length of the shoring on an average spacing of 250 feet.
- iii. Borings shall be performed to a depth sufficient to fully characterize the soils adjacent to and below the proposed shoring.
- iv. Unless otherwise stated in these guidelines, subsurface investigation shall also be made in accordance with the provisions of [AREMA, Vol. 2, Ch. 8, Part 22](#), Geotechnical Subsurface Investigation.

b. Type of backfill and backfill properties.

- i. Backfill is defined as material behind the wall, whether undisturbed ground or compacted fill, that contributes to the pressure against the wall.

- ii. The compacted fill may be classified with reference to the soil types described in [AREMA Vol. 2, Ch. 8, Articles 5.2.5 and 5.3.2](#). However, the unit weight used in design shall be representative of the actual unit weight of the material as measured by laboratory testing.
- c. Backfill placement and compaction.
 - i. The compacted fill shall meet the latest version requirements of [Section 31 23 26 of the UPRR General Conditions and Specifications \(UPRR\)](#) or BNSF Standard Construction Specifications (BNSF).
 - ii. No dumping of backfill material shall be permitted in such a way that the successive layers slope downward toward the wall. The layers shall be horizontal or shall slope downward away from the wall.
 - iii. If the wall is not free to rotate (i.e., is anchored or braced) and achieve an active condition during compaction of the backfill, the induced earth pressure due to compaction shall be evaluated. The assumed earth pressure shall be no less than the at-rest earth pressure (see [Section 3.7c.ii](#)).
- d. Stress states and corresponding soil strength properties.
 - i. Saturated cohesive soils (clays and some silts) can reside in two different stress states while shoring is in service:
 - Undrained / Total Stress: A short-term condition where the undrained shear strength (S_u) of the soil should be used for analysis.
 - Drained / Effective Stress: A long-term condition where drained effective friction angle (ϕ') and effective cohesion (c') of the soil should be used for analysis.
 - ii. It is impossible to accurately predict how long saturated cohesive soils will remain in an undrained / total stress state before pore pressures dissipate and the soil achieves a drained / effective stress state. For this reason, the Undrained Cohesive soil state shall only control for design when it results in a higher factor of safety for the shoring design than that estimated for the Drained Cohesive soil state. This will generally only be the case when the cohesive soils are relatively soft.
 - iii. It is noted that cohesive soils can also reside in an “unsaturated” state, where the soil can be characterized by an unsaturated shear strength. The unsaturated shear strength of a cohesive soil can vary drastically as it’s moisture content increases or decreases. Given the impossibility of predicting moisture content changes for soils exposed to weather and groundwater fluctuations, the unsaturated shear strength of the soil shall not be used for design.
 - iv. Saturated and unsaturated cohesionless soils (some silts, sands, and gravels) should be assumed to always reside in a drained / effective stress state.
- e. A Geotechnical Report summarizing the existing and proposed subsurface conditions shall be provided by a Licensed Professional Engineer. The Geotechnical Report shall include:
 - i. Boring location plan showing the location of each boring in relation to tracks and the proposed shoring.
 - ii. Boring logs that indicate the elevation and depth of each layer of soil encountered, USCS classification of each layer of soil, an indication of whether the soil is fill or natural soil, the depth/elevation of groundwater, results of in-situ testing, index properties of the soil layers as determined by laboratory testing (e.g., moisture, density, sand content, plasticity, unconfined strength, etc.)
 - iii. Results of all laboratory testing. Laboratory testing shall include at a minimum: moisture content, density, unconfined compression tests on clay/rock, and direct shear or triaxial compression testing on soils to determine the effective cohesion and internal angle of friction.

- iv. Recommended soil properties for the design of shoring for each layer of soil as follows:
 - Top/bottom elevation of soil layer
 - Moist (γ) and effective (γ') unit weight
 - Undrained shear strength (S_u) of cohesive soils
 - Effective cohesion (c') and friction angle (ϕ')
 - Active and passive earth pressure coefficients
 - Parameters for p-y curve generation, if necessary.
- v. If required, allowable bearing capacity for spread footings.
- vi. Compaction recommendations for backfill, optimum moisture content and maximum density of fill material, and design parameters for the compacted fill. See [Sections 3.5b and 3.5c](#).
- vii. Water table elevation to be assumed on both sides of the shoring system.
- viii. Dewatering recommendations, as needed, and proposed flownets or zones of groundwater influence.

3.6 (Step 3) SHORING TYPES

- a. Shoring/Trench Box is a prefabricated shoring system which is installed as the excavation progresses. This system is allowed in special applications only, typically where Railroad live load surcharge is not present unless it can be shown that the over excavation outside the box will be filled and compacted before the presence of Railroad live load.
- b. Anchored systems with tiebacks are discouraged, as the tiebacks will be an obstruction to future utility installations and may also damage existing utilities. If used, see Section 3.1.j for design requirements for tiebacks and soil nails.
- c. Sheet Pile Wall (Anchored) is a structure designed to provide lateral support for a soil mass and derives stability from passive resistance of the soil in which the sheet pile is embedded and the tensile resistance of tiebacks.
- d. Sheet Pile Wall (Cantilevered) is a structure designed to provide lateral support for a soil mass and derives stability from passive resistance of the soil in which the sheet pile is embedded. Cantilever sheet pile walls shall be used only in granular soils or stiff clays. The maximum height of wall above the excavation line shall be 10 feet in Zone A (see [Figure 1](#)) and 12 feet in Zone B.
- e. Soldier Pile with Lagging Wall (Anchored) is a structure designed to provide lateral support for a soil mass and derives stability from passive resistance of the soil/rock in which the soldier beam is embedded and from the tensile resistance of tiebacks. Soldier beams include steel H-piles, wide flange sections or other fabricated sections that are driven or set in drilled holes. Lagging refers to the members spanning between soldier beams.
- f. Soldier Pile with Lagging Wall (Cantilever) is a structure designed to provide lateral support for a soil mass and derives stability from passive resistance of the soil/rock in which the soldier beam is embedded. The maximum height of the wall above the excavation line shall be 8 feet for Zone A (see [Figure 1](#)) and 12 feet for Zone B.
- g. Braced Excavation is a structure designed to provide lateral support for a soil mass and derives stability from passive resistance of the soil in which the vertical members are embedded and from the structural capacity of the bracing members. For purposes of these guidelines, the vertical members of the braced excavation system include steel sheet piling or soldier beams comprised of steel H-piles, wide flange sections, or other fabricated sections that are driven or installed in drilled holes. Wales are horizontal structural members designed to transfer lateral loads from the vertical members to struts or rakers. Struts and rakers are structural compression members that support the lateral loads from the wales and transfer the load to either another side of a shored excavation (struts) or to a reaction pile/thrust block (raker).
- h. Cofferdam is an enclosed temporary structure used to keep water and soil out of an excavation for a permanent structure such as a bridge pier or abutment or similar structure. Cofferdams may be

constructed of timber, steel, concrete or a combination of these. These guidelines consider cofferdams primarily constructed with steel sheet piles.

3.7 (Step 4) APPLIED LOADS AND CALCULATIONS

- a. For shoring design submittal, all design criteria, temporary and permanent loading must be clearly stated in the design calculations and on the contract and record plans.
- b. Applied loading will consist of driving pressures/forces on the back of the shoring and resisting pressures/forces on the front of the shoring.
 - Driving pressure will generally consist of:
 - Active, At-Rest & Apparent pressures. ([Sections 3.7c.i, 3.7c.ii, 3.7c.iii](#))
 - Surcharge ([Section 3.7c.iv](#))
 - Hydrostatic pressures ([Section 3.7c.v](#)).
 - Resisting pressure will generally consist of:
 - Passive earth pressure (3.7d.i) and brace/tieback loading.
- c. **Driving Pressures/Loads:**
 - i. **Active Earth Pressure**
 - Use for cantilever walls and flexible walls with only one row of tiebacks/braces (i.e., flexible anchored bulkheads), if the minimum deflection criteria per AREMA Vol. 2, Ch. 8, Article 20.1.2.d is met. If the minimum deflection criteria for flexible anchored bulkheads is not met, use Apparent Earth Pressure for top-down shoring construction ([Section 3.7c.iii](#)), and At-Rest Earth Pressure for walls that are backfilled ([Section 3.7c.ii](#)).
 - The active earth pressure may be computed by the Rankine, Coulomb or Log-Spiral theories. The active earth pressure may also be based on general soil type per [AREMA Vol. 2, Ch. 8, Part 20, Table 8-20-3](#) as provided in the [Appendix](#).
 - For interface friction angles used for Coulomb and Log-Spiral theories, the interface friction angle shall not be greater than one-half of the effective friction angle of the soil, or that consistent with published values for specific types of soil in contact with either steel or concrete (e.g., **NAVFAC DM7.02, Chapter 3, Table 1**).
 - The backslope of the retained soil shall be considered when calculating the active earth pressure.
 - See [Section 3.5b](#). Subsurface Characterization, for further requirements for computing earth pressure from compacted backfill.

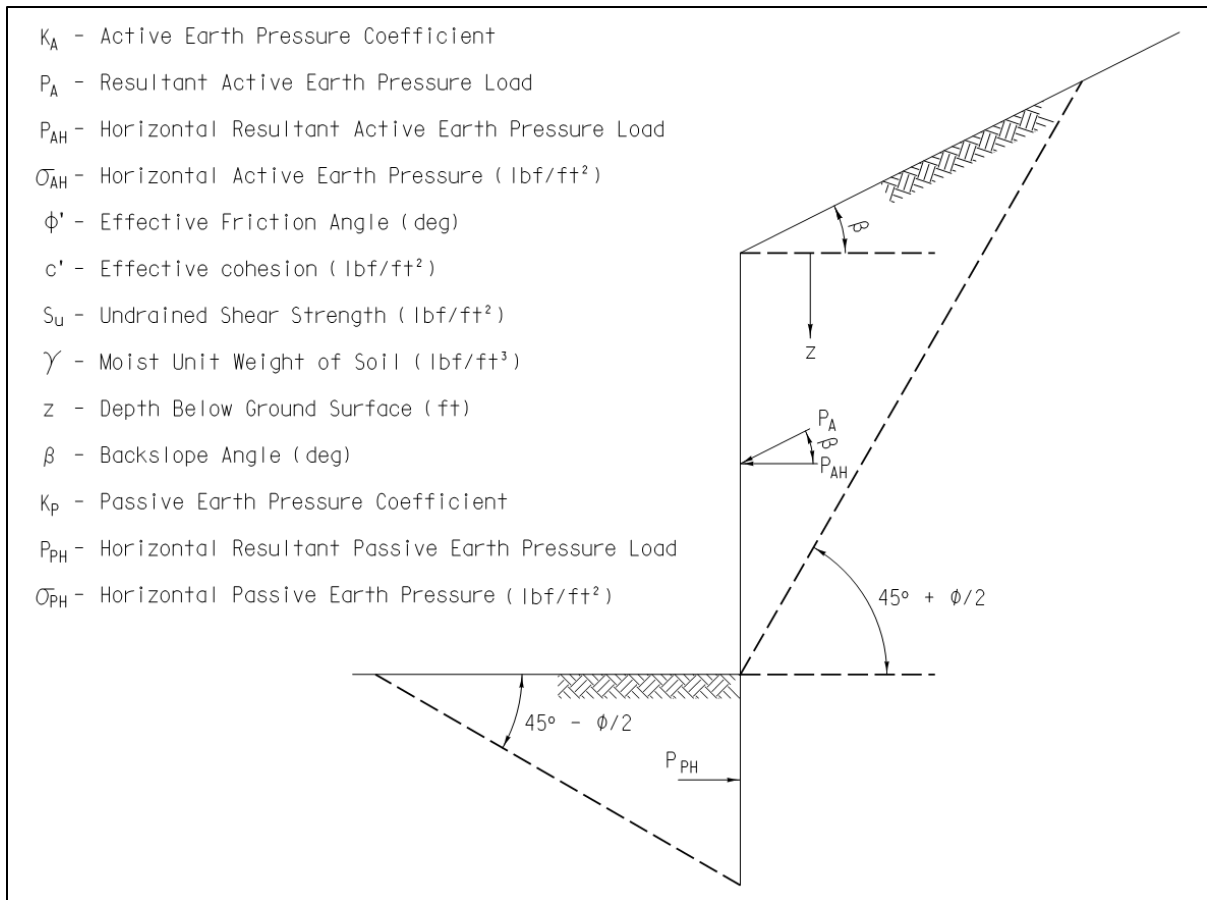


FIGURE 2

❖ **NON-COHESIVE SOILS**

Level Backslope (Rankine)

$$\sigma_{AH} = K_A \gamma z, \text{ where } K_A = \tan^2 \left(45 - \frac{\phi'}{2} \right)$$

Sloping Backslope (Rankine)

$$\sigma_{AH} = K_A \gamma z \cos \beta, \text{ where } K_A = \cos \beta \left(\frac{\cos \beta - \sqrt{\cos^2 \beta - \cos^2 \phi'}}{\cos \beta + \sqrt{\cos^2 \beta - \cos^2 \phi'}} \right)$$

❖ **COHESIVE SOILS & FRACTURED ROCK**

Drained Cohesive & Fractured Rock - Level & Sloping Backslope (Rankine/Bell)

- Use these drained equations unless the undrained equations below result in greater earth pressures in the shoring design.

$$\sigma_{AH} = K_A \gamma z - 2c' \sqrt{K_A}$$

$$K_A = \tan^2 \left(45 - \frac{\phi'}{2} \right), \text{ For Level Backslope}$$

$$K_A = \cos \beta \left(\frac{\cos \beta - \sqrt{\cos^2 \beta - \cos^2 \phi'}}{\cos \beta + \sqrt{\cos^2 \beta - \cos^2 \phi'}} \right), \text{ For Sloping Backslope}$$

- **Effective Cohesion Note:** Effective cohesion shall be assumed to be zero, unless local experience by a Licensed Geotechnical Engineer indicates the fully softened strength of the clay will have an effective cohesion greater than zero.
- **Fractured Rock Note:** The active earth pressure for fractured rock and intermediate geomaterials (e.g., weak shales, sandstone, etc.) shall be based on either the rock mass effective cohesion and friction angle, or mass shear strength. The mass strength parameters shall be determined using a methodology that accounts for rock type, intact strength, spacing and conditions of joints, rock quality designation (RQD), geological strength index (GSI), and/or rock mass rating (RMR).

Undrained Cohesive – Level Ground (Rankine/Bell)

- Only use undrained when it results in a higher earth pressure in the shoring design. Otherwise use the Drained equations above.
- Assumes $\phi=0$ and $c'=S_u$

$$\sigma_{AH} = \gamma z - 2S_u$$

or

$$\sigma_{AH} = K_A \gamma z, \text{ where } K_A = 1 - \frac{2S_u}{\gamma z}$$

Very Soft to Medium Clays/Silts

- Where the Stability Number $N_s = \gamma H / S_{ub}$ is greater than 4, active earth pressure shall be estimated as the greater of that determined using the equations above for drained (effective) and undrained (total stress) conditions, or the equations directly below. The factor of safety against basal heave shall also be analyzed per [Section 3.8j.ii3.8](#). For $N_s > 6$, the global stability of the shoring shall also be evaluated by a limit-equilibrium method of slices per [Section 3.8j.ii](#).

- For $4 < N_s < 5.14$, $K_A = 0.22$
- For $N_s > 5.14$ (Henkel, 1971), $K_A = 1 - \frac{4S_u}{\gamma H} + 2\sqrt{2} \frac{d}{H} \left(1 - \frac{5.14S_{ub}}{\gamma H}\right) \geq 0.22$

Where:

S_u = Undrained strength of retained soil (lbf/ft²)

S_{ub} = Undrained strength of soil below excavation base (lbf/ft²)

γ = Total unit weight of retained soil (lbf/ft³)

H = Total excavation depth (ft)

d = Depth of potential base failure surface below base of excavation (ft)

(The lessor of either the thickness of soft to medium stiff clay below the bottom of excavation, or the width of the excavation divided by the square root of 2. See [Figure 3](#) below.)

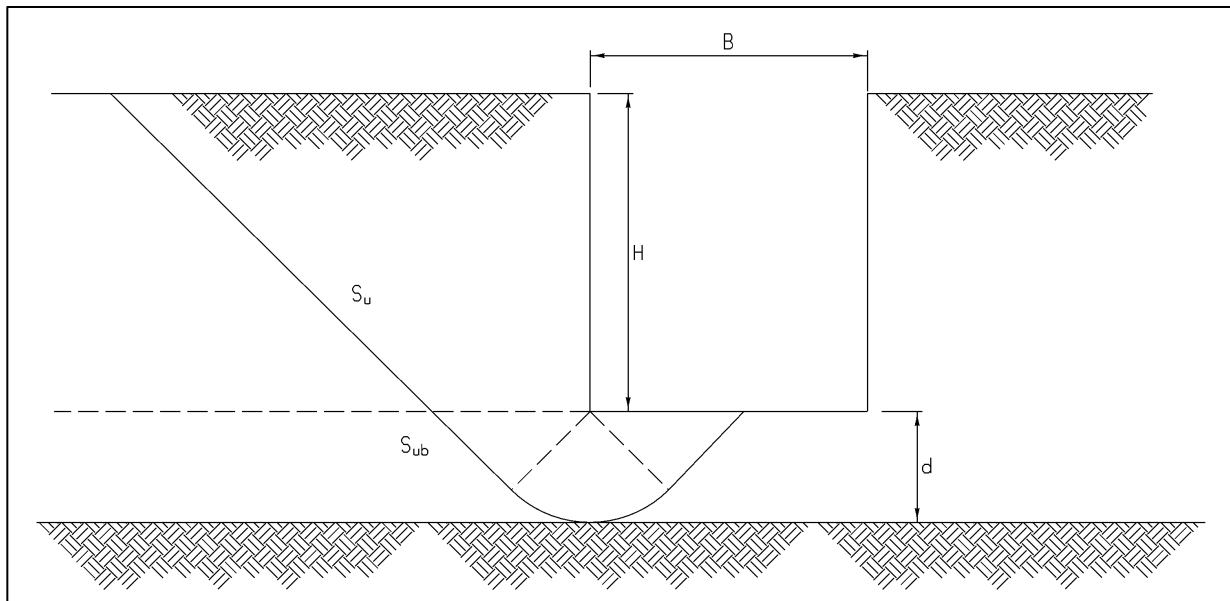


FIGURE 3

ii. **At-Rest Earth Pressure.**

- Used for rigid walls (e.g., reinforced concrete walls) that deflect less than that indicated in [Table 1](#).

Table 1 - When to Use At-Rest Earth Pressure

Type of Backfill	Wall Deflection / Wall Height
Dense sand	0.001
Medium dense sand	0.002
Loose sand	0.004
Compacted Silt	0.002
Compacted lean clay	0.010
Compacted fat clay	0.010

(Clough & Duncan, 1991)

- At-Rest earth pressure shall also be used for walls that are restrained above the dredge line by braces/tiebacks and are backfilled with compacted fill. See also [Section 3.8j.ii](#).
- At-Rest earth pressure shall be calculated as follows:

Level Ground

$$\sigma_{0H} = K_0 \gamma z, \text{ where } K_0 = (1 - \sin\phi')OCR^{(\sin\phi')}$$

Sloping Backslope

$$\sigma_{0H} = K_0 \gamma z (1 + \sin\beta)$$

Where:

- σ_{0H} – Horizontal At-Rest Earth Pressure (lbf/ft²)
- K_0 – At-Rest Earth Pressure Coefficient
- ϕ' – Effective Friction Angle (deg)
- OCR – Over-Consolidation Ratio
- β – Backslope Angle (deg)

iii. Apparent Earth Pressure

- Use for braced excavations with single or multiple levels of braces/tiebacks.
- Use equations determined per [AREMA Vol. 2, Ch. 8, Article 28.5.4.1](#) or [FHWA-IF-99-015, Sections 5.2.4](#) (sands), [5.2.5](#) (stiff to hard clays) and [5.2.6](#) (soft to medium clays).
- For braced excavations that bottom out in very soft to medium stiff clays/silts, where the Stability Number $N_s = \gamma \cdot H / S_{ub}$ is greater than 4, the requirements of [Section 3.7c.i](#) for very soft to medium clays shall also apply if they control for design.

iv. Surcharge Loads

- Loads include but are not limited to: Railroad vertical and centrifugal loading, railroad service vehicles (HS-20 truck), roadway loading, fills placed above the top of shoring, construction equipment, crane pads, future grading and paving, structures, material storage piles, and snow.
- Dead load assumptions to be used for design:
 - Spoil pile: must be included assuming a minimum height of two feet of soil adjacent to the excavation.
 - Track: use 200 lbs/linear-ft for rails, inside guardrails and fasteners.
 - Roadbed: ballast, including track ties, use 120 lbs per cubic foot.
- For specific applications of the Cooper E80 live load, refer to in [Appendix 5.1](#), which illustrates Live Load Pressure Due to Cooper E80.
- Additional analysis for centrifugal force calculations as described in [AREMA Vol. 2, Ch. 15, Article 1.3.6](#). Centrifugal Loads are required where shoring is located along the outer side of curved track and track curvature exceeds three degrees.
- Lateral pressure from to infinite and uniform surcharge load.
 - The surcharge can effectively be treated as another soil layer, whereby the vertical surcharge pressure is multiplied by the active or at-rest earth pressure coefficient as shown below:

$$\sigma_{UA} = K_A q \quad \text{or} \quad \sigma_{U0} = K_0 q$$

Where:

σ_{UA} – Uniform lateral surcharge pressure for active condition (lbf/ft²)

σ_{U0} – Uniform lateral surcharge pressure for at-rest condition (lbf/ft²)

K_A - Active earth pressure coefficient

K_0 – At-rest earth pressure coefficient

q - Uniform surcharge load (lbf/ft²)

- Lateral pressure from to point, line, uniform strip, and rectangular-area surcharge loads.
 - Equations shall be based on Boussinesq theory (i.e., elastic theory) and a rigid wall condition.
 - For point loads, see **AREMA, Vol. 2, Ch. 8, Article 20.3.2.4**.
 - For line loads, see **AREMA, Vol. 2, Ch. 8, Article 20.3.2.3**.
 - For rectangular loads, see **NAVFAC DM7.02, Figure 11**.
 - For uniform strip loads, see Case I (Cooper E80 loading parallel to walls) in [Appendix 5.1](#), or **AREMA, Vol. 2, Ch. 8, Article 20.3.2.2**.
- Trial Wedge method per [AREMA, Vol. 2, Ch. 8, Article C5.3.2.II](#) may also be used.

v. **Hydrostatic Pressure Due to Unbalanced Groundwater Levels.**

- Hydrostatic pressure shall be assumed on secant/tangent pile and sheet pile shoring if the base of the excavation extends below the water table and no drainage system is installed behind the shoring.
- Weep holes are not considered an effective drainage system, unless the soil behind the shoring above the dredge line is uniformly free-draining granular material.

d. **Resisting Pressures/Loads:**

i. **Passive earth pressure**

- The passive earth pressure, P_p , below the excavation line may be computed by Rankine or Log-Spiral theories, but not the Coulomb theory.
- For Log-Spiral theory, the interface friction angle shall not be greater than one-half of the effective friction angle of the soil, or that consistent with published values for specific types of soil in contact with either steel or concrete.
- The passive earth pressure for cohesionless soils (sands, gravels and some silts), uncontrolled fill, and mixed layers of cohesive and cohesionless soil shall be calculated based on the effective friction angle of the soil.
- The passive earth pressure for cohesive (clay and some silts) soils and controlled backfill shall be calculated for the effective stress condition (see [Section 3.5d.i](#) for definition), unless the resulting earth pressure for the total stress condition (i.e., S_u) is less.
- For conditions where the slope in front of the shoring slopes down and away from the wall, the slope in front of the wall shall be considered when calculating passive pressure. If the ground in front of the shoring slopes upwards away from the wall, the ground level shall be assumed to be level for analysis.
- For reference, Rankine equations are provided below:

K_P – Passive Earth Pressure Coefficient

σ_{PH} – Horizontal Passive Earth Pressure (lbf/ft²)

ϕ' – Effective Friction Angle (deg)

c' – Effective cohesion (lbf/ft²)

S_u – Undrained Shear Strength (lbf/ft²)

γ – Moist Unit Weight of Soil (lbf/ft³)

z – Depth Below Ground Surface (ft)

β – Front Slope Angle (deg)

NON-COHESIVE SOILS

Level Frontslope (Rankine)

$$\sigma_{PH} = K_P \gamma z, \text{ where } K_P = \tan^2 \left(45 + \frac{\phi'}{2} \right)$$

Sloping Frontslope (Rankine)

- Use only if ground is sloping down and away from shoring (i.e., β is negative)

$$\sigma_{PH} = K_P \gamma z \cos \beta, \text{ where } K_P = \cos \beta \left(\frac{\cos \beta + \sqrt{\cos^2 \beta - \cos^2 \phi'}}{\cos \beta - \sqrt{\cos^2 \beta - \cos^2 \phi'}} \right)$$

COHESIVE SOILS & FRACTURED ROCK

Drained Cohesive & Fractured Rock - Level & Sloping Backslope (Bell's)

$$\sigma_{PH} = K_P \gamma z + 2c' \sqrt{K_P}$$

$$K_P = \tan^2 \left(45 + \frac{\phi'}{2} \right), \text{ For Level Frontslope}$$

$$K_P = \cos\beta \left(\frac{\cos\beta + \sqrt{\cos^2\beta - \cos^2\phi'}}{\cos\beta - \sqrt{\cos^2\beta - \cos^2\phi'}} \right), \text{ For Sloping Frontslope}$$

- Effective cohesion shall be assumed to be zero unless local experience by a Licensed Geotechnical Engineer indicates the fully softened strength of the clay will have an effective cohesion greater than zero.
- The passive resistance for fractured rock and intermediate geomaterials (e.g., weak shales, sandstone, etc.) shall be based on either the rock mass effective cohesion and friction angle, or mass shear strength. The mass strength parameters shall be determined using a methodology that accounts for rock type, intact strength, spacing and conditions of joints, rock quality designation (RQD), geological strength index (GSI), and/or rock mass rating (RMR).

Undrained Cohesive – Level Ground (Rankine/Bell)

- Only use undrained when it results in a lower earth pressure in the shoring design. Otherwise use Drained equations above.
- Assumes $\phi=0$ and $c'=S_u$

$$\sigma_{PH} = \gamma z + 2S_u$$

or

$$\sigma_{PH} = K_P \gamma z \text{ where } K_P = 1 + \frac{2S_u}{\gamma z}$$

- For soldier pile walls, the upper 1.5 pile/shaft diameters of passive resistance in soil below the excavation line shall be ignored per [AREMA, Vol. 2, Ch. 8, Article 28.5.3.2.a](#).
 - Allowable arching factors for soldier pile walls shall comply with [AREMA, Vol. 2, Ch. 8, Article 28.5.3.2.a](#).
 - As noted in [Section 3.1i.ii](#) above, the width of the drilled hole for a soldier pile shall not be assumed to provide passive resistance unless the concrete backfill has a minimum compressive strength of 3,000 psi, and a minimum coverage of at least 3.0 inches between the edge of the pile and drilled hole.
 - P-y curve methods shall use a P-multiplier less than 1 to account for group effects on sheet and soldier pile walls when piles are spaced less than 3.5D apart on center, and for slopes in front of the wall.
- ii. Seepage pressures on bulkheads and cofferdams.
- Where the imbalance of water levels results in water seeping under the bottom of shoring and upward into the excavation, the seepage pressures on the wall and base of excavation shall be based on flownet or equivalent analyses, and the passive resistance reduced accordingly. See [AREMA, Vol. 2, Ch. 8, Article 20.3.5](#) or FHWA-IF-99-015 Section 5.2.9 for further detail.

3.8 (Step 5) STRUCTURAL DESIGN CALCULATIONS

- a. Temporary shoring is defined by [AREMA, Vol. 2, Ch. 8, Article 28.1.1](#), and is anticipated to be in service for not more than an 18-month period. Earth retention structures that are anticipated to be in service for more than 18 months shall be designed per AREMA as permanent structures.
- b. Calculations shall be performed for each stage of construction, when one or more rows of braces/tiebacks are being implemented. The calculations shall be performed for each stage of excavation before the braces/tiebacks are installed for that stage.
- c. Calculations shall be performed by one of two methods:
 1. **Classical Method:** A sum of forces and moments analysis whereby driving and resisting pressures are balanced. Driving pressures are applied from the top to the bottom of the back side of the shoring. For braced excavations, Apparent earth pressure will be applied from the top down to the excavation line, and below the excavation line, Active earth pressure will be applied down to the bottom of the shoring on the back side of the shoring. Resisting pressures/forces are applied from the excavation line to the bottom of the front side of the shoring. To achieve an acceptable factor of safety for embedment, the passive resistance will be reduced as required in [Section 3.8j.i](#). It is noted that all AREMA requirements are based on an assumption that the Classical Method will be used for design.
 2. **P-y Method:** A force-deflection analysis (i.e., Winkler beam analysis) whereby the soil below the excavation line on both sides of the shoring is characterized as springs. Driving earth pressures are generally only applied above the excavation line. However, surcharge loads are generally applied to the bottom of the shoring elements. Minimum embedment is based on the base of the shoring reaching fixity as required in [Section 3.8j.i](#).
- d. Calculations shall be in English units. If Metric units are used, all controlling dimensions, elevations, design criteria assumptions, and material stresses shall be expressed in dual units, with English units to be in parentheses.
- e. List all assumptions used to design the temporary shoring system, and provide references for equations, tables, figures, and design criteria obtained from design manuals and guidelines.
- f. Computerized calculations and programs must clearly indicate the input and output data. List all equations used in determining the output.
- g. Example calculations with values must be provided to support computerized output and match the calculated computer result.
- h. Provide a simple free body diagram showing all controlling dimensions and applied loads on the temporary shoring system.
- i. Documents and manufacturer's recommendations which support the design assumptions must be included with the calculations.
- j. **Embedment depth and stability.**
 - i. The minimum depth of embedment is that required to balance driving and resisting pressures/loads.
 - The minimum factor of safety for balancing active and passive pressures shall be 1.5 (See [AREMA, Vol. 2, Ch. 8, Article 20.5.1.a](#)). The factor of safety is achieved by reducing the passive earth pressure resistance by a factor of 0.67. A calculated factor of safety based on shallow penetration into strong soil layer is not acceptable.
 - Note, some commercially available software packages add ~ 30% length to the embedment computed for moment equilibrium in order to achieve force equilibrium. This additional length added by the software is not the required factor of safety noted above. Additional embedment, beyond the 30% added by the software package, is required to achieve the specified factor of safety.

- The minimum embedment for p-y methods shall be based on both the shoring meeting the deflection limit criteria in [Table 2](#) over the full height of the shoring, and a moment reversal (i.e., moment diagram passes through zero twice) being achieved below the excavation line.
- ii. In special circumstances, as indicated in these guidelines, minimum embedment might also be controlled by basal heave or global stability.
- The minimum factor of safety against basal heave shall be 1.5 for temporary structures. See FHWA-IF-99-015, Section 5.8.2 for further details on methodology.
 - The minimum factor of safety for global stability shall be 1.3 when using a limit-equilibrium method of slices. (See AREMA, Vol. 2, Ch. 8, Article 20.4.1.c). The global stability analyses shall consider failure surfaces that pass both below and through non-continuous shoring (e.g., soldier piles) located below the dredge line, as well as both through and behind wall anchors. See FHWA IF-99-015, Section 5.7.3 for further details on methodology.
 - Global stability shall also be analyzed for slopes steeper than 2(H):1(V) that are above, adjacent or below shoring.
- iii. Multiple tiers of shoring should not be used if the active wedge of the lower wall overlies the passive wedge of the upper wall.
- If there is active/passive overlap between tiers of shoring, or the shoring will be supporting an existing retaining wall, the effect of loading of the upper wall/shoring on the lower wall shall be evaluated. This will require estimating the bearing, sliding and/or passive resistance demand of the upper wall, and applying those demands in part or fully to the lower wall. In addition, any loading in front of or behind the upper wall that is not fully supported by the wall, would also need to be applied to the shoring. Lastly, a global stability analysis per [Section 3.8j.ii](#) shall be performed to determine the external stability of the multi-tiered wall/shoring system.

k. **Deflection limits.**

- i. Calculated total deflections of any part of the temporary shoring system and top of rail elevation shall not exceed the criteria outlined in [Table 2](#) Deflection Criteria. Include the accumulated elastic deflection of all of the wall elements (piles, anchors, lagging, walers, strut/raker restraints, etc.), as well as the deflection due to the passive deflection of the resisting soil mass.

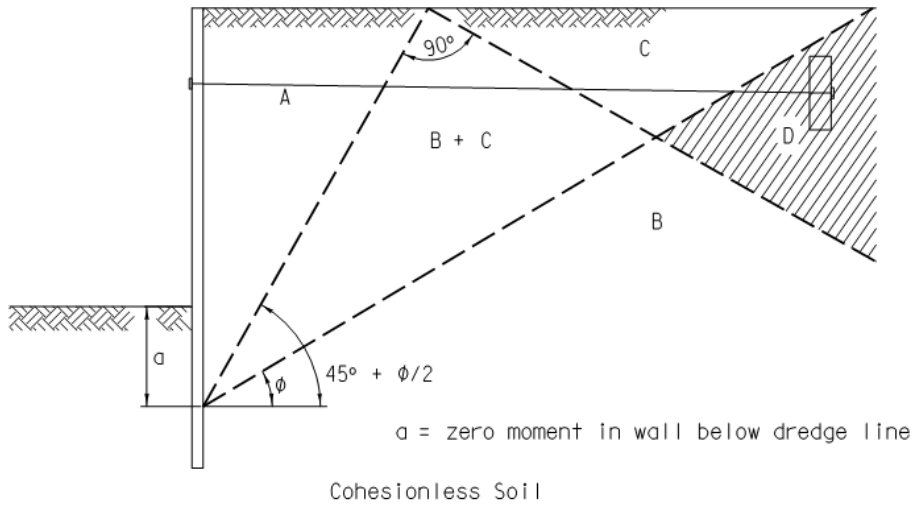
Table 2 - Deflection Criteria

Horizontal distance from shoring to track C/L measured at a right angle from track	Maximum horizontal movement of shoring system	Maximum acceptable horizontal or vertical movement of rail
15' < S < 18'	3/8"	1/4"
18' < S < 25'	1/2"	1/4"
S > 25'	1% of shoring height above excavation line	-

- ii. Braced excavations should be designed for conditions in which the ground surface on all sides is relatively uniform in elevation. If the ground surface elevation varies significantly from one side of the excavation to the other, the deflection of the higher braced shoring towards the side with lower braced shoring shall be evaluated. This analysis would approximate that required for shoring supported by rakers, where the lower shoring acts as the raker thrust block, such that the passive deflection of the lower shoring is added to the higher shoring deflection and the resulting sum is verified to not exceed the deflection criteria in [Table 2](#).

I. **Strength design.**

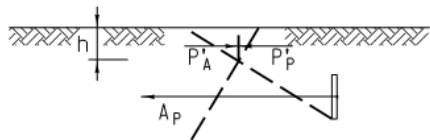
- i. Shall be performed using the Service Load Design method. Allowable Stresses based on AREMA requirements are as follows:
 - Structural Steel Allowable Stress: See [AREMA, Vol. 2, Ch. 15, Section 1.4, Table 15-1-11](#) For common shoring components, generally 0.55 of the yield strength of the steel.
 - Sheet Pile Sections: 2/3 of yield strength for steel. ([AREMA, Vol. 2, Ch. 8, Article 20.5.7](#))
 - Concrete: 1/3 of Compressive strength. ([AREMA, Vol. 2, Ch. 8, Article 20.5.7](#))
 - Anchor Rods: 1/2 of yield strength for steel. ([AREMA, Vol. 2, Ch. 8, Article 20.5.7](#))
- ii. AISC allowances for increasing allowable stress due to temporary loading conditions are not acceptable.
- iii. Structures and structural members shall be designed to have design strengths at all sections at least equal to the required strengths calculated for the loads and forces in such combinations as stipulated in [AREMA, Vol. 2, Ch. 8, Article 2.2.4b](#), which represents various combinations of loads and forces to which a structure may be subjected. Each part of the structure shall be proportioned for the group loads that are applicable, and the maximum design required shall be used.
- iv. In braced excavations, the connections between struts and wales shall be designed to resist both axial demands as well as the vertical demands from the self-weight of the members and any incidental vertical loads applied during construction.
- v. Stiffeners shall be provided at points of bearing concentrated load. (See [AREMA Vol. 2, Ch.15, Article 1.7.7](#)).
- m. Gravity type temporary shoring systems must also be analyzed for settlement, overturning, sliding, bearing capacity per [AREMA, Vol. 2, Ch. 8, Part 5](#), and global stability per the requirements in [Section 3.8j.ii](#).
- n. Anchor blocks and deadman for tiebacks shall be designed for a safety factor of 2.0, where safety factor is derived as the ratio of the net passive resistance (passive earth pressure minus active earth pressure) on the anchor block to the load on tie rod. To utilize the full allowable anchor capacity, the minimum length of the tie rod shall be as shown in [Figure 4](#). If site constraints prevent the minimum length of tie rods from being implemented, the anchor capacity shall be reduced as Indicated in [Figure 4](#). For deriving anchor block capacity where minimum tie rod length is achieved, NAVFAC DM7.02 or CalTrans 2011 may be referenced.
 - i. For sheet and soldier pile deadman, p-y methods may be used. The sum of the estimated deflection of the deadman pile and shoring shall be less than that indicated in [Section 3.8k](#).



For Cohesionless soils, anchor resistance in each zone is as follows:

A - No Anchor resistance available

B - Anchor block resistance is reduced by $P'_p - P'_A$



$$P'_p = \frac{1}{2} h^2 \gamma \tan^2 \left(45^\circ + \frac{\phi}{2} \right)$$

$$P'_A = \frac{1}{2} h^2 \gamma \tan^2 \left(45^\circ - \frac{\phi}{2} \right)$$

C - Anchor block achieves full resistance but pressure is increased on the wall by ΔP_p .
(See ΔP_p force diagram in Theoretical Soil Mechanics, pgs. 232-233 or NAVFAC DM7.02, Figure 20)

B + C - Anchor block resistance is reduced by $P'_p - P'_A$ and pressure is increased on the wall by ΔP_p .

D - Anchor block achieves full resistance without adding additional load to the wall

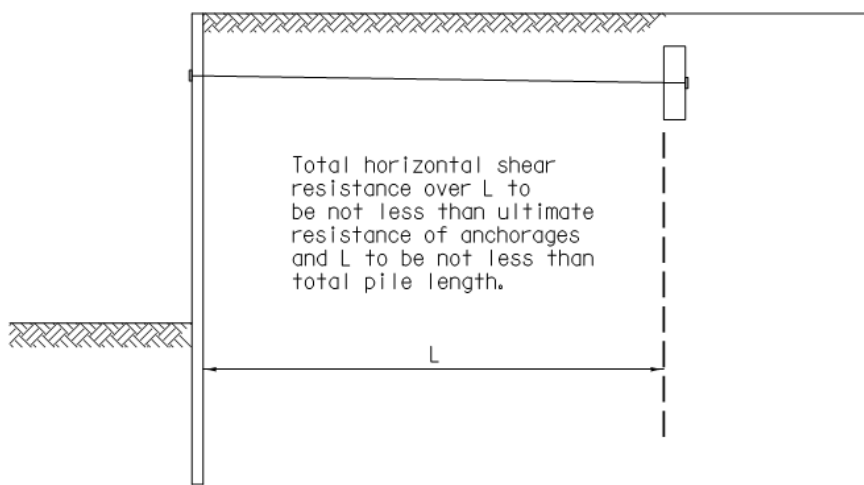


FIGURE 4

3.9 DESIGN PLAN REQUIREMENTS

- a. Shoring design plans shall be in English units. If Metric units are used, all controlling dimensions, elevations, design criteria assumptions, and material stresses shall be expressed in dual units, with English units to be in parentheses. The shoring plans must completely identify the site constraints and the shoring system, and must be signed and stamped by a Licensed Professional Engineer, registered in the state where the work will be performed. Use the design templates provided in the appendix as an example to show the required information, specifications and drawings. The specific requirements of the plan submittals are as follows:

i. **General plan view should show:**

- Railroad Right-of-Way and North arrow.
- Position of all railroad tracks and identify each track as mainline, siding, spur, etc.
- Spacing between all existing tracks.
- Location of all access roadways, drainage ditches and direction of flow.
- Contours of existing grade elevations.
- Footprint of proposed structure, proposed shoring system and any existing structures if applicable.
- Proposed horizontal construction clearances. The minimum allowable is 15 feet measured at a right angle from centerline of track. In curved track the temporary horizontal construction clearances shall increase either 6 inches total or 1.5 inches for every degree of curve, whichever is greater, per [Section 4.4.1.2 of the BNSF-UPRR Guidelines for Railroad Grade Separation Projects](#).
- Location of existing and proposed utilities.
- Location of soil borings used for design.
- Specifications for all elements of the proposed shoring.
- Detailed view of shoring along with controlling elevations and dimensions.

ii. **Typical sections and elevations perpendicular to adjacent track alignment should show:**

- Top of rail and/or top of tie elevations for all tracks.
- Offset from the outside face of shoring system to the centerline of all tracks at all changes in horizontal alignment.
- All structural components, controlling elevations and dimensions of shoring system.
- All drainage ditches and controlling dimensions.
- All slopes, existing structures and other facilities which may surcharge the shoring system.
- Location of all existing and proposed utilities.
- Total depth of shoring system.

- For shoring with tiebacks/bracing, elevations for each temporary stage of shoring construction.
- The assumed groundwater elevation.
- The extent of the Zone A envelope as it overlies the proposed shoring.

iii. **General notes**

- Design loads to be based on the AREMA manual and Cooper E80 loading.
- Pressure due to embankment surcharges.
- ASTM designation and yield strength for each material.
- Maximum allowable bending stress for structural steel is $0.55F_y$.
- Temporary overstress allowances are not acceptable.
- All timber members shall be Douglas Fir grade 2 or better.
- In-situ soil classification.
- Backfill soil classification.
- Soil properties used for design.
- Active and passive soil coefficients.
- Fill and backfill compaction criteria.
- Slopes without shoring shall not be steeper than 2 horizontal to 1 vertical.
- Dredge line elevation.
- Shoring deflection to be calculated and meet Railroad requirements.
- Rail, ground and shoring movement monitoring requirements.

iv. **Miscellaneous:**

- Project name, location, GPS coordinates, track owner, railroad line segment, milepost and subdivision in the title block.
- A detailed construction sequence outlining the installation and removal of the temporary shoring system.
- A description of the tieback installation including

- drilling, casing, grouting, stressing information and testing procedures, anchor capacity, type of tendon, anchorage hardware, minimum unbonded lengths, minimum anchor lengths, angle of installation, tieback locations, spacing, and distance below bottom of tie.
- All details for construction of drainage facilities associated with the shoring system shall be clearly indicated.

- Details and descriptions of all shoring system members and connection details.
- Handrail and protective fence details along the excavation.
- Railroad and other “CALL BEFORE YOU DIG” numbers and web sites
- Construction clearance diagram.

4. DEFINITIONS

Access Road:

A road used and controlled by the Railroad for maintenance, inspection and repair.

Applicant:

Any party proposing a temporary retaining structure project on Railroad Right-of-Way or other Railroad operating location, regardless of track being active or out of service. Includes all agents working on behalf of the Applicant.

AREMA:

The current edition of the American Railway Engineering and Maintenance-of-Way Association Manual for Railway Engineering.

AASHTO:

The current edition of the American Association of State Highway and Transportation Officials Standard Specifications for Highway Bridges.

BNSF:

Burlington Northern Sante Fe Railway

C & M Agreement:

A Construction and Maintenance Agreement that has been negotiated between the Railroad and the Applicant that addresses all the duties and responsibilities of each party regarding the construction of the proposed grade separation and the maintenance requirements after construction of the said structure.

Construction Documents:

Design plans and calculations, project and/or standard specifications, geotechnical report and drainage report.

Construction Window:

A timeframe in which construction or maintenance can be performed by the Contractor with the required presence of a Flagman.

Contractor:

The individual, partnership, corporation or joint venture and all principals and representatives (including Applicant’s subcontractors) with whom the contract is made by the Applicant for the construction of the Grade Separation Project.

Crossover:

A track connection which allows trains and on-track equipment to cross from one track to another.

Engineer-of-Record:

The licensed Professional Engineer that develops the criteria and concept for the project and is responsible for the preparation of the Plans and Specifications.

Final Plans:

100% plans signed & stamped by the Engineer-of-Record.

Flagman:

A qualified employee of the Railroad providing protection to and from Railroad operations per Railroad requirements.

Guidelines:

Information contained in this document or referenced in AREMA or AASHTO.

Grade Separation Project:

A project that includes an Overhead or Underpass Structure that crosses the Railroad Right-of-Way or other Railroad operating location regardless of track status being active or out of service.

Main Track:

A principle track, designated by Timetable or special instructions, upon which train movements are generally authorized and controlled by the train dispatcher. Main Track must not be occupied without proper authority.

Multiple Main Tracks:

Two or more parallel or adjacent Main Tracks.

Overhead Structure:

A Roadway and/or Trail Structure over the Railroad Right-of-Way.

Railroad Local Representative / Railroad Representative:

The individual designated by the Railroad as the primary point of contact for the project.

Railroad:

Refers to BNSF Railway and/or Union Pacific Railroad.

Railroad Track Maintenance Representative (UPRR=MTM, BNSF=RDM):

Railroad representative responsible for maintenance of the track and supporting subgrade.

Railroad Right-of-Entry Agreement:

An agreement between the Railroad and an Applicant or a Contractor allowing access to Railroad property.

Railroad Right-of-Way:

The limits of property owned, controlled and/or operated upon by the Railroad.

Shoofly:

A temporary track built to bypass an obstruction or construction site.

Siding:

A track connected to the Main Track used for storing or passing trains.

Timetable:

A Railroad publication with instructions on train, engine or equipment movement. It also contains other essential Railroad information.

Trail:

A pathway impacting Railroad Right-of-Way or other Railroad operating locations regardless of track status being active or out of service. This includes pedestrian, bicycle, approved motorized recreational equipment and equestrian uses.

Underpass Structure:

Railroad Structure over a Roadway and/or Trail.

UPRR:

Union Pacific Railroad

Yard:

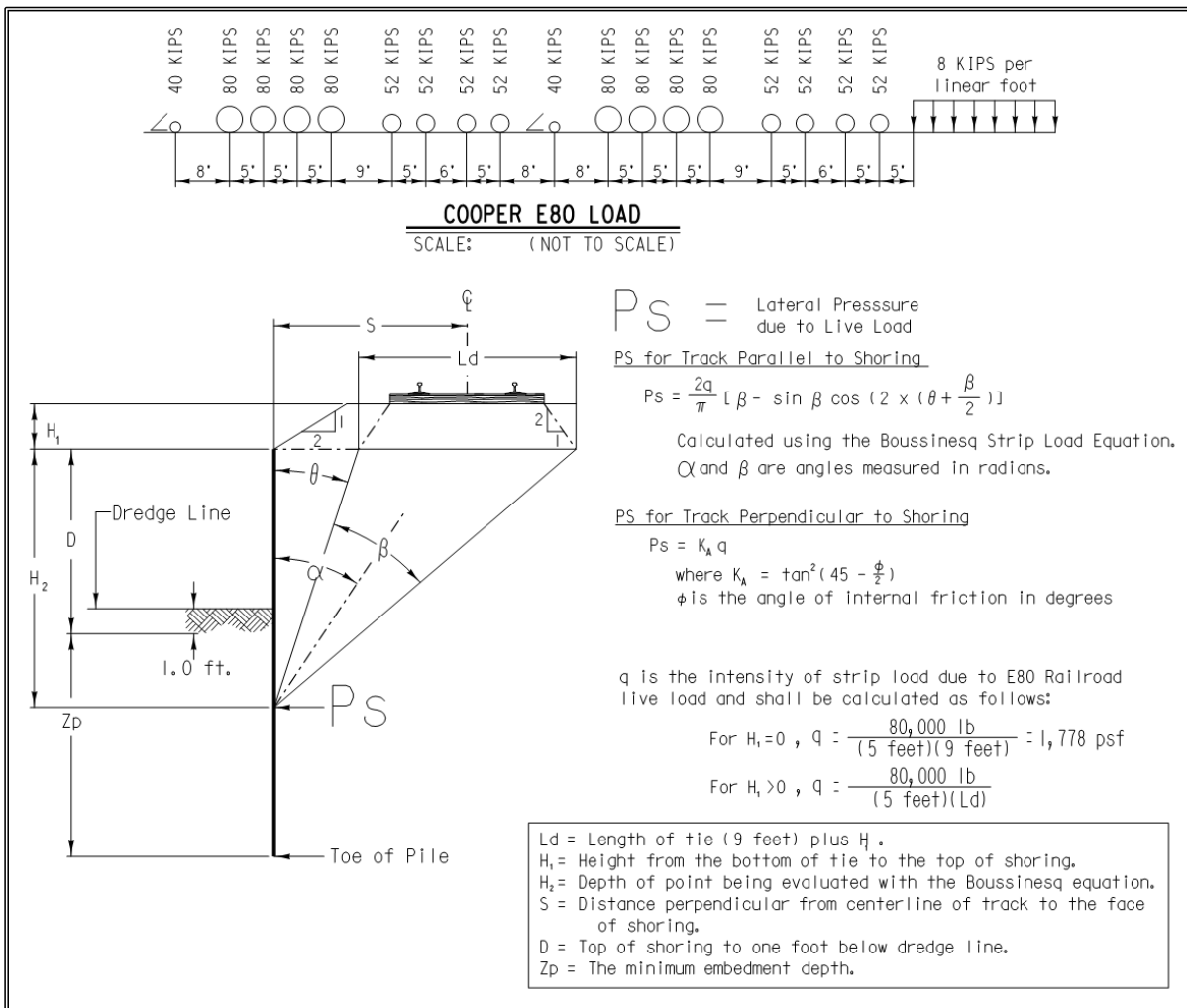
A system of tracks of defined limits, other than main tracks and sidings, for storing and sorting cars and other purposes.

Yard Limits:

A portion of main track designated by “yard limit” signs and included in the timetable special instructions or a track bulletin.

5. APPENDIX

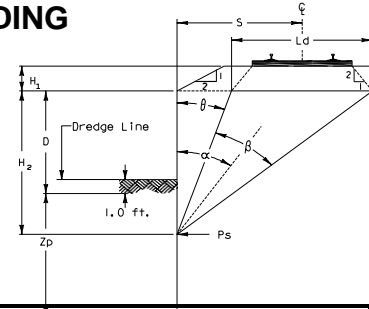
5.1 LIVE LOAD PRESSURE DUE TO COOPER E80 LOADING



5.2 CHART – LIVE LOAD PRESSURE DUE TO E80 LOADING

This chart identifies the active pressure and resulting forces due to E80 liveload.

1. Select distance S from track centerline to face of shoring.
2. Select depth H₂ below base of tie.
3. Read Ps, M, R and \bar{z} from the table.
4. Use the procedure outlined in the sample problem to determine values at non-tabulated points.



$$P_s = \frac{2q}{\pi} [\beta - \sin \beta \cos(2\alpha)] \quad \text{where } q = 1778 \text{ psf}$$

Boussinesq surcharge pressure E80 live load for H₁=0

Depth below top of shoring H ₂ (ft)	Variables	Horizontal distance (S) from shoring to track CL measured at a right angle of tie									
		12	14	16	18	20	22	24	26	28	30
2	Ps (psf)	305	220	166	130	105	86	72	61	53	46
	α (radians)	1.38	1.41	1.44	1.45	1.47	1.48	1.48	1.49	1.50	1.50
	β (radians)	0.14	0.10	0.07	0.06	0.05	0.04	0.03	0.03	0.02	0.02
	z (ft)	1.32	1.33	1.33	1.33	1.33	1.33	1.33	1.33	1.33	1.33
	M (ft-lbs/ft)	215	152	114	89	71	58	49	41	36	31
	R (lbs/ft)	317	226	170	132	106	87	73	62	53	46
4	Ps (psf)	496	381	299	240	197	164	138	118	102	89
	α (radians)	1.21	1.27	1.31	1.34	1.36	1.38	1.40	1.41	1.43	1.44
	β (radians)	0.25	0.19	0.14	0.11	0.09	0.07	0.06	0.05	0.05	0.04
	z (ft)	2.59	2.61	2.63	2.64	2.64	2.65	2.65	2.65	2.65	2.66
	M (ft-lbs/ft)	1,609	1,165	882	692	557	459	384	327	281	244
	R (lbs/ft)	1,141	840	643	508	411	339	285	242	209	182
6	Ps (psf)	558	461	381	317	266	225	193	167	146	128
	α (radians)	1.06	1.13	1.19	1.23	1.27	1.29	1.32	1.34	1.35	1.37
	β (radians)	0.33	0.25	0.20	0.16	0.13	0.11	0.09	0.08	0.07	0.06
	z (ft)	3.77	3.83	3.88	3.90	3.92	3.94	3.95	3.96	3.96	3.97
	M (ft-lbs/ft)	4,944	3,674	2,830	2,244	1,822	1,508	1,269	1,082	933	813
	R (lbs/ft)	2,214	1,696	1,332	1,070	877	731	618	529	458	400
8	Ps (psf)	535	476	414	358	309	268	234	205	181	160
	α (radians)	0.94	1.02	1.08	1.13	1.17	1.21	1.24	1.26	1.29	1.30
	β (radians)	0.37	0.29	0.24	0.19	0.16	0.14	0.12	0.10	0.09	0.08
	z (ft)	4.84	4.97	5.06	5.11	5.16	5.19	5.21	5.23	5.24	5.26
	M (ft-lbs/ft)	10,481	8,006	6,286	5,051	4,141	3,452	2,920	2,501	2,165	1,892
	R (lbs/ft)	3,316	2,641	2,134	1,751	1,456	1,228	1,047	903	786	689
10	Ps (psf)	474	449	411	370	329	293	260	232	207	186
	α (radians)	0.83	0.92	0.99	1.04	1.09	1.13	1.17	1.19	1.22	1.24
	β (radians)	0.38	0.32	0.26	0.22	0.19	0.16	0.14	0.12	0.10	0.09
	z (ft)	5.81	6.02	6.16	6.26	6.34	6.39	6.44	6.47	6.50	6.52
	M (ft-lbs/ft)	18,145	14,227	11,385	9,280	7,689	6,463	5,502	4,736	4,117	3,610
	R (lbs/ft)	4,328	3,571	2,964	2,482	2,099	1,792	1,544	1,341	1,175	1,037
12	Ps (psf)	404	403	386	360	331	302	274	248	225	204
	α (radians)	0.75	0.83	0.90	0.96	1.01	1.06	1.10	1.13	1.16	1.18
	β (radians)	0.38	0.33	0.28	0.24	0.20	0.18	0.15	0.13	0.12	0.11
	z (ft)	6.68	6.97	7.18	7.34	7.46	7.55	7.61	7.67	7.71	7.75
	M (ft-lbs/ft)	27,703	22,237	18,121	14,980	12,550	10,641	9,121	7,895	6,894	6,068
	R (lbs/ft)	5,207	4,424	3,763	3,214	2,762	2,389	2,080	1,823	1,608	1,427
14	Ps (psf)	338	351	349	337	319	298	276	255	234	215
	α (radians)	0.68	0.76	0.83	0.89	0.94	0.99	1.03	1.07	1.10	1.13
	β (radians)	0.38	0.33	0.28	0.25	0.22	0.19	0.17	0.15	0.13	0.12
	z (ft)	7.46	7.85	8.13	8.35	8.51	8.64	8.74	8.82	8.89	8.94
	M (ft-lbs/ft)	38,880	31,856	26,395	22,116	18,729	16,021	13,831	12,043	10,568	9,339
	R (lbs/ft)	5,948	5,178	4,499	3,913	3,414	2,990	2,631	2,327	2,068	1,847
16	Ps (psf)	280	301	310	308	300	286	271	254	237	220
	α (radians)	0.62	0.70	0.77	0.83	0.88	0.93	0.97	1.01	1.04	1.07
	β (radians)	0.36	0.32	0.28	0.25	0.22	0.20	0.18	0.16	0.14	0.13
	z (ft)	8.17	8.64	9.01	9.29	9.51	9.68	9.82	9.93	10.03	10.10
	M (ft-lbs/ft)	51,411	42,880	36,066	30,598	26,183	22,590	19,644	17,207	15,175	13,468
	R (lbs/ft)	6,563	5,829	5,158	4,560	4,034	3,576	3,179	2,837	2,540	2,284

Continued

Depth below top of shoring H ₂ (ft)	Variables	Horizontal distance (S) from shoring to track CL measured at a right angle									
		12	14	16	18	20	22	24	26	28	30
18	Ps (psf)	231	256	271	277	276	269	259	247	234	220
	α (radians)	0.57	0.64	0.71	0.77	0.82	0.87	0.92	0.96	0.99	1.02
	β (radians)	0.35	0.31	0.28	0.25	0.23	0.20	0.18	0.16	0.15	0.13
	z (ft)	8.80	9.37	9.81	10.16	10.44	10.67	10.85	11.00	11.12	11.22
	M (ft-lbs/ft)	65,062	55,110	46,976	40,313	34,834	30,304	26,536	23,384	20,728	18,477
	R (lbs/ft)	7,072	6,386	5,739	5,145	4,609	4,132	3,710	3,338	3,012	2,725
20	Ps (psf)	191	217	236	246	250	249	244	237	227	217
	α (radians)	0.52	0.59	0.66	0.72	0.77	0.82	0.87	0.91	0.94	0.98
	β (radians)	0.33	0.30	0.28	0.25	0.23	0.21	0.19	0.17	0.15	0.14
	z (ft)	9.37	10.03	10.56	10.98	11.32	11.59	11.82	12.01	12.16	12.30
	M (ft-lbs/ft)	79,641	68,368	58,973	51,137	44,586	39,093	34,465	30,548	27,216	24,367
	R (lbs/ft)	7,493	6,859	6,245	5,668	5,135	4,651	4,214	3,822	3,474	3,163
22	Ps (psf)	159	184	204	217	225	228	227	223	217	210
	α (radians)	0.49	0.55	0.62	0.67	0.73	0.77	0.82	0.86	0.90	0.93
	β (radians)	0.31	0.29	0.27	0.25	0.23	0.21	0.19	0.17	0.16	0.14
	z (ft)	9.89	10.64	11.24	11.73	12.14	12.47	12.74	12.97	13.17	13.33
	M (ft-lbs/ft)	94,986	82,497	71,913	62,945	55,341	48,878	43,370	38,658	34,611	31,122
	R (lbs/ft)	7,842	7,260	6,684	6,131	5,611	5,128	4,685	4,283	3,918	3,590
24	Ps (psf)	133	157	176	191	202	207	210	209	206	201
	α (radians)	0.45	0.52	0.58	0.63	0.68	0.73	0.78	0.82	0.85	0.89
	β (radians)	0.30	0.28	0.26	0.24	0.22	0.20	0.19	0.17	0.16	0.15
	z (ft)	10.35	11.19	11.87	12.44	12.90	13.29	13.62	13.89	14.13	14.32
	M (ft-lbs/ft)	110,969	97,366	85,670	75,625	66,997	59,577	53,183	47,661	42,875	38,716
	R (lbs/ft)	8,132	7,600	7,064	6,540	6,037	5,564	5,122	4,715	4,342	4,001
26	Ps (psf)	112	134	153	168	180	188	192	194	193	191
	α (radians)	0.42	0.48	0.54	0.60	0.65	0.69	0.74	0.78	0.82	0.85
	β (radians)	0.28	0.27	0.25	0.23	0.22	0.20	0.19	0.17	0.16	0.15
	z (ft)	10.78	11.69	12.45	13.09	13.62	14.07	14.44	14.77	15.04	15.28
	M (ft-lbs/ft)	127,485	112,863	100,135	89,071	79,460	71,105	63,836	57,499	51,963	47,113
	R (lbs/ft)	8,376	7,890	7,393	6,899	6,418	5,959	5,524	5,118	4,741	4,393
28	Ps (psf)	94	114	132	148	160	169	175	179	180	180
	α (radians)	0.40	0.46	0.51	0.56	0.61	0.66	0.70	0.74	0.78	0.81
	β (radians)	0.27	0.26	0.24	0.23	0.21	0.20	0.19	0.17	0.16	0.15
	z (ft)	11.17	12.16	12.99	13.70	14.29	14.80	15.23	15.60	15.91	16.19
	M (ft-lbs/ft)	144,448	128,896	115,211	103,191	92,642	83,385	75,258	68,113	61,823	56,274
	R (lbs/ft)	8,581	8,137	7,677	7,214	6,758	6,315	5,892	5,491	5,115	4,764
30	Ps (psf)	80	98	115	130	142	152	160	165	167	168
	α (radians)	0.37	0.43	0.48	0.53	0.58	0.63	0.67	0.71	0.74	0.78
	β (radians)	0.26	0.25	0.23	0.22	0.21	0.20	0.18	0.17	0.16	0.15
	z (ft)	11.52	12.59	13.49	14.26	14.92	15.48	15.97	16.38	16.75	17.06
	M (ft-lbs/ft)	161,789	145,388	130,819	117,903	106,466	96,343	87,381	79,443	72,404	66,153
	R (lbs/ft)	8,755	8,349	7,925	7,492	7,060	6,636	6,227	5,834	5,462	5,112
32	Ps (psf)	69	85	101	115	127	137	145	151	155	157
	α (radians)	0.35	0.41	0.46	0.51	0.55	0.60	0.64	0.68	0.71	0.75
	β (radians)	0.25	0.24	0.22	0.21	0.20	0.19	0.18	0.17	0.16	0.15
	z (ft)	11.85	12.98	13.95	14.79	15.51	16.13	16.67	17.13	17.54	17.89
	M (ft-lbs/ft)	179,452	162,274	146,888	133,136	120,859	109,909	100,144	91,432	83,655	76,706
	R (lbs/ft)	8,904	8,532	8,140	7,736	7,329	6,925	6,531	6,150	5,785	5,438

5.3 TABLES FOR SOIL SPECIFICATIONS

Table 8-20-1. Granular Soils

Descriptive Term for Relative Density	Standard Penetration Test Blows per Foot "N"
Very Loose	0 – 4
Loose	4 – 10
Medium	10 – 30
Dense	30 – 50
Very Dense	Over 50

Table 8-20-2. Silt and Clay Soils

Descriptive Term for Consistency	Unconfined Compressive Strength Tons per Square Foot
Very Soft	Less than 0.25
Soft	0.25 – 0.50
Medium	0.50 – 1.00
Stiff	1.00 – 2.00
Very Stiff	2.00 – 4.00
Hard	Over 4.00

Table 8-20-3. Unit Weights of Soils, and Coefficients of Earth Pressure

Type of Soil	Unit Weight of Moist Soil, γ (Note 1)		Unit Weight of Submerged Soil, γ' (Note 1)		Coefficient of Active Earth Pressure, K_a				Coefficient of Passive Earth Pressure, K_p		
	Minimum	Maximum	Minimum	Maximum	For Backfill	For Soils in Place	Friction Angles (Note 2)		For Soils in Place	Friction Angles (Note 2)	
							ϕ	δ		ϕ	δ
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Clean Sand:											
Dense	110	140	65	78		0.20	38	20	9.0	38	25
Medium	110	130	60	68		0.25	34	17	7.0	34	23
Loose	90	125	56	63	0.35	0.30	30	15	5.0	30	20
Silty Sand:											
Dense	110	150	70	88		0.25			7.0		
Medium	95	130	60	68		0.30			5.0		
Loose	80	125	50	63	0.50	0.35			3.0		
Silt and Clay (Note 3)	$\frac{165(1+w)}{1+2.65w}$		$\frac{103}{1+2.65w}$		1.00	$1 - \frac{q_u}{\bar{p} + \gamma z}$			$1 + \frac{q_u}{\bar{p} + \gamma z}$		
Note 1:	In pounds per cubic foot.										
Note 2:	These angles, expressed in degrees, are ϕ , the angle of internal friction, and δ , the angle of wall friction, and are used in estimating the coefficients under which they are listed.										
Note 3:	The symbol γ represents γ or γ' , whichever is applicable; \bar{p} is the effective unit pressure on the top surface of the stratum; q_u is the unconfined compressive strength; w is the natural water content, in percentage of dry weight; and z is the depth below the top surface of the stratum.										

6. REFERENCES

- a. The following list of references used in these guidelines are placed here in alphabetical order for your convenience.
 - i. AREMA Manual for Railway Engineering, 2019, American Railway Engineering and Maintenance-of-Way Association.
 - ii. Clough and Duncan, 1991, "Earth Pressures," Foundation Engineering Handbook, 2nd Edition, Fang, Chapter 6.
 - iii. CalTrans Trenching and Shoring Manual, 2011, Revision 1, State of California Department of Transportation, Office of Structures Construction.
 - iv. Dismuke, T.D., 1991, "Retaining Structures and Excavations," Foundation Engineering Handbook, 2nd Edition, Fang, Chapter 12.
 - v. FHWA-IF-99-015, Geotechnical Engineering Circular 4, Ground Anchors and Anchored Systems, June 1999, Federal Highway Administration, Office of Bridge Technology.
 - vi. Henkel, D. J., 1971, "The Calculation of Earth Pressures in Open Cuts in Soft Clays." The Arup Journal, Vol. 6, No. 4, pp. 14-15.
 - vii. NAVFAC DM7.02, Foundations and Earth Structures, September 1986, Department of the Navy, Naval Facilities Engineering Command.
 - viii. Terzaghi, K., 1943, Theoretical Soil Mechanics, John Wiley & Sons, Inc., New York, NY.



INVITATION TO BID #2024-108
Intertie 2 Diversion Facility – Pump Station Expansion
Project (“BID”) ADDENDUM #5
January 9, 2025

On November 26, 2024, Clackamas County (“County”) published Invitation to Bid #2024-108 (“BID”). The County has found that it is in the interest to amend the BID through the issuance of this Addendum #4. Except as expressly amended below, all other terms and conditions of the original BID shall remain unchanged.

1. Section B-11: Volume 1 - Technical Specifications

a. Specification Section 26 32 13 – Diesel-Engine Generators:

i. **Replace** paragraph 2.3(I) as follows:

l. Jacket Water Cooling System:

1. Radiator:

- a. Consisting of jacket water pump, fan assembly, fan guard, and duct flange outlet.
- b. Cooling System: Rated for full load operation in 122 degrees F (50 degrees C) ambient as measured at alternator air inlet.
- c. Fan: Suitable for use in a system with 0.5 in H₂O restriction.
- d. Sized based on a core temperature that is 20 degrees F higher than rated operation temperature.

2. Engine Thermostat: As recommended by manufacturer to regulate engine water temperature.

3. Jacket Water Heater:

- a. Suitable for operation on 120-volt, single phase, 60 Hz current.
- b. Maintain engine water temperature at 120 degrees F with an ambient temperature of 50 degrees F.
- c. Thermostatically controlled.

4. Engine Cooling Liquid: Fill cooling system with a 50/50 ethylene glycol/water mixture prior to shipping.

ii. **Delete** paragraphs 2.3(J) and (L).

End of Addendum #5

FIRST-TIER SUBCONTRACTOR DISCLOSURE FORM
PROJECT: 2024-108 Intertie 2 Diversion Facility – Pump Station Expansion Project

BID OPENING: December 19, 2024, 2:00 PM, Pacific Time

Failure to submit this Form by the disclosure deadline will result in a nonresponsive bid.

INSTRUCTIONS:

This First-Tier Subcontractor Disclosure Form (“Form”) must be submitted and received at the location specified in the Notice of Public Improvement Contract Opportunity on the advertised Bid Closing, and within two working hours after the advertised Bid Closing Time.

The Form may be mailed, hand-delivered or emailed to: Procurement@clackamas.us. It is the responsibility of Bidders to submit this Form and any additional sheets with the Project name clearly marked on the envelope or the subject line of the email.

Subcontractor lists may be submitted with the bid in the same envelope or email at the Bid Closing date and time. Subcontractor lists **MUST** be submitted within **two (2) hours** of the Bid Closing date and time.

List below the name of each subcontractor that will be furnishing labor, or labor and materials, for which disclosure is required, the category of work that the subcontractor will be performing, and the dollar value of the subcontract. Enter **“NONE”** if the value of the project bid is less than \$100,000 or there are no subcontractors that need to be disclosed. **ATTACH ADDITIONAL SHEETS IF NECESSARY.**

	SUBCONTRACTOR NAME	DOLLAR VALUE	CATEGORY OF WORK
1.	<u>Team Electric</u>	<u>\$1,407,273.00</u>	<u>Electrical</u>
2.	_____	_____	_____
3.	_____	_____	_____
4.	_____	_____	_____
5.	_____	_____	_____
6.	_____	_____	_____

The above listed first-tier subcontractor(s) are providing labor, or labor and material, with a Dollar Value equal to or greater than:

- a) 5% of the total Contract Price, but at least \$15,000. If the Dollar Value is less than \$15,000 do not list the subcontractor above; or
- b) \$350,000 regardless of the percentage of the total Contract Price.

Firm Name: R.L. Reimers Co.

Bidder Signature:  Phone # 971-304-5661

SUPPLEMENTARY CONDITIONS OF THE CONSTRUCTION CONTRACT

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SUPPLEMENTARY CONDITIONS OF THE CONSTRUCTION CONTRACT

These Supplementary Conditions amend or supplement the Standard General Conditions of the Construction Contract as indicated below. The General Conditions remain in full force and effect except as amended or supplemented.

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. As used in the Contract Documents, masculine pronouns refer to both masculine and feminine genders.

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.

ARTICLE 1—DEFINITIONS AND TERMINOLOGY

1.01 *Defined Terms*

SC-1.01 Delete and replace the following subsections in Paragraph 1.01.A:

5. *Bidder*: Any individual, partnership, corporation, joint venture, or other legal entity who submits a Bid to Owner for the Work contemplated and meets the standards set forth in Oregon Revised Statutes 279B.110.
16. *Contractor*: Person or entity identified as such in the Agreement and the Contractor's authorized representatives who are referred to throughout the Contract Documents as if singular in number.
22. *Engineer*: Person or entity identified as such in the Agreement and the Engineer's authorized representatives who are referred to throughout the Contract Documents as if singular in number.
30. *Owner*: The individual, entity, public body or authority identified as such in the Agreement and the Owner's authorized representatives who are referred to throughout the Contract Documents as if singular in number.

SC-1.01 Revise Paragraph 1.01.A.33 by replacing the word "Engineer" with "Owner" and adding the sentence "Synonymous with Construction Manager." to the end of the paragraph.

SC-1.01 Add the following language at the end of 1.01.A.42:

Substantial Completion is further defined as (i) that degree of completion of the Project's operating facilities or systems sufficient to provide Owner the full time, uninterrupted, and continuous beneficial operation of the Work; (ii) all required functional, performance, and acceptance or startup testing has been successfully demonstrated for all components, devices, equipment, and instrumentation and control to the satisfaction of Engineer in accordance with the requirements of the Specifications; (iii) all inspections required have been completed and identified critical defective Work has been replaced or corrected; and (iv) all appurtenant operations and maintenance features (i.e., hose bibs, drainage systems,

etc.) have been installed and are functional. See Paragraph SC-15.03.A for additional requirements.

SC-1.01 Add the following language to the end of the sentence in Paragraph 1.01.A.44:
“as further identified in the Agreement.”

SC-1.01 Add new paragraphs immediately following Paragraph 1.01.A.50:

51. *Latent Defect*: A defect in the Work of which the Owner has no knowledge.
52. *Specialist*: The term Specialist refers to a person, partnership, firm, or corporation of established reputation (or if newly organized, whose personnel have previously established a reputation in the same field), which is regularly engaged in, and which maintains a regular force of workers skilled in either (as applicable) manufacturing of fabricated items required by the Contract Documents, or otherwise performing Work required by the Contract Documents. Where the Specifications require the installation by a Specialist, that term shall also be deemed to mean either the manufacturer of the items, a person, partnership, firm, or corporation licensed by the manufacturer, or a person, partnership, firm, or corporation who will perform the Work under the manufacturer's direct supervision.
53. *Construction Manager*: Person or entity designated by the Owner to provide construction management services for the Project with duties, responsibilities, and limitations of the Engineer, unless stipulated otherwise. Synonymous with and having same meaning as Resident Project Representative.
54. *Equipment*:
 - a) Construction: All machinery and equipment, together with the necessary supplies for upkeep and maintenance, including tools and apparatus necessary for the proper construction and acceptable completion of the Work contemplated.
 - b) Installation: All material or articles used in equipping a facility or apparatus required to fulfill a functional design.
55. *Geotechnical Data Report (“GDR”)*: The factual report that collects and presents data regarding actual subsurface conditions at or adjacent to the Site, including Technical Data and other geotechnical data, prepared by or for Owner. The GDR's content may include logs of borings, trenches, and other site investigations, recorded measurements of subsurface water levels, the results of field and laboratory testing, and descriptions of the investigative and testing programs. The GDR does not include an interpretation of the data. If opinions, or interpretive or speculative non-factual comments or statements appear in a document that is labeled a GDR, such opinions,

comments, or statements are not operative parts of the GDR and do not have contractual standing. Subject to that exception, the GDR is a Contract Document.

- 56. ORS: Oregon Revised Statutes.
- 57. OAR: Oregon Administrative Rules.
- 58. Float: The number of days an activity can be delayed beyond its scheduled completion without delaying a succeeding or related activity or restricting the schedule of a preceding activity in the construction schedule.

ARTICLE 2—PRELIMINARY MATTERS

2.01 Delivery of Bonds and Evidence of Insurance

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

- B. *Evidence of Contractor's Insurance:* When Contractor delivers the signed counterparts of the Agreement to Owner, Contractor shall also deliver to Owner copies of the policies (including all endorsements, and identification of applicable self-insured retentions and deductibles) of insurance required to be provided by Contractor in this Contract. Contractor may block out (redact) any confidential premium or pricing information contained in any policy or endorsement furnished under this provision.
- C. *Public Works Bond:* Before starting any work on the Project, Contractor and every Subcontractor performing work on the Project must have a public works bond filed with the Oregon Construction Contractors Board, as required by ORS 279C.830 and 279C.836, unless exempt under those provisions. Contractor must require that the Subcontractor have a public works bond filed with the Construction Contractors Board before starting work on the Project unless exempt under ORS 279C.836. Contractor shall include copies of both its public works bond and the public works bonds from its Subcontractors in the copies of the bonds required in Paragraph 2.01.A above. See SC-6.01.A for additional requirements related to the public works bond.

2.02 Copies of Documents

SC-2.02 Delete the first sentence of Paragraph 2.02.A in its entirety and replace with the following:

If requested, Owner shall furnish to Contractor up to four copies of the conformed Contract Documents (Specifications and half size Drawings and two copies of full-size Drawings) incorporating and integrating all Addenda and any amendments negotiated prior to the Effective Date of the Contract (including one fully executed counterpart of the Agreement) and one copy in electronic portable document format (PDF).

2.03 Before Starting Construction

SC-2.03 Add new paragraph immediately following Paragraph 2.03.A.3:

- 4. a preliminary schedule of payments showing projected cash flow.

SC-2.03 Add new paragraphs immediately following Paragraph 2.03.A:

- B. Before any Work at the Site is started, Contractor shall prepare and submit a written plan for the Project-specific safety precautions and programs. The safety plan shall identify Contractor's process for ensuring that safety is the highest priority on the

Project and will be complete with respect to procedures and actions that Contractor intends for Contractor and all others as provided in Paragraphs 7.13 and as required by all applicable Laws and Regulations. The submittal shall include a statement that the Contractor is solely responsible for safety on the Project, that it will conduct its operations in accordance with all applicable safety standards and requirements, and that it will continually review its operations to ensure that safe conditions are provided at all times. Contractor's plan for safety precautions and programs shall have been approved and endorsed by Contractor's designated safety representative required in Paragraph 7.13.B. Delivery of this plan will in no way reduce or obviate Contractor's obligation to comply with the safety obligations set forth in Section 7.13 of the General Conditions.

- C. *Contractor Drug Testing Program*: Before any Work at the site is started, Contractor shall provide evidence that it has an employee drug testing program in place that is administered and enforced by the Contractor in accordance with ORS 279C.505.
- D. Before any Work at the Site is started, Contractor shall prepare and submit a plan describing their Workplace Harassment Prevention Program. The program shall ensure all workers, regardless of their identity or status, are guaranteed a safe and respectful work environment. This applies, but is not limited to, a worker's race, ethnicity, color, national origin, gender identity, gender expression, sex, sexual orientation, religion, marital or familial status, age, mental or physical disability (as defined by the American's with Disabilities Act and Oregon state law), former incarceration, immigrant status, or veteran status.
 - 1. The program shall include in-person/virtual training for workers of all ranks and meaningful policies including procedures for aggrieved workers in need of recourse.
 - 2. Contractor shall post on the jobsite and make available a notice that rights of workers on the site include:
 - a. Participation in positive jobsite training.
 - b. Copies of policies about hate, intimidation or harassment including how to report and how to receive support. Contractor must provide these materials in languages inclusive of the workforce.
 - c. Contractor shall investigate incidents involving bullying or harassment in a prompt, thorough, and impartial manner.
- E. Contractor shall assume responsibility for every aspect of providing a safe and respectful workplace on the jobsite, including a safe and respectful workplace for and by Subcontractors, suppliers and other persons on the jobsite.

2.04 Preconstruction Conference; Designation of Authorized Representatives

SC-2.04 Add the following to the end of Paragraph 2.04.A:

The preconstruction conference will be scheduled by Contractor within five (5) days of the Notice to Proceed or as otherwise agreed to by the parties.

2.05 *Acceptance of Schedules*

SC-2.05 Add the following to the end of Paragraph 2.05.A:

5. Contractor's schedule of payments will be acceptable if it provides a reasonable projection of payments in relationship to the Progress Schedule and Schedule of Values.

ARTICLE 3—CONTRACT DOCUMENTS: INTENT, REQUIREMENTS, REUSE

3.01 *Intent*

SC 3.01 Add the following to the end of Paragraph 3.01.A:

However, in the event of conflicts or discrepancies among the Contract Documents, interpretations will be based on the following descending order of precedence:

1. Permits from outside agencies;
2. The Agreement including exhibits, and addenda and any amendments thereto, with those of later date having precedence over those of an earlier date;
3. Supplementary General Conditions;
4. Standard General Conditions of the Construction Contract, Engineers Joint Contract Documents Committee (EJCDC) 2018;
5. Specifications – Division 01;
6. Specifications – Divisions 02 - 43;
7. Drawings;
8. Design Details: Figure dimensions, and dimensions that can be computed, on plans shall take precedence over scale dimensions. The Drawings with the higher level of detail take precedence over less detailed Drawings.

Change Orders, Work Change Directives, Field Orders, Engineer's written interpretation and clarifications and Notice to Proceed, in precedence listed, will take precedence over all other Contract Document components referenced herein.

SC 3.01 Add the following paragraph immediately after Paragraph 3.01.G:

- H. Sections of Division 01, General Requirements, govern the execution of the Work of all sections of the Specifications.

3.03 *Reporting and Resolving Discrepancies*

SC 3.03 Delete Paragraph 3.03.B.1 in its entirety and replace with the following:

1. Except as may be otherwise specifically stated in the Contract Documents, the provisions of the Contract Documents shall take precedence in resolving any conflict, error, ambiguity, or discrepancy between such provisions of the Contract Documents and the provision 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).

ARTICLE 4—COMMENCEMENT AND PROGRESS OF THE WORK

4.01 Commencement of Contract Times; Notice to Proceed

SC 4.01 Delete the third sentence of Paragraph 4.01.A in its entirety.

4.04 Progress Schedule

SC 4.04 Add the following subparagraph immediately after Paragraph 4.04.A.2:

3. If, in the opinion of Engineer, Contractor falls behind the accepted Construction Schedule due to actions or neglect of Contractor or Contractor's agents, servants, employees, officers, Subcontractors, directors, or any party contracting to perform part or all of the Work or to supply any equipment or materials, Contractor shall take steps, including, but not limited to, increasing the number of personnel, shifts, and/or overtime operations, days of work, and/or amount of construction equipment until such time as the Work is back on schedule. Contractor shall also submit for review no later than the time of submittal of the next request for partial payment, such supplementary schedule or schedules as may be necessary to demonstrate the manner in which the acceptable rate of progress will be regained, all without additional cost to Owner.

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

5.01 Availability of Lands

SC 5.01 Delete Paragraph 5.01.B in its entirety.

SC 5.01 Add the following paragraph immediately after Paragraph 5.01.c:

- D. Any work performed in public rights-of-way, in addition to conforming to the Contract Documents, shall be done in accordance with the requirements of the permit issued by the public agency in whose right-of-way the Work is located.

5.02 Use of Site and Other Areas

SC 5.02 Delete subparagraph 5.02.A.2 in its entirety and replace with the following:

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 claims as to all parties through negotiations with such owner or occupant, or otherwise resolve the claim by arbitration or other dispute resolution proceeding, or at law; and (c) to the fullest extent permitted by Laws and Regulations, indemnify and hold harmless Owner and Clackamas County, and their officers, elected officials, directors, employees, agents, consultants, and subcontractors from and against any such claim, and against all costs (including attorney fees), losses and damages arising out of or relating to any claim or action, legal or equitable, brought

by any such owner or occupant against Owner, Clackamas County, 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 has a right to control.

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:

Report Title	Date of Report	Technical Data
Intertie 2 Diversion Geotechnical Data Report	2010	Rock Strength and Boring Logs
Utility Pothole Data	2022-2023	Location and depth of select utilities within the area of Work
Summary of Pump Test Results and Review of Dewatering Requirements – Pump Station and Diversion Structure	2010	Pump Test Results and Boring Log

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:

Drawings Title	Date of Drawings	Technical Data
Intertie 2 Diversion A – Pump Station Record Drawings	2013	None known to Owner
Sanitary Sewer Diversion Pipeline Record Drawings, Selected Sheets	2000	None known to Owner
Intertie 2 Diversion Facility - 30” Force Main Improvement Project, Selected Sheets	2024	None known to Owner
Tri-City Service District Sewage Treatment Plant-Influent Pump Station-Record Drawings, Selected Sheets	1986	None know to Owner
Tri-City WPCP Phase 1 Expansion Record Drawings, Selected Sheets	2012	None know to Owner

G. Contractor may request copies from Engineer of reports and drawings identified in SC-5.03.E and SC-5.03.F that were not included with the Bidding Documents.

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:

Report Title	Date of Report	Technical Data
None known to Owner		

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:

Drawings Title	Date of Drawings	Technical Data
None known to Owner		

SC-5.06 Delete Paragraph 5.06.I and 506.J in their entirety and replace with the following:

- I. Subject to the limitations of the Oregon Constitution and the Oregon Tort Claims Act, Owner shall indemnify and hold harmless Contractor, and its officers, employees, and agents from and against all claims, costs losses and damages 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 Clackamas County, and their officers, elected officials, directors, employees, agents, consultants, and subcontractors from and against all claims, costs (including attorney fees), losses, and damages 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.

ARTICLE 6—BONDS AND INSURANCE

6.01 *Performance, Payment, and Other Bonds*

SC-6.01 Add the following paragraphs immediately after Paragraph 6.01.C:

The Contractor will submit the performance bond and payment bond on forms provided by the Owner.

SC-6.01 Delete Paragraph 6.01.B in its entirety and replace with the following:

B. Before starting any work on the Project, the Contractor shall file with the Oregon Construction Contractors Board, and maintain in full force and effect, the separate public works bond required by Oregon Revised Statutes, Chapter 279C.830 and 279C.836, unless otherwise exempt under those provisions. The Contractor shall also include in every subcontract a provision requiring the Subcontractor to have a public works bond filed with the Construction Contractors Board before starting Work, unless otherwise exempt, and shall verify that the Subcontractor has filed a public works bond before permitting any Subcontractor to start Work. Contractor shall include copies of both its public works bond and the public works bonds from its Subcontractors in the copies of the bonds required in Paragraph 2.01.A above.

These bonds shall remain in effect until one year after date of Final Completion of the Project and acceptance by the Owner, except as provided otherwise by Laws or Regulations or by the Contract Documents.

SC-6.01 Add the following phrase to Paragraph 6.01.C after the word "Treasury":
or otherwise acceptable to Owner.

SC-6.01 Add the following sentence to the end of Paragraph 6.01.C:

The performance bond shall include, in part, provisions to indemnify and hold harmless Owner and Clackamas County, and their officers, directors, elected officials, agents, and employees.

6.02 *Insurance—General Provisions*

SC-6.02 Delete Paragraph 6.02.B. in its entirety and replace with the following:

B. As evidence of the insurance coverage required by the Contract, the Contractor shall furnish certificate(s) of insurance to the Owner prior to execution of the Agreement. The certificate(s) will specify all of the parties who are additional insureds or loss payees for the Agreement, identified in SC-6.02.C. A renewal certificate shall be sent to Owner at least 10 days prior to coverage expiration.

Insurance coverage required under the Agreement shall be obtained from insurance companies or entities acceptable to the Owner and that are eligible to provide such insurance under Oregon law. Eligible insurers include admitted insurers that have been issued a certificate of authority from the Oregon Department of Consumer and Business Services authorizing them to conduct an insurance business and issue policies of insurance in the state of Oregon, and certain non-admitted surplus lines insurers that satisfy the requirements of applicable Oregon law and which are subject to approval by the Owner. All companies that provide policies required under this Contract shall have a rating of not less than A-X in the most current edition of Best's Rating Guide, in addition to any other requirements specified herein. The Contractor shall be financially responsible for all deductibles, self-insured retentions and/or self-insurance included hereunder. Any deductible, self-insured retention and/or self-insurance in excess of \$50,000 shall be subject to approval by the Owner in writing and shall be a condition precedent to the effectiveness of any Contract.

SC-6.02 Add the following to the end of Paragraph 6.02.D:

The general liability insurance coverage, automobile liability, umbrella, and pollution liability if required, shall include the Owner (Water Environment Services), Clackamas County, and Engineer (CONSOR North America, Inc) as additional insureds, but only with respect to the Contractor's activities to be performed under the Contract Documents. The additional-insured endorsement for CGL insurance must be written on ISO Form CG 20 10 (10 01) and CG 20 37 (10 01), or their equivalent, but shall not use either of the following forms: CG 20 10 (10 93) or CG 20 10 (03 94). Proof of insurance must include a copy of the endorsement showing "Water Environment Services and Clackamas County, together with their elected officials, agents, officers, and employees" as additional insureds.

If Contractor cannot obtain an insurer to name the Owner and Engineer as additional insureds, Contractor shall obtain at Contractor's expense, and keep in effect during the term of the Contract, Owners and Contractors Protective Liability Insurance, naming the Owner and Engineer as additional insureds with not less than a \$4,000,000 limit per occurrence. This policy must be kept in effect for 36 months following Final Completion. As evidence of coverage, Contractor shall furnish the actual policy to Owner prior to execution of the Agreement.

SC-6.02 Delete all language in Paragraphs 6.02.E, I, and K and replace each with the word "Reserved."

SC-6.02 Add the following before the first sentence in Paragraph 6.02.I.

Contractor shall keep insurance policies required by this contract in effect for the entire term of the Contract.

SC-6.02 Delete from Paragraph 6.02.N "10 days" and replace with "60 days"

SC-6.02 Add the following new paragraphs in order after Paragraph 6.02.N.

- O. Compliance. Failure of the Contractor to fully comply with these requirements will be considered a material breach of Contract and shall be cause for immediate termination of the Contract at the option of Owner.
- P. If the Contractor receives a non-renewal or cancellation notice from an insurance carrier affording coverage required herein, or receives notice that coverage no longer complies with the insurance requirements herein, Contractor agrees to notify Owner within five (5) business days with a copy of the non-renewal or cancellation notice, or written specifics as to which coverage is no longer in compliance. When notified by Owner, the Contractor agrees to stop Work pursuant to the Contract at Contractor's expense, unless all required insurance remain in effect. Any failure to comply with the reporting provisions of this section, except for the potential exhaustion of aggregate limits, shall not affect the coverages provided to the Owner and its institutions, divisions, officers, and employees. Owner shall have the right, but not the obligation, of prohibiting Contractor from entering the Project Site until a new certificate(s) of insurance is provided to Owner evidencing the replacement coverage. The Contractor agrees that Owner reserves the right to withhold payment to Contractor until evidence of reinstated or replacement coverage is provided to Owner.
- Q. Upon Owner's approval, Contractor may obtain worker's compensation insurance from an insurance company that has not been rated by A.M. Best, provided that such company (a) is domiciled in the state in which the project is located, (b) is certified or

authorized as a worker’s compensation insurance provider by the appropriate state agency, and (c) has been accepted to provide worker’s compensation insurance for similar projects by the state within the last 12 months.

- R. All insurance carried by Contractor under the Agreement shall be the primary coverage. The coverages indicated are minimums unless otherwise specified in the Contract Documents.

6.03 Contractor’s Insurance

SC-6.03 Add the following new paragraphs in order after Paragraph 6.03.C:

- D. *Other Additional Insureds:* As a supplement to the provisions of Paragraph 6.03.C of the General Conditions, the commercial general liability, automobile liability, umbrella or excess, pollution liability, and unmanned aerial vehicle liability policies must include as additional insureds (in addition to Owner and Engineer) the following: **Clackamas County**.
- E. *Workers’ Compensation and Employer’s Liability:* The Contractor is an independent contractor for purposes of the Oregon Workers’ Compensation Law, as set forth in ORS Chapter 656 (“Workers’ Comp Law”) and is solely liable for any Workers’ Compensation coverage under this Agreement. All employers, including Contractor, that employ subject workers who work under the Agreement in the State of Oregon shall comply with ORS 656.017 and provide the required Workers’ Compensation coverage, unless such employers are exempt under ORS 656.126. This shall include Employer’s Liability Insurance with coverage limits of not less than \$1,000,000 per accident for bodily injury or disease. Contractor shall ensure that each of its Subcontractors complies with these requirements. The Contractor shall require proof of such Workers’ Compensation coverage by receiving and keeping on file a certificate of insurance from each Subcontractor or anyone else directly employed by either the Contractor or its Subcontractors. The Contractor will be solely responsible for payment of any local, state or federal taxes required as a result of these Contract Documents.

Workers’ Compensation and Related Policies	Policy limits of not less than:
Workers’ Compensation	
State	Statutory
Applicable Federal (e.g., Longshoreman’s)	Statutory
Foreign voluntary workers’ compensation (employer’s responsibility coverage), if applicable	Statutory
Employer’s Liability	
Each accident	\$1,000,000

These Contract Documents are not intended to entitle the Contractor to any benefits generally granted to the District, officers, commissioners, agents or employees. Without limitation, but by way of illustration, the benefits not intended to be extended to the Contractor are vacation, holiday and sick leave, other leaves with pay, tenure, medical and dental coverage, life and disability insurance, overtime pay, Social Security, workers’ compensation, unemployment compensation, or retirement benefits (except so far as

benefits are required by law if the Contractor is presently a member of the Public Employees Retirement System).

- F. *Commercial General Liability—Claims Covered:* Contractor shall purchase and maintain commercial general liability insurance, covering all operations by or on behalf of Contractor, on an occurrence basis, against claims for:
1. damages because of bodily injury, sickness or disease, or death of any person other than Contractor's employees,
 2. damages insured by reasonably available personal injury liability coverage, and
 3. damages because of injury to or destruction of tangible property wherever located, including loss of use resulting therefrom.
- G. *Commercial General Liability—Form and Content:* Contractor's commercial liability policy must be written on a 1996 (or later) Insurance Services Organization, Inc. (ISO) commercial general liability form (occurrence form) and include the following coverages and endorsements:
1. Products and completed operations coverage.
 - a. Such insurance must be maintained for three years after final payment.
 - b. Contractor shall furnish Owner and each other additional insured (as identified in the Supplementary Conditions or elsewhere in the Contract) evidence of continuation of such insurance at final payment and three years thereafter.
 2. Blanket contractual liability coverage, including but not limited to coverage of Contractor's contractual indemnity obligations in Paragraph 7.18.
 3. Severability of interests and no insured-versus-insured or cross-liability exclusions.
 4. Underground, explosion, and collapse coverage.
 5. Personal injury coverage.
 6. Additional insured endorsements that include both ongoing operations and products and completed operations coverage through ISO Endorsements CG 20 10 10 01 and CG 20 37 10 01 (together). If Contractor demonstrates to Owner that the specified ISO endorsements are not commercially available, then Contractor may satisfy this requirement by providing equivalent endorsements.
 7. For design professional additional insureds, ISO Endorsement CG 20 32 07 04 "Additional Insured—Engineers, Architects or Surveyors Not Engaged by the Named Insured" or its equivalent.
- H. *Commercial General Liability—Excluded Content:* The commercial general liability insurance policy, including its coverages, endorsements, and incorporated provisions, must not include any of the following:
1. Any modification of the standard definition of "insured contract" (except to delete the railroad protective liability exclusion if Contractor is required to indemnify a railroad or others with respect to Work within 50 feet of railroad property).
 2. Any exclusion for water intrusion or water damage.

3. Any provisions resulting in the erosion of insurance limits by defense costs other than those already incorporated in ISO form CG 00 01.
4. Any exclusion of coverage relating to earth subsidence or movement.
5. Any exclusion for the insured's vicarious liability, strict liability, or statutory liability (other than worker's compensation).
6. Any limitation or exclusion based on the nature of Contractor's work.
7. Any professional liability exclusion broader in effect than the most recent edition of ISO form CG 22 79.

I. *Commercial General Liability—Minimum Policy Limits*

Commercial General Liability	Policy limits of not less than:
General Aggregate	\$ 5,000,000
Products—Completed Operations Aggregate	\$ 2,000,000
Personal and Advertising Injury	\$ 2,000,000
Bodily Injury and Property Damage—Each Occurrence	\$ 4,000,000

- J. *Automobile Liability:* Contractor shall obtain, at Contractor's expense, and keep in effect during the term of the Agreement, Automobile Liability Insurance covering owned, and/or hired vehicles, as applicable. The coverage may be written in combination with the Commercial General Liability Insurance. Contractor and its Subcontractors shall be responsible for ensuring that all non-owned vehicles maintain adequate Automobile Liability insurance while on Project Site. The Owner may adjust the Automobile Liability insurance amounts required under this provision at any time based upon institution specific risk assessments through the issuance of an amendment to the Agreement.

Automobile Liability	Policy limits of not less than:
Combined Single Limit	
Combined Single Limit (Bodily Injury and Property Damage)	\$ 2,000,000

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

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

Excess or Umbrella Liability	Policy limits of not less than:
Each Occurrence	\$ 10,000,000
General Aggregate	\$ 10,000,000

- L. *Using Umbrella or Excess Liability Insurance to Meet CGL and Other Policy Limit Requirements*: Contractor may meet the policy limits specified for employer’s liability, commercial general liability, and automobile liability through the primary policies alone, or through combinations of the primary insurance policy’s policy limits and partial attribution of the policy limits of an umbrella or excess liability policy that is at least as broad in coverage as that of the underlying policy, as specified herein. If such umbrella or excess liability policy was required under this Contract, at a specified minimum policy limit, such umbrella or excess policy must retain a minimum limit of \$3,000,000 after accounting for partial attribution of its limits to underlying policies, as allowed above.
- M. *Contractor’s Pollution Liability Insurance*: Contractor shall purchase and maintain a policy covering third-party injury and property damage, including cleanup costs, as a result of pollution conditions arising from Contractor’s operations and completed operations. This insurance must be maintained for no less than three years after final completion.

Contractor’s Pollution Liability	Policy limits of not less than:
Each Occurrence/Claim	\$ 5,000,000
General Aggregate	\$ 10,000,000

- N. *Contractor’s Professional Liability Insurance*: If Contractor will provide or furnish professional services under this *Contract*, through a delegation of professional design services or otherwise, then Contractor shall be responsible for purchasing and maintaining applicable professional liability insurance. This insurance must cover negligent acts, errors, or omissions in the performance of professional design or related services by the insured or others for whom the insured is legally liable. The insurance must be maintained throughout the duration of the Contract and for a minimum of two years after Substantial Completion. The retroactive date on the policy must pre-date the commencement of furnishing services on the Project.

Contractor’s Professional Liability	Policy limits of not less than:
Each Claim	\$ 1,000,000
Annual Aggregate	\$ 5,000,000

6.04 *Builder's Risk and Other Property Insurance*

SC-6.04 Supplement Paragraph 6.04 of the General Conditions with the following provisions:

F. *Builder's Risk Requirements:* The builder's risk insurance must:

1. be written on a builder's risk "all risk" policy form that at a minimum includes insurance for physical loss or damage to the Work, temporary buildings, falsework, and materials and equipment stored and in transit, and must not exclude the coverage of the following risks: fire; windstorm; hail; flood; earthquake, volcanic activity, and other earth movement; lightning; riot; civil commotion; terrorism; vehicle impact; aircraft; smoke; theft; vandalism and malicious mischief; mechanical breakdown, boiler explosion, and artificially generated electric current; collapse; explosion; debris removal; demolition occasioned by enforcement of Laws and Regulations; and water damage (other than that caused by flood).
 - a. Such policy will include an exception that results in coverage for ensuing losses from physical damage or loss with respect to any defective workmanship, methods, design, or materials exclusions.
 - b. If insurance against mechanical breakdown, boiler explosion, and artificially generated electric current; earthquake, volcanic activity, and other earth movement; or flood, are not commercially available under builder's risk policies, by endorsement or otherwise, such insurance will be provided through other insurance policies acceptable to Owner and Contractor.
2. cover, as insured property, at least the following: (a) the Work and all materials, supplies, machinery, apparatus, equipment, fixtures, and other property of a similar nature that are to be incorporated into or used in the preparation, fabrication, construction, erection, or completion of the Work, including Owner-furnished or assigned property; (b) spare parts inventory required within the scope of the Contract; and (c) temporary works which are not intended to form part of the permanent constructed Work but which are intended to provide working access to the Site, or to the Work under construction, or which are intended to provide temporary support for the Work under construction, including scaffolding, form work, fences, shoring, falsework, and temporary structures.
3. cover expenses incurred in the repair or replacement of any insured property (including but not limited to fees and charges of contractors, engineers, and architects).
4. extend to cover damage or loss to insured property while in temporary storage at the Site or in a storage location outside the Site (but not including property stored at the premises of a manufacturer or Supplier). If this coverage is subject to a sublimit, such sublimit will be a minimum of \$100,000.
5. extend to cover damage or loss to insured property while in transit. If this coverage is subject to a sublimit, such sublimit will be a minimum of \$100,000.
6. allow for the waiver of the insurer's subrogation rights, as set forth in this Contract.
7. allow for partial occupancy or use by Owner by endorsement, and without cancellation or lapse of coverage.

8. include performance/hot testing and start-up, if applicable.
9. include as named insureds the Owner, Contractor, Subcontractors (of every tier), and any other individuals or entities required by this Contract to be insured under such builder's risk policy. For purposes of Paragraphs 6.04, 6.05, and 6.06 of the General Conditions, and this and all other corresponding Supplementary Conditions, the parties required to be insured will be referred to collectively as "insureds."

SC-6.04 Supplement Paragraph 6.04 of the General Conditions with the following provisions:

- G. *Coverage for Completion Delays:* The builder's risk policy will include, for the benefit of Owner, loss of revenue and soft cost coverage for losses arising from delays in completion that result from covered physical losses or damage. Such coverage will include, without limitation, fixed expenses and debt service for a minimum of 12 months with a maximum deductible of 30 days, plus engineering or other consultants' fees, if not otherwise covered.
- H. *Builder's Risk and Other Property Insurance Deductibles:* The purchaser of any required builder's risk, installation floater, or other property insurance will be responsible for costs not covered because of the application of a policy deductible.
 1. The builder's risk policy (or if applicable the installation floater) will be subject to a deductible amount of no more than \$50,000 for direct physical loss in any one occurrence, except the earthquake and flood deductible, which shall not exceed 2 percent of each loss or \$50,000, whichever is greater.
 - I. A loss insured under the Builder's Risk insurance shall be made payable to the Owner as loss payee. The Contractor shall pay Subcontractors their just shares of insurance proceeds received by the Contractor, and by appropriate agreements, written where legally required for validity, shall require Subcontractors to make payments to their Sub-Subcontractors in similar manner. The Owner shall have power to work directly with and settle a loss with insurers.

6.05 *Property Losses; Subrogation*

SC-6.05 Delete all language in Paragraphs 6.05.B and C and replace each with the word "Reserved."

6.06 *Receipt and Application of Property Insurance Proceeds*

SC-6.06 Delete Paragraph 6.06.A, B and C in their entirety and replace with the following paragraph:

- A. Any insured loss under the builder's risk and other policies of insurance required by Paragraph 6.04 will be adjusted and settled with the named insured that purchased the policy.

ARTICLE 7—CONTRACTOR'S RESPONSIBILITIES

7.02 *Supervision and Superintendence*

SC-7.02 Add the following immediately after the first sentence of Paragraph 7.02.B:

If a replacement is necessary, the replacement shall also be a competent resident superintendent and shall be subject to prior approval by Owner. The Contractor's

superintendent shall be present at the Site at all times while Work is in progress and shall be available by phone for emergencies 24 hours per day, 7 days per week. If at any time the superintendent leaves the Project Site while Work is in progress, Owner and Engineer shall be notified and provided with the name of the Contractor's representative having responsible charge. The superintendent will be Contractor's representative at the Site and shall have authority to act on behalf of Contractor. All communications given to or received from the superintendent shall be binding on Contractor.

7.03 *Labor; Working Hours*

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

1. Regular working hours will be between 7:00 a.m. and 6:00 p.m. on weekdays, Monday through Friday, only. If change to these standard hours is desired, a written request must be placed with Owner and Engineer a minimum of five work days prior to the first day of altered hours. Contractor shall comply with all applicable requirements of ORS 279C.540.
2. The Contractor agrees to ensure observance of holidays in accordance with ORS 279C.540. Owner's legal holidays are:
 - New Year's Day (January 1)
 - Martin Luther King Jr. Day (third Monday in January)
 - President's Day (third Monday in February)
 - Memorial Day (last Monday in May)
 - Juneteenth National Independence Day (June 19)
 - Independence Day (July 4)
 - Labor Day (first Monday in September)
 - Veteran's Day (November 11)
 - Thanksgiving Day (fourth Thursday in November)
 - Christmas Day (December 25)

7.04 *Services, Materials, and Equipment*

SC-7.04 Add the following paragraphs immediately after Paragraph 7.04.C:

- D. Until Substantial Completion of the Work is acknowledged by Owner, Contractor shall have the responsible charge and care of the Work and of materials to be used herein, including materials for which Contractor has received partial payment or materials which have been furnished by Owner, and shall bear the risk of injury, loss, or damage to any part thereof by the action of the elements or from any other cause, whether arising from the execution of the Work or not.
- E. Contractor shall rebuild, repair, restore, and make good all injuries, losses, or damages to any portion of the Work or the materials occasioned by any cause before the Work's completion and acceptance and shall bear the expense thereof. Where necessary to protect the Work or materials from damage, Contractor shall, at Contractor's own expense, provide suitable drainage and erect such temporary structures or rent such structures as are necessary to protect the Work or materials from damage. The suspension of the Work or the granting of an extension of time for any cause whatever shall not relieve Contractor of Contractor's responsibility for the Work and materials as specified herein.

- F. When the quality of a material, process, or article is not specifically set forth in the Contract Documents, the best available quality of the material, process, or article shall be provided.

7.06 *Substitutes*

- SC-7.06 Amend Paragraph 7.06.B by deleting the third sentence stating “Engineer will be the sole judge of acceptability.”

7.07 *Concerning Subcontractors and Suppliers*

- SC-7.07 Add the following language directly following the last sentence of Paragraph 7.06.A:

Contractor shall perform with Contractor’s own organization Work amounting to not less than 25 percent of the combined value of all items of the Work covered by the Contract.

- SC-7.07 Add the following new paragraphs immediately after Paragraph 7.07.M:

- N. Contractor shall ensure that any person entering into any subcontract to perform under the Contract is registered with the Secretary of State to do business in the State of Oregon, not prohibited from entering into a public contract by the Oregon Bureau of Labor and Industry, the Oregon Construction Contractors Board or Federal Excluded Party listings and is a Responsible Proposer as defined by ORS 279C.
- O. Subcontractor Insurance: Unless a special type of insurance or special amount of coverage is required by the Owner for a specific subcontract or type of work, Contractor shall require all Subcontractors to provide and maintain insurance coverages with at least \$1,000,000/claim, \$2,000,000 aggregate for commercial general liability, \$1,000,000/claim for automobile liability, \$1,000,000/claim for professional liability (if applicable), and statutory limits for workers’ compensation insurance. Contractor shall require certificates of insurance from all Subcontractors as evidence of coverage. Contractor shall provide copies of Subcontractor’s certificates of insurance, if requested by Owner. This condition may be met through utilization of a Contractor Controlled Insurance Program.

7.08 *Patent Fees and Royalties*

- SC-7.08 Delete Paragraph 7.08.B and .C in their entirety and replace with the following:

- B. Subject to the limits of the Oregon Constitution, Owner shall indemnify and hold harmless Contractor, and its officers, employees, agents from and against all claims, costs (including attorney fees), losses, and damages 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, Clackamas County and their officers, directors, elected officials, employees, agents, consultants and subcontractors of from and against all claims, costs (including attorney fees), losses, and damages 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*

SC-7.09 Add the following new paragraph immediately after Paragraph 7.09.A:

- B. The Owner shall obtain and pay for all necessary project permits. Contractor will be responsible for finalizing any permits as necessary and maintaining compliance with all permits throughout the performance of the Work, including, but not limited to, providing all requisite notices to public authorities. The Contractor shall be responsible for any penalties or fines that result from Contractor's noncompliance with the terms of the permits.

7.11 *Laws and Regulations*

SC-7.11 Delete Paragraph 7.11.B in its entirety and replace with the following:

- B. If Contractor performs any Work or takes any other action knowing or having reason to know that is contrary to Laws and Regulations, Contractor shall bear all resulting costs and losses, and shall indemnify and hold harmless Owner, Clackamas County, and their officers, directors, elected officials, employees, agents, consultants and subcontractors from and against all claims, costs, losses and damages (including attorney fees) arising out of or relating to such Work or other action. It is not be Contractor's responsibility to make certain that the Work described in the Contract Documents is in accordance with Laws and Regulations, but this does not relieve Contractor of its obligations under Paragraph 3.03.

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

- D. While not intended to be inclusive of all Laws or Regulations for which Contractor may be responsible under Paragraph 7.10, the following Laws or Regulations, as may be amended from time to time, are included as mandated by statute or for the convenience of Contractor:

1. Prevailing Wage Rates:

- a. Contractor shall comply fully with the provisions of ORS 279C.800 through 279C.870. Pursuant to ORS 279C.830(1)(d), Contractor shall pay workers not less than the specified minimum hourly rate of wage, and shall include that requirements in all subcontracts.

PREVAILING WAGE RATES for Public Works Contracts in Oregon, October 5, 2024 which can be downloaded at the following web address:

http://www.oregon.gov/boli/whd/pwr/pages/pwr_state.aspx

- b. Owner will pay the Commissioner of the Bureau of Labor and Industries the fee required by ORS 279C.825.
 - c. Contractor shall provide written notice to all workers of the number of hours per day and days per week such workers may be required to work.
2. Discrimination: Contractor shall comply with all applicable requirements of federal and state civil rights and rehabilitation statutes, rules and regulations, and:

- a. In accordance with ORS 279A.110, Contractor will not discriminate against Disadvantaged, Minority, Women, or Emerging Small Business enterprises, as those terms are defined in ORS 200.005, or a business enterprise that is owned or controlled by or that employs a disabled veteran, as that term is defined in ORS 408.225, in obtaining required subcontracts.
- b. Contractor shall maintain, in current and valid form, all licenses and certificates required by the applicable Laws, Regulations or the Contract when performing the work.
3. In accordance with ORS 279C.505, Contractor shall demonstrate to Owner that it has an employee drug testing program in place prior to commencement and at all times during the performance of the Work.
4. ORS 654.150 applies at the Construction Site. All costs incurred in complying with state statutes requiring sanitation facilities shall be borne by Contractor.
5. Payment by Contractor:
 - a. The Contractor shall promptly make full payment for labor, materials, supplies and provisions at such times as they become due and payable to all persons supplying the Contractor or their Subcontractor with labor, services, materials, supplies, or provisions for the prosecution of the Work provided for in the Contract. Contractor shall pay all contributions or amounts due the Industrial Accident Fund from such Contractor or Subcontractor incurred in the performance of the Work. The Contractor shall not permit any lien or claim to be filed or prosecuted against the Owner for or on account of any labor, services, materials, supplies, or provisions furnished. The Contractor shall pay to the Department of Revenue all sums withheld from employees pursuant to ORS 316.167.
 - b. In the event the Contractor fails, neglects, or refuses to make prompt and full payment of any claim for labor, services, materials, supplies or provisions furnished by any person in connection with the Work, whether the labor, services, materials, supplies, or provisions to be performed are furnished for the Contractor or for a Subcontractor, then and in such event, the Owner may withhold the amount of such claim by the person or persons furnishing such labor, services, materials, supplies, or provisions and deduct the amount of from funds due or to become due to the Contractor by reason of the Contract Documents. The deduction of any such amounts because of claims and the manner herein authorized will not, however, relieve the Contractor or his surety from their obligation with respect to any unpaid claims. Sums withheld for the purposes named herein will be paid to the Contractor upon certification that said claims have been paid. Notwithstanding the foregoing, Owner, in its discretion, may pay such claims and deduct or charge that amount of the payment against funds due or to become due the Contractor by reason of the Contract Documents.
 - c. If the Contractor or a first-tier Subcontractor fails, neglects or refuses to make payment to a party furnishing labor or materials in connection with the project within 30 days after receipt of payment from the Owner or Contractor, the Contractor or first-tier Subcontractor shall owe the party the

amount due plus interest charges commencing at the end of the ten-day period that payment is due under ORS 279C.580(4) and any upon final payment unless payment is subject to a good-faith dispute as defined in ORS 279C.580. The rate of interest charge to the Contractor or first-tier Subcontractor and the amount due shall equal three times the discount rate on 90-day commercial paper in effect at the Federal Reserve Bank in the Federal Reserve District that includes Oregon on the date that is 30 days after the date when payment was received from the Owner or from the Contractor, but the rate of interest shall not exceed 30 percent. The amount of interest may not be waived. Contractor shall incorporate this provision into all subcontracts.

- d. If the Contractor or a Subcontractor fails, neglects or refuses to make payment to a person furnishing labor or materials in connection with the Contract, the person may file a complaint with the Oregon Construction Contractor's Board unless payment is subject to a good-faith dispute as defined in ORS 279C.580. Resolution of such dispute and computation of amounts due plus interest and costs shall be as provided in that statute. Contractor shall incorporate this provision into any subcontract related to this project.
- e. The payment of a claim in the manner authorized under this section shall not relieve the Contractor or the surety from any obligation with respect to any unpaid claims.
- f. Contractor shall pay Subcontractor for satisfactory performance within ten days out of such amounts paid to Contractor by Owner, and shall at all times comply with ORS 279C.580, which is incorporated herein by reference.
- g. The Contractor shall include in each subcontract for property or services entered into by the Contractor and a first-tier Subcontractor, including a materials supplier, for the purpose of performing a construction contract, a payment clause that obligates the Contractor to pay the first-tier Subcontractor for satisfactory performance under its subcontract within ten (10) days out of such amounts as are paid to the Contractor by the Owner under such Contractor.
- h. All employers, including Contractor, that employ subject workers who work under the Contract Documents in the State of Oregon shall comply with ORS 656.017 and provide the required Workers Compensation coverage, unless such employees are exempt under ORS 656.126. Contractor shall ensure that each of its subcontracts complies with these requirements.
- i. As a condition to Owner's performance hereunder, Contractor shall promptly, as due, make payment to any person, co-partnership, association or corporation furnishing medical, surgical, and hospital care or other needed care and attention, incident to sickness or injury, to the employees of the Contractor, of all sums of which the Contractor agrees to pay for the services and all moneys and sums that the Contractor collected or deducted from the wages of employees under any law, contract or agreement for the purpose of providing or paying for the services.

6. Payroll Certification and Fee Requirements.
 - a. In accordance with ORS 279C.845, the Contractor and every Subcontractor shall submit written certified statements to the Owner on the form prescribed by the Commissioner of BOLI, certifying the hourly rate of wage paid each worker which the Contractor or the Subcontractor has employed on the Project and further certifying that no worker employed on the Project has been paid less than the prevailing rate of wage or less than the minimum hourly rate of wage specified in the Contract Documents, which certified and statement shall be verified by the oath of the Contractor or the Subcontractor that the Contractor or Subcontractor knows the contents of the certified statement, and, that to the Contractor's or Subcontractor's best knowledge and belief, the certified statement is true. The certified statements shall set out accurately and completely the payroll costs for the prior week, including the name and address for each worker, the worker's correct classification, rate of pay, daily and weekly number of hours worked, deductions made, and actual wages paid. Certified statements for each week during which the Contractor or Subcontractor has employed a worker on the Project shall be submitted once a month, by the fifth (5th) business day of the following month. The Contractor and Subcontractor shall preserve the certified statements for a period of ten (10) years from the date of completion of the Work.
 - b. Pursuant to ORS 279C.845(7), the Owner shall retain 25 percent of any amount earned by the Contractor, in addition to other retainage, on the Work until the Contractor has filed the certified statements required above. The Owner shall pay the Contractor the amount retained under this subsection within 14 business days after the Contractor files the required certified statements, regardless of whether a Subcontractor has failed to file certified statements.
 - c. Pursuant to ORS 279C.845(8), the Contractor shall retain 25 percent of any amount earned by a first-tier Subcontractor on this Project until the Subcontractor has filed with the Owner the certified statements required above. Before paying any amount required under this subsection, the Contractor shall verify that the first-tier Subcontractor has filed the certified statement. Within 14 days after the first-tier Subcontractor has filed the certified statement, the Contractor shall pay the first-tier Subcontractor any amount retained under this subsection.
- 7 Subcontracts. Contractor shall include in each first-tier subcontract, and shall require that each first-tier Subcontractor include in each lower-tier subcontract; clauses for payments, interest penalties and conditions as required under ORS 279C.580, which is incorporated herein by reference. Contractor shall certify that it shall not accept a bid from Subcontractors to perform Work unless such Subcontractors are registered with the Construction Contractors Board in accordance with ORS 701.021 at the time they submit their bids to the Contractor.
8. Environmental Pollution:

- a. In compliance with ORS 279C.525, lists of federal, state, and local agencies of which the Owner has knowledge that have enacted ordinances or regulations relating to environmental pollution and the preservation of natural resources that may affect the performance of the Contract are listed in the 2015 Oregon Department of Transportation Standard Specifications for Construction, Section 00170.01.
 - b. If Contractor is delayed or must undertake additional work by reason of existing regulation or ordinances of agencies not cited herein, or due to enactment of new or the amendment of existing statutes, ordinances or regulations occurring after the submission of the successful Proposal, Owner may grant a time extension, a reasonable adjustment in the Cost of Work by issuance of a Change Order setting forth the additional work that must be undertaken. Such Change Order, if any, shall not invalidate the Agreement and shall, as applicable, increase the Agreement price to compensate Contractor for all costs and expenses incurred, including overhead and profits, as reasonable compensation of any such delay or additional work.
9. In accordance with ORS 279C.510, Contractor shall salvage or recycle construction and demolition debris if feasible and cost effective.
10. Contractor shall comply with all requirements of ORS 279C.520 regarding hours worked. Workers employed by Contractor shall not be able to collect for unpaid overtime unless a claim is filed in accordance with ORS 279C.545 with Contractor.
11. Person claiming not being paid in full for supplied labor or materials for performance of the Work has right to file notice of such claim. Notice shall be filed in accordance with ORS 279C.605.
12. As applicable, Contractor shall comply with Clackamas County Code and Water Environment Services Rules and Regulations.
13. Contractor agrees to comply with the following, as applicable and as may be amended from time to time: i) Title VI and VII of the Civil Rights Act of 1964; ii) Section 503 and 504 of the Rehabilitation Act of 1973; iii) the Health Insurance Portability and Accountability Act of 1996; iv) the Americans with Disabilities Act of 1990; v) ORS Chapter 659A; vi) all regulations and administrative rules established pursuant to any applicable laws; and vii) all other applicable requirements of federal, state, county or other local government entity statutes, rules and regulations.
14. The following notice is applicable to Contractors who perform excavation Work: ATTENTION: Oregon law requires you to follow rules adopted by the Oregon Utility Notification Center. Those rules are set forth in OAR 952-001-0090. You may obtain copies of the rules by calling the center at (877) 668 4001.
15. Independent Contractor Status: The service or services performed under the Contract Documents are those of an independent contractor as defined in ORS 670.600. Contractor represents and warrants that it is not an officer, employee or agent of the Owner as those terms are used in ORS 30.265.
16. Retirement System Status and Taxes: Contractor represents and warrants that it is not a contributing member of the Public Employees' Retirement System and will

be responsible for any federal or state taxes applicable to payment received under the Agreement. Contractor will not be eligible for any benefits from these payments under the Agreement of federal Social Security, employment insurance, workers' compensation or the Public Employees' Retirement System, except as a self-employed individual. Unless Contractor is subject to backup withholding, Owner will not withhold from such payments any amount(s) to cover Contractor's federal or state tax obligations.

17. Government Employment Status: The Contractor represents and warrants that it is not currently employed by the Federal Government. This does not preclude the Contractor from holding another contract with the Federal Government.
19. Failure to comply with any or all of the requirements of Section 7.11.D shall be a material breach of the Contract and constitute grounds for Contract termination. Any and all damages or costs resulting from such noncompliance shall be the responsibility of Contractor.

7.12 *Record Documents*

SC-7.12 Amend Paragraph 7.12.A by adding "and Owner" after the word "Engineer" in the third sentence.

7.13 *Safety and Protection*

SC-7.13 Add the following directly after the last sentence of Paragraph 7.13.E:

Contractor shall be aware that permit-required confined spaces exist in or near the Project Site. Entry to these spaces must be accomplished in compliance with the requirements of OAR 166-150-0190 (29 CFR 1910.146). Examples of permit-required confined spaces include but are not limited to the following:

- Open tanks beyond the handrails including clarifiers, aeration basins, channels, etc.
- Manholes.
- Flow control structures which have the potential to contain sewage.
- Enclosed tanks including digesters, clarifiers, grit basins, chemical tanks, etc.
- Wet well and dry wells of pump stations.
- Headworks channels.
- Electrical vaults.

The hazards associated with these confined spaces may include but are not limited to:

- Oxygen deficiency.
- Combustible vapors including methane.
- Slip hazards.
- Fall/retrieval hazard.
- Engulfment hazard.
- Lockout required of mechanical and electrical devices.
- Toxic or hazardous chemicals including hydrogen sulfide and process chemicals.
- Traffic hazards.
- Hot work and ignition sources.

- Potential for rapid changes in working conditions.
- Painting or coating application activities often pose temporary hazards.

Prior to beginning Work in permit-required confined spaces, Contractor shall provide Owner with a copy of Contractor's permit-required confined space entry plan/program including a copy of the permit forms that will be used by Contractor. Upon request by Contractor, Owner will review with Contractor, Owner's permit-required confined space program and specific procedures Owner would incorporate in spaces entered. Owner will coordinate any of its entries into the same spaces with Contractor. When the permit-required confined space Work is completed, Contractor shall inform Owner, in writing, of any hazards encountered or changes made resulting in different hazards within the space.

SC-7.13 Add the following new paragraphs immediately after Paragraph 7.13.J:

- K. Contractor shall revise Contractor's plan for safety precautions and programs at appropriate times to reflect changes in construction conditions, the Work, Contractor's means, methods, techniques, sequences, and procedures of construction. Contractor shall disseminate the original plan and revisions to all others indicated in Paragraphs 7.13.C.1.
- L. Contractor's plan for safety precautions and programs will not require more stringent safety requirements, training or other qualifications for all others than Contractor sets forth for comparable activity and responsibility of Contractor, Subcontractors and Suppliers and their respective employees.

7.15 *Emergencies*

SC-7.15 Amend Paragraph 7.15.A by adding the words "and Owner" immediately after the word "Engineer" in the second sentence.

7.17 *Contractor's General Warranty and Guarantee*

SC-7.17 Add the following new paragraph after Paragraph 7.17.D.9:

- 10. any acceptance by Owner or any failure to do so.

SC-7.17 Add the following new paragraph after Paragraph 7.17.E:

- F. Contractor shall warrant the Work to be free of defects in materials and workmanship for a period of one year from the date of Substantial Completion by the Owner. The Contractor shall correct defective Work during the warranty period as described in the General Conditions.

7.18 *Indemnification*

SC-7.18 Delete Paragraph 7.18.A in its entirety and replace with the following:

- A. Contractor shall be responsible for all damage to property, injury to persons, and loss, expense, inconvenience, and delay that may be caused by, or result from, the carrying out of the Work to be done under the Contract, or from any act, omission or neglect of the Contractor, its Subcontractors, employees, guests, visitors, invitees and agents.

To the fullest extent permitted by law, Contractor shall indemnify, defend (with counsel approved by Owner) and hold harmless the Owner, Clackamas County, and their elected officials, officers, directors, agents, and employees (collectively "Indemnitees") from and against all liabilities, damages, losses, claims, expenses (including attorney

fees), demands and actions of any nature whatsoever which arise out of, result from or are related to: (a) any damage, injury, loss, expense, inconvenience or delay; (b) any accident or occurrence which happens or is alleged to have happened in or about the Project Site or any place where the Work is being performed, or in the vicinity of either, at any time prior to the time the Work is fully completed in all respects; (c) any failure of the Contractor to observe or perform any duty or obligation under the Contract Documents which is to be observed or performed by the Contractor, or any breach of any agreement, representation or warranty of the Contractor contained in the Contract Documents or in any subcontract; (d) the negligent acts or omissions of the Contractor, a Subcontractor or anyone directly or indirectly employed by them or any one of them or anyone for whose acts they may be liable, regardless of whether or not such claim, damage, loss or expense is caused in part by a party indemnified hereunder (except to the extent otherwise void under ORS 30.140); and (e) any lien filed upon the Project or bond claim in connection with the Work. Such obligation shall not be construed to negate, abridge, or reduce other rights or obligations of indemnity which would otherwise exist as to a party or person described in this section.

In addition, Contractor shall indemnify and hold harmless the Owner, Clackamas County, and their elected officials, officers, directors, agents, and employees from and against any and all actions, claims, fines, costs (including attorney fees) or damages incurred by Owner as a result of a violation of the Owner's National Pollutant Discharge Elimination System Permit, where such violations are the result of the Contractor's negligence. The Owner may withhold from any payments owed to the Contractor the amount of such fines, and a Change Order shall be issued to reflect any such reduction.

However, neither Contractor nor any attorney engaged by Contractor shall defend the claim in the name of Owner, Clackamas County ("County"), purport to act as legal representative of Owner or County, nor settle any claim on behalf of Owner or County without the prior approval of the Clackamas County Counsel's Office. Owner or County may assume their own defense and settlement at their election and expense.

SC-7.18 Amend Paragraph 7.18.B by removing "Engineer" from the first sentence.

ARTICLE 8—OTHER WORK AT THE SITE

8.02 Coordination

SC-8.02 Add the following new Paragraph 8.02.C immediately after Paragraph 8.02.B:

- C. Other work is anticipated to be performed at the Clackamas Pump Station and Tri-City WWTP by others that is related to, coincides with, and is dependent on completion of the scheduled performance of the Work under these Contract Documents. Contractor will be required to coordinate work as identified in the contract documents.

8.03 *Legal Relationships*

SC-8.03 Amend Paragraph 8.03.C by deleting both uses of the word “Engineer” from the first sentence.

ARTICLE 9—OWNER’S RESPONSIBILITIES

9.02 *Replacement of Engineer*

SC-9.02 Amend Paragraph 9.02.A by deleting the words “provided Contractor makes no reasonable objection to the replacement engineer.”

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

SC-9.05 Delete Paragraph 9.05.C in its entirety and replace with the following:

- 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 relating to existing surface or subsurface structures at the Site that have been utilized by Engineer in preparing the Contract Documents.

9.11 *Evidence of Financial Arrangements*

SC-9.11 Delete Paragraph 9.11.A in its entirety and replace with the following:

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

ARTICLE 10—ENGINEER’S STATUS DURING CONSTRUCTION

10.03 *Resident Project Representative*

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

- C. Resident Project Representative (RPR) will be furnished by the Engineer. The responsibilities, authority, and limitations of the RPR are limited to those of Engineer in accordance with Paragraph 10.08 and as set forth elsewhere in the Contract Documents and are further limited and described below. The RPR will:
 - 1. *Schedules*: Review and monitor Progress Schedule, Schedule of Submittals, and Schedule of Values prepared by Contractor and consult with Engineer concerning acceptability.
 - 2. *Conferences and Meetings*: Conduct or attend meetings with Contractor, such as preconstruction conferences, progress meetings, Work conferences and other Project related meetings.
 - 3. *Liaison*
 - a. Serve as Engineer’s liaison with Contractor, working principally through Contractor’s authorized representative, and assist in understanding the intent of the Contract Documents;

- b. Assist Engineer in serving as Owner's liaison with Contractor when Contractor's operations affect Owner's onsite operations;
 - c. Assist in obtaining from Owner additional details or information when required for proper execution of the Work.
4. *Interpretation of Contract Documents:* Inform Engineer and Owner when clarifications and interpretations of the Contract Documents are needed and transmit to Contractor technical clarifications and interpretations as issued by Engineer, or non-technical clarifications and interpretations of the Contract Documents issued by Owner.
5. *Submittals:* Receive submittals that are furnished at the Site by Contractor, and notify Engineer of availability for examination. Advise Engineer and Contractor of the commencement of any Work or arrival of materials and equipment at Site, when recognized, requiring a Shop Drawing or Sample if the submittal has not been approved by Engineer.
6. *Modifications:* Consider and evaluate Contractor's suggestions for modifications in Drawings or Specifications and provide recommendations to Engineer; transmit to Contractor, in writing decisions as issued by Engineer.
7. *Review of Work and Rejection of Defective Work:*
- a. Conduct onsite observations of the Work in progress to assist Engineer in determining if the Work is, in general, proceeding in accordance with the Contract Documents.
 - b. Inform Engineer and Contractor whenever RPR believes that any Work is defective.
 - c. Advise Engineer whenever RPR believes that any Work will not produce a completed Project that conforms generally to the Contract Documents or will prejudice the integrity of the design concept of the completed Project as a functioning whole as indicated in the Contract Documents, whenever RPR believes Work should be uncovered for observation, or requires special testing, inspection, or approval.
 - d. Monitor to ensure that tests, equipment and systems startups and operating and maintenance training are conducted in the presence of appropriate personnel, and that Contractor maintains adequate records thereof.
 - e. Observe, record and report to Engineer appropriate details relative to the test procedures and startups.
 - f. Accompany visiting inspectors representing public or other agencies having jurisdiction over the Project, record the results of these inspections and report to the Engineer.
8. *Inspections, Tests, and System Startups:*
- a. Verify tests, equipment and systems startups and operating and maintenance training are conducted in the presence of appropriate personnel, and that Contractor maintains adequate records thereof.

- b. Observe, record, and report to Engineer appropriate details relative to the test procedures and system startups.
 - c. Accompany visiting inspectors representing public or other agencies having jurisdiction over the Project, record the results of these inspections, and report to Engineer.
9. *Records:*
- a. Maintain at the Site files for correspondence, conference records, Submittals including Shop Drawings and Samples, reproductions of original Contract Documents including all Addenda, the signed Agreement, Written Amendments, Work Change Directives, Change Orders, Field Orders, additional Drawings issued after the Effective Date of the Agreement, Engineer's written clarifications and interpretations, progress reports, and other Project related documents.
 - b. Keep a record of pertinent Site conditions, activities, decisions and events.
10. *Reports:*
- a. Furnish Engineer periodic reports of progress of the Work and of Contractor's compliance with the Progress Schedule and Schedule of Submittals.
 - b. Consult with Engineer in advance of scheduled major tests, inspections or start of important phases of the Work.
 - c. Assist in drafting proposed Change Orders, Work Change Directives, and Field Orders, and obtain backup material from Contractor as appropriate.
11. *Payment Requests:* Review Applications for Payment with Contractor for compliance with the established procedure for their submission and forward with recommendations to Engineer, noting particularly the relationship of the payment requested to the Schedule of Values, Work completed, and materials and equipment delivered at the Site but not incorporated in the Work.
12. *Certificates, Operation and Maintenance Manuals:* During the course of the Work, verify materials and equipment certificates and operation and maintenance manuals and other data required by Specifications to be assembled and furnished by Contractor are applicable to the items actually installed and in accordance with the Contract Documents, and ensure these documents have been delivered to Engineer for review and forwarding to Owner prior to payment for that part of the Work.
13. *Substantial Completion:*
- a. Conduct an inspection in the company of Engineer, Owner, and Contractor and prepare a list of items to be completed or corrected.
 - b. Submit to Engineer a list of observed items requiring completion or correction.
14. *Final Completion:*
- a. Conduct final inspection in the company of Engineer, Owner, and Contractor.

- b. Notify Contractor and Engineer in writing of all particulars in which this inspection reveals that the Work is incomplete or defective.
 - c. Observe that all items on final list have been completed, corrected, or accepted by Owner and make recommendations to Engineer concerning acceptance.
- D. The RPR will not:
- 1. Have authority to authorize a deviation from Contract Documents or substitution of materials or equipment, unless authorized by Owner.
 - 2. Exceed limitations of Engineer's authority as set forth in the Contract Documents.
 - 3. Undertake any of the responsibilities of Contractor, Subcontractors, Suppliers, or Contractor's authorized representative.
 - 4. Advise on, issue directions relative to, or assume control over any aspect of the means, methods, techniques, sequences or procedures of construction, unless such advice or directions are specifically required by the Contract Documents.
 - 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 Owner.
 - 7. Accept shop drawings or samples from anyone other than Contractor.
 - 8. Authorize Owner to occupy the Project in whole or in part.
 - 9. Take an action that would affect Owner's obligations related to scope or schedule of the Work.

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

SC-10.06 Delete the last sentence of Paragraph 10.06.A and replace it with the following:

In rendering such decisions and judgments, Engineer will not show partiality to the Owner or Contractor. If a dispute, matter for interpretation or need for judgment arises that includes allegations against the Engineer, then the Engineer shall not be the party deciding that matter.

10.07 *Limitations on Engineer's Authority and Responsibilities*

SC-10.07 Add the following new paragraph immediately after Paragraph 10.07.E:

F. Only the Owner has the authority to authorize modifications of the Contract Documents, additional Work, or changes the Contract Time or Contract Price.

ARTICLE 11—CHANGES TO THE CONTRACT

11.02 *Change Orders*

SC-11.02 Delete Paragraph 11.02.B in its entirety.

11.07 *Change of Contract Price*

SC-11.07 Amend Paragraph 11.07.C.2.a by replacing “15” with “10”.

SC-11.07 Amend Paragraph 11.07.C.2.c by replacing “15” with “10”.

SC-11.07 Add the following new paragraph immediately after Paragraph 11.07.C:

- D. In the event Contractor submits request for additional compensation as a result of a change or differing Site conditions, or as a result of delays, acceleration, or loss of productivity, Owner reserves right, upon written request, to audit and inspect Contractor’s books and records relating to the Project. Upon written request for an audit, Contractor shall make its books and records available within 14 days of request. Owner shall specifically designate the identity of the auditor. As part of audit, Contractor shall make available its books and records relating to the Project, including, but not limited to, Bidding Documents, cost reports, payroll records, material invoices, subcontracts, purchase orders, daily timesheets, and daily diaries. Audit shall be limited to those cost items that are sought by Contractor in a Change Order or Claim submission to Owner.

11.08 *Change of Contract Times*

SC-11.08 Add the following to Paragraph 11.08.B:

All requests for time extensions shall be supported by Schedule analysis showing the effect on the entire Project taking into account concurrent Work and the critical path, including Float. Partial demonstration of impact on particular operations only will not be acceptable to show the criticality of any event on the Project Schedule as a whole.

SC-11.08 Add the following new paragraphs immediately following Paragraph 11.08.B:

C. *Use of Float:*

1. A claim for an adjustment of Contract Times (or Milestones), otherwise allowable under the Contract Documents, shall be granted only when the time lost or gained exceeds the float for the activity at the time of the event giving rise to the claim. Float is jointly owned by both Owner and Contractor, whether expressly disclosed or implied in any manner.
2. Contractor shall not use Float suppression techniques (including, but not limited to, preferential sequencing caused by late starts of follow-up trades, unreasonably small crews, extended durations, or imposed dates) in information provided to Owner or Engineer.

ARTICLE 12—CLAIMS

12.01 *Claims*

SC-12.01 Delete Paragraph 12.01.A.1 in its entirety and replace with the following:

1. Appeals by the Contractor of Owner’s decisions regarding Change Proposals;

- SC-12.01 Add the following language to the end of the sentence in Paragraph 12.01.D.3:
“for disputes involving the Owner and Contractor.”

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

13.01 *Cost of the Work*

- SC-13.01 Amend Paragraph 13.01.B.1 by deleting the third sentence and replacing it with the following language:

Labor costs for employees in the direct employ of Contractor in the performance of the Work will be the actual cost for wages in accordance with the Oregon BOLI Prevailing Wage Rates for Public Works Contracts in Oregon (see SC-7.10.D.1.a for specific BOLI publication) for each craft or type of workers performing the Work at the time the Work is done, plus BOLI’s established Fringe Rate for employer payments of payroll taxes, worker compensation insurance, liability insurance, health and welfare, pension, vacation, apprenticeship funds, and other direct costs resulting from Federal, State or local laws, as well as assessments or benefits required by lawful collective bargaining agreements. Labor costs for equipment operators and helpers will be paid only when such costs are not included in the invoice for equipment rental. The labor costs for foremen and superintendents shall be proportioned to all of their assigned Work and only that applicable to extra Work shall be paid.

- SC-13.01 In Paragraph 13.01.B.4, delete the word “special” and replace with the word “technical,” and delete the parenthetical phrase “(including but not limited to engineers, architects, testing laboratories, surveyors, attorneys, and accountants)” in its entirety.
- SC-13.01 Delete Paragraph 13.01.B.5.c in its entirety and replace with the following:

- c. Rentals of construction equipment at the rental rate listed for such equipment specified in the current edition of the “Contractor’s Equipment Cost Guide” as published by Equipment Watch (www.equipmentwatch.com), telephone number 800/699-3282, or from rate sheets from local rental companies. Such rental rate will be used to compute payments for equipment whether the equipment is under the Contractor’s control through direct ownership, leasing, renting, or another method of acquisition. The rental rate to be applied for use of each item of equipment will be the rate resulting in the least total cost to the Owner for the total period of use. If it is deemed necessary by the Contractor to use the equipment not listed by the references specified herein, an equitable rental rate for the equipment will be established by the Engineer. The Contractor may furnish cost data which might assist the Engineer in the establishment of the rental rate. Payment shall be subject to the following:
- 1) Payment for equipment which is already on the Project Site and which is used in the completion of Work will not be allowed;
 - 2) All equipment shall, in the opinion of the Engineer, be in good working condition and suitable for the purpose for which the equipment is to be used;
 - 3) Before construction equipment is used on the extra Work, the Contractor shall plainly stencil or stamp an identifying number thereon at a conspicuous location, and shall furnish to the Engineer, in duplicate, a description of the equipment and its identifying number;

- 4) Unless otherwise specified, manufacturer's ratings and manufacturer approved modifications shall be used to classify equipment for the determination of applicable rental rates. Equipment which has no direct power unit shall be powered by a unit of at least minimum rating recommended by the manufacturer;
 - 5) Individual pieces of equipment or tools having a replacement value of \$400 or less, whether or not consumed by use, will be considered to be small tools and no payment will be made therefore; and
 - 6) Rental time will not be allowed while equipment is inoperative due to breakdowns.
- d. The rental time to be paid for equipment at the Site will be the time the equipment is in productive operation on the Work being performed and, in addition, will include the time required to move the equipment to the location of the extra Work and return it to the original location or to another location; except, that moving time will not be paid if the equipment is used on other than the Work, even though located at the Site of the Work. Loading and transporting costs will be allowed, in lieu of moving time, when the equipment is moved by means other than its own power, except that no payment will be made for loading and transporting costs when the equipment is used at the Site of the Work on other than the Work related to the Change Order, Change proposal, Claim, set-off, or other adjustment in Contract Price. Rental time will not be allowed while equipment is inoperative due to breakdowns. The rental time of equipment on the Work Site will be computed subject to the following:
- 1) When hourly rates are listed, any part of an hour less than 30 minutes of operation will be considered to be one-half hour of operation, and any part of an hour in excess of 30 minutes will be considered 1 hour of operation;
 - 2) When daily rates are listed, any part of a day less than 4 hours operation will be considered to be half-day of operation. When Owner -operated equipment is used to perform extra Work to be paid from on time and materials basis, the Contractor will be paid for the equipment and operator, as follows:
 - a) Payment for the equipment will be made in accordance with the provisions in Paragraph 13.01.B.5.c above;
 - b) Payment for the cost of labor and subsistence or travel allowance will be made at the rates established in Paragraph SC-13.01.B.1; and
 - c) The direct cost of equipment rental and labor, computed as provided herein, will be added the allowances for equipment rental and labor as provided in Section 00 72 00, General Conditions, Paragraph 13.01.D.

SC-13.01 Add the following language to the end of Paragraph 13.01.B.5.h:

Express and courier services must be approved prior to use.

SC-13.01 Supplement Paragraph 13.01.C.2 by adding the following sentence at the end of the existing language:

For purposes of this paragraph, "small tools and hand tools" means any tool or equipment whose current price if it were purchased new at retail would be less than \$750.

SC-13.01 Amend Paragraph 13.01.E by deleting the word “three” in the third sentence and replacing it with “ten”.

SC-13.01 Add the following to Paragraph 13.01.E:

Supporting data shall include but not be limited to daily submissions of timesheets indicating hours and trades worked, equipment and time equipment was employed, and materials expended. Also see SC-7.11.D.6.

If for any reason, any part of the Work or the Contract shall be subject to litigation, Contractor shall retain all such records until all litigation is resolved and Contractor shall continue to provide Owner and/or its agents with full access to such records until such time as all litigation is complete and all periods for appeal have expired and full and final satisfaction of any judgment, order or decree is recorded and Owner receives a record copy of documentation from Contractor.

13.03 *Unit Price Work*

SC-13.03 Delete Paragraph 13.03.E in its entirety.

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

14.02 *Tests, Inspections, and Approvals*

SC-14.02 Delete Paragraph 14.02.A in its entirety and replace with the following:

A. Contractor shall notify Engineer 48 hours prior to the expected time for operations requiring inspection and laboratory testing services. Contractor shall cooperate with inspection and testing personnel and furnish samples of materials, design mix, equipment, tools, storage and assistance as requested.

SC-14.02 Add the following to the end of Paragraph 14.02.D:

Tests required by Contract Documents to be performed by Contractor that require test certificates be submitted to Owner or Engineer for acceptance shall be made by an independent testing laboratory or agency licensed or certified in accordance with Laws and Regulations and applicable state and local statutes. In the event state license or certification is not required, testing laboratories or agencies shall meet the following applicable requirements:

1. “Recommended Requirements for Independent Laboratory Qualification,” published by the American Council of Independent Laboratories.
2. Basic requirements of ASTM E329, “Standard Specification for Agencies Engaged in the Testing and/or Inspection of Materials Used in Construction” as applicable.
3. Calibrate testing equipment at reasonable intervals by devices of accuracy traceable to either the National Bureau of Standards or accepted values of natural physical constants.

Prior to requesting a certificate of Substantial Completion, and allowing occupancy of facilities, Contractor shall provide an inspection by a state industrial safety representative, by an independent safety inspector certified by the state in the construction type being inspected, or a federal or state (OSHA) representative qualified in the construction type

being inspected, to determine that the facilities provided are in compliance with the state and federal safety requirements. Signed copies of the inspection reports shall be submitted to the Engineer for Owner's files. Violations or deficiencies noted therein shall be resolved prior to occupancy of the facilities and before final payment will be made.

14.03 *Defective Work*

SC 14.03 Add the following language to Paragraph 14.07.C:

If the Owner is unable to use set-offs to recover the total amount owed under this provision, then Owner may use any and all available methods for recovering the remaining amounts from Contractor.

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

15.01 *Progress Payments*

SC-15.01 Amend Paragraph 15.01.A by adding the following after the last sentence:

The Owner will make progress payments in accordance with ORS 279C.570.

SC-15.01 Add the following subparagraphs after Paragraph 15.01.B.4:

5. **Stored Material and Equipment:** Payments for stored materials and equipment shall be based only upon the actual cost of the materials and equipment to Contractor and shall not include any overhead or profit to Contractor. Partial payments will not be made for undelivered materials or equipment.
6. **Schedule and Data:** During the progress of the Work, each Application for payment shall be accompanied by Contractors updated schedule of operations, or progress report, with Shop Drawings schedules, procurement schedules, and value of materials on hand included in the application and other data specified in Section 01 33 00, Submittal Procedures, or reasonably required by Engineer.
7. Unless otherwise indicated in the Contract Documents, partial payment for Equipment shall be as follows:
 - a. 5 percent upon final approval of Shop Drawings by Engineer or Owner.
 - b. 55 percent upon delivery of goods.
 - c. 35 percent upon start-up and final acceptance by Engineer or Owner in accordance with Paragraph 15.04.
 - d. 5 percent upon delivery of operations and maintenance manuals.
8. Total price for mobilization shall not exceed 1.0 percent of the Contract Price. Total price for demobilization shall not be less than 2.0 percent of the Contract Price.

SC-15.01 Amend Paragraph 15.01.E.1 by adding the following at the end:

m) Any funds retained pursuant to SC-7.11.D.6, SC-7.18 and SC-15.03.B.

SC--15.01 Add the following new paragraph immediately after Paragraph 15.01.E:

F. **Subcontractor Payments.** Contractor shall make payments to Subcontractors in accordance with SC-7.11.D.

15.03 *Substantial Completion*

SC-15.03. Amend Paragraph 15.03.A by adding the following:

Conditions precedent to Substantial Completion of the Work and Engineer's issuance of a Certificate of Substantial Completion shall include:

1. Conformance with all training services requirements and deliverables.
2. Submittal of current record documents to the Owner and Engineer.

Submittals have been received and approved or accepted by Engineer including, but not limited to, the following:

- i. Approved Shop Drawings;
- ii. Electrical testing and wiring diagrams;
- iii. Equipment data forms;
- iv. Manufacturer's certificates of proper installation;
- v. Factory test reports;
- vi. Commissioning, testing and startup reports;
- vii. Final Operations and Maintenance Manuals;
- viii. Extra materials (spare parts) (as specified).

SC-15.03 Add the following new subparagraph to Paragraph 15.03.B:

1. If some or all of the Work has been determined not to be at a point of Substantial Completion and will require re-inspection or re-testing by Engineer, the cost of such re-inspection or re-testing, including the cost of time, travel and living expenses, will be paid by Contractor to Owner. If Contractor does not pay, or the parties are unable to agree as to the amount owed, then Owner may impose a reasonable set-off against payments due under this Article 15.

15.06 *Final Payment*

SC-15.06 Add the following new paragraph immediately after Paragraph 15.06.A.2.e:

- f. In accordance with ORS 279A.120, when out of state Contractor is awarded a Contract, Contractor is required to report to the Department of Revenue the Contract Price, terms of payment, length of Contract, and other information as Department of Revenue may require. Owner will verify Contractor has satisfied this requirement prior to issuing final payment.

15.07 *Waiver of Claims*

SC-15.07 Delete Paragraph 15.07.A in its entirety.

ARTICLE 16—SUSPENSION OF WORK AND TERMINATION

16.01 Owner May Suspend Work

SC-16.01 Amend Paragraph 16.01.A by adding the following language to the end of the third sentence:
“unless the cause for delay is due to the negligence of Contractor or anyone whom Contractor has the responsibility or right to control.”

16.02 Owner May Terminate for Cause

SC-16.02. Amend Paragraph 16.02.A by adding the following at the end of the sentence:
“in a manner consistent with ORS 279C.670.”

16.04 Contractor May Stop Work or Terminate

SC-16.04. Delete Paragraph 16.04 in its entirety.

ARTICLE 17—FINAL RESOLUTIONS OF DISPUTES

17.02 Litigation

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

17.02 Litigation

- A. Any Claim between Owner and Contractor that arises from or relates to the Contract and that is not resolved through the Claims Review Process shall be brought and conducted solely and exclusively within the Circuit Court of Clackamas County for the State of Oregon; provided, however, if a Claim must be brought in a federal forum, then it shall be brought and conducted solely and exclusively within the United States District Court for the District of Oregon. In no event shall this section be construed as a waiver by the County of any form of defense or immunity, whether sovereign immunity, governmental immunity, immunity based on the Eleventh Amendment to the Constitution of the United States or otherwise, from any claim or from the jurisdiction of any court. CONTRACTOR, BY EXECUTION OF THE CONTRACT, HEREBY CONSENTS TO THE IN PERSONAM JURISDICTION OF THE COURTS REFERENCED IN THIS SECTION.

ARTICLE 18—MISCELLANEOUS

18.06 Survival of Obligations

SC-18.06. Amend Paragraph 18.06.A by adding the following directly after the last sentence:

All warranty and indemnification provisions of the Contract, and all of Contractor’s other obligations under the contract that are not fully performed by the time of Final Completion

or termination, shall survive final completion, final acceptance, or any termination of the Contract.

18.07 *Controlling Law*

SC-18.07 Delete Paragraph 18.07.A in its entirety and replace with the following:

- A. This Contract is governed by the laws of the State of Oregon without giving effect to the conflict of law provisions thereof.

18.11 *General Provisions*

SC-18.11 Add the following after Paragraph 18.10:

18.11 *General Provisions*

- A. **No Third Party Beneficiaries:** Owner and Contractor are the only parties to the Contract and are the only parties entitled to enforce its terms. Nothing in the Contract gives, is intended to give, or shall be construed to give or provide any benefit or right, whether directly, indirectly, or otherwise, to third persons unless such third persons are individually identified by name herein and expressly described as intended beneficiaries of the terms of the Contract.
- B. **Severability:** If any provision of the Contract is declared by a court to be unenforceable, illegal, or in conflict with any law, the validity of the remaining terms and provisions shall not be affected and the rights and obligations of the parties shall be construed and enforced as if the Contract did not contain the particular provision held to be invalid.
- C. **Non-Exclusive Rights and Remedies:** Except as otherwise expressly provided herein, the rights and remedies expressly afforded under the provisions of the Contract shall not be deemed exclusive, and shall be in addition to and cumulative with any and all rights and remedies otherwise available at law or in equity. The exercise by either Party of any one or more of such remedies shall not preclude the exercise by it, at the same or different times, of any other remedies for the same default or breach, or for any other default or breach, by the other Party.
- D. **Debt Limitation:** The Contract is expressly subject to the debt limitation of Oregon counties set forth in Article XI, Section 10, of the Oregon Constitution, and is contingent upon funds being appropriated therefore. Any provisions herein which would conflict with law are deemed inoperative to that extent.
- E. **No Attorney Fees:** In the event any arbitration, action or proceeding, including any bankruptcy proceeding, is instituted to enforce any term of this Contract, each party shall be responsible for its own attorneys' fees and expenses.

STANDARD GENERAL CONDITIONS OF THE CONSTRUCTION CONTRACT

Prepared By



Endorsed By



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National Society of Professional Engineers
1420 King Street, Alexandria, VA 22314-2794
(703) 684-2882
www.nspe.org

American Council of Engineering Companies
1015 15th Street N.W., Washington, DC 20005
(202) 347-7474
www.acec.org

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

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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.



CLACKAMAS
WATER ENVIRONMENT SERVICES
**WATER ENVIRONMENT SERVICES
PUBLIC IMPROVEMENT CONTRACT**

PERFORMANCE BOND

Bond No.: 109 87 69
Solicitation: #2024-108
Project Name: Intertie 2 Diversion Facility – Pump Station Expansion Project

The Hanover Insurance Company	Bond Amount No. 1:	\$ 8,178,775.00
_____ (Surety #1)	Bond Amount No. 2: *	\$ _____
_____ (Surety #2)*	Total Penal Sum of Bond:	\$ 8,178,775.00
* If using multiple sureties		

We, R.L. Reimers Co. _____ as Principal, and the above identified Surety(ies), authorized to transact surety business in Oregon, as Surety, hereby jointly and severally bind ourselves, our respective heirs, executors, administrators, successors and assigns firmly by these presents to pay unto Water Environment Services (“District”), the sum of (Total Penal Sum of Bond) \$ ^{Eight million one hundred seventy-eight thousand} ~~Seven hundred seventy-five and no/100--~~ Dollars (Provided, that we the Sureties bind ourselves in such sum “jointly and severally” as well as “severally” only for the purpose of allowing a joint action or actions against any or all of us, and for all other purposes each Surety binds itself, jointly and severally with the Principal, for the payment of such sum only as is set forth opposite the name of such Surety); and

WHEREAS, the Principal has entered into a contract with the District, along with the plans, specifications, terms and conditions of which are contained in the above-referenced Project Contract Documents; and

WHEREAS, the terms and conditions of the contract, together with applicable plans, standard specifications, special provisions, schedule of performance, and schedule of contract prices, are made a part of this Performance Bond by reference, whether or not attached to the contract (all hereafter called “Contract”); and

WHEREAS, the Principal has agreed to perform the Contract in accordance with the terms, conditions, requirements, plans and specifications, and all authorized modifications of the Contract which increase the amount of the work, the amount of the Contract, or constitute an authorized extension of the time for performance, notice of any such modifications hereby being waived by the Surety:

NOW, THEREFORE, THE CONDITION OF THIS BOND IS SUCH that if the Principal herein shall faithfully and truly observe and comply with the terms, conditions and provisions of the Contract, in all respects, and shall well and truly and fully do and perform all matters and things undertaken by Contractor to be performed under the Contract, upon the terms set forth therein, and within the time prescribed therein, or as extended as provided in the Contract, with or without notice to the Sureties, and shall defend, indemnify, and save harmless the District and Clackamas County and their elected officials, officers, employees and agents, against any direct or indirect damages or claim of every kind and description that shall be suffered or claimed to be suffered in connection with or arising out of the performance of the Contract by the Principal or its subcontractors, and shall in all respects perform said contract according to law, then this obligation is to be void; otherwise, it shall remain in full force and effect for so long as any term of the Contract remains in effect.

Nonpayment of the bond premium will not invalidate this bond nor shall the District, be obligated for the payment of any premiums.

This bond is given and received under authority of Oregon Revised Statutes Chapter 279C and the Clackamas County Local Contractor Review Board Rules, the provisions of which hereby are incorporated into this bond and made a part hereof.

IN WITNESS WHEREOF, WE HAVE CAUSED THIS INSTRUMENT TO BE EXECUTED AND SEALED BY OUR DULY AUTHORIZED LEGAL REPRESENTATIVES.

Dated this 10th day of February, 2025.

PRINCIPAL: R.L. Reimers Co.

By: [Signature]
Signature Ron Reimers
President

Attest: [Signature]
Official Capacity
Corporation Secretary

SURETY: The Hanover Insurance Company
[Add signatures for each if using multiple bonds]

BY ATTORNEY-IN-FACT:
[Power-of-Attorney must accompany each bond]

Todd Brem
[Signature] Name
Signature
13810 SW 31st Ct. Address
Beaverton, OR 97008
City State Zip
503-260-1589 None
Phone Fax





WATER ENVIRONMENT SERVICES
PUBLIC IMPROVEMENT CONTRACT

PAYMENT BOND

Bond No.: 109 87 69

Solicitation: #2024-108

Project Name: Intertie 2 Diversion Facility – Pump Station Expansion Project

The Hanover Insurance Company	Bond Amount No. 1:	\$ 8,178,775.00
(Surety #1)	Bond Amount No. 2:*	\$ _____
(Surety #2)*	Total Penal Sum of Bond:	\$ 8,178,775.00

* If using multiple sureties

We, R.L. Reimers Co., as Principal, and the above identified Surety(ies), authorized to transact surety business in Oregon, as Surety, hereby jointly and severally bind ourselves, our respective heirs, executors, administrators, successors and assigns firmly by these presents to pay unto Water Environment Services (“District”) the sum of (Total Penal Sum of Bond) Eight million one hundred seventy-eight thousand Seven hundred seventy-five and no/100-- Dollars (Provided, that we the Sureties bind ourselves in such sum “jointly and severally” as well as “severally” only for the purpose of allowing a joint action or actions against any or all of us, and for all other purposes each Surety binds itself, jointly and severally with the Principal, for the payment of such sum only as is set forth opposite the name of such Surety); and

WHEREAS, the Principal has entered into a contract with the District, along with the plans, specifications, terms and conditions of which are contained in above-referenced Project Contract Documents; and

WHEREAS, the terms and conditions of the contract, together with applicable plans, standard specifications, special provisions, schedule of performance, and schedule of contract prices, are made a part of this Payment Bond by reference, whether or not attached to the contract (all hereafter called “Contract”); and

WHEREAS, the Principal has agreed to perform the Contract in accordance with the terms, conditions, requirements, plans and specifications, and schedule of contract prices which are set forth in the Contract and any attachments, and all authorized modifications of the Contract which increase the amount of the work, or the cost of the Contract, or constitute authorized extensions of time for performance of the Contract, notice of any such modifications hereby being waived by the Surety:

NOW, THEREFORE, THE CONDITION OF THIS BOND IS SUCH that if the Principal shall faithfully and truly observe and comply with the terms, conditions and provisions of the Contract, in all respects, and shall well and truly and fully do and perform all matters and things by it undertaken to be performed under said Contract and any duly authorized modifications that are made, upon the terms set forth therein, and within the time prescribed therein, or as extended therein as provided in the Contract, with or without notice to the Sureties, and shall defend, indemnify, and save harmless the District and Clackamas County and their elected officials, officers, employees and agents, against any claim for direct or indirect damages of every kind and description that shall be suffered or claimed to be suffered in connection with or arising out of the performance of the Contract by the Contractor or its subcontractors, and shall promptly pay all persons supplying labor, materials or both to the Principal or its subcontractors for prosecution of the work provided in the Contract; and shall promptly pay all contributions due the State Industrial Accident Fund and the State Unemployment Compensation Fund from the Principal or its subcontractors in connection with the performance of the Contract; and shall pay over to the Oregon Department of Revenue all sums required to be deducted and retained from the wages of employees of the Principal and its subcontractors pursuant to ORS 316.167, and shall permit no lien nor claim to be filed or prosecuted against the District on account of any labor or materials furnished; and shall do all things required of

the Principal by the laws of this State, then this obligation shall be void; otherwise, it shall remain in full force and effect for so long as any term of the Contract remains in effect.
Nonpayment of the bond premium will not invalidate this bond nor shall the District be obligated for the payment of any premiums.

This bond is given and received under authority of Oregon Revised Statutes Chapter 279C and the Clackamas County Local Contractor Review Board Rules, the provisions of which hereby are incorporated into this bond and made a part hereof.

IN WITNESS WHEREOF, WE HAVE CAUSED THIS INSTRUMENT TO BE EXECUTED AND SEALED BY OUR DULY AUTHORIZED LEGAL REPRESENTATIVES:

Dated this 10th day of February, 2025.

PRINCIPAL: R.L. Reimers Co.

By: [Signature]
Signature Ron Reimers
President

Attest: [Signature]
Official Capacity
Corporation Secretary

The Hanover Insurance Company
SURETY: _____
[Add signatures for each if using multiple bonds]

BY ATTORNEY-IN-FACT:
[Power-of-Attorney must accompany each bond]

Todd Brem

Name
[Signature]
Signature

13810 SW 31st Ct.
Address

Beaverton, OR 97008
City State Zip

503-260-1589 None
Phone Fax



THE HANOVER INSURANCE COMPANY
MASSACHUSETTS BAY INSURANCE COMPANY
CITIZENS INSURANCE COMPANY OF AMERICA

POWERS OF ATTORNEY
CERTIFIED COPY

KNOW ALL MEN BY THESE PRESENTS: That THE HANOVER INSURANCE COMPANY and MASSACHUSETTS BAY INSURANCE COMPANY, both being corporations organized and existing under the laws of the State of New Hampshire, and CITIZENS INSURANCE COMPANY OF AMERICA, a corporation organized and existing under the laws of the State of Michigan, do hereby constitute and appoint

Todd Brem and/or Carol Brem

of **Beaverton, OR** and each is a true and lawful Attorney(s)-in-fact to sign, execute, seal, acknowledge and deliver for, and on its behalf, and as its act and deed any place within the United States, or, if the following line be filled in, only within the area therein designated any and all bonds, recognizances, undertakings, contracts of indemnity or other writings obligatory in the nature thereof, as follows:

Any such obligations in the United States, not to exceed Thirty Million and No/100 (\$30,000,000) in any single instance

and said companies hereby ratify and confirm all and whatsoever said Attorney(s)-in-fact may lawfully do in the premises by virtue of these presents. These appointments are made under and by authority of the following Resolution passed by the Board of Directors of said Companies which resolutions are still in effect:

"RESOLVED, That the President or any Vice President, in conjunction with any Vice President, be and they are hereby authorized and empowered to appoint Attorneys-in-fact of the Company, in its name and as its acts, to execute and acknowledge for and on its behalf as Surety any and all bonds, recognizances, contracts of indemnity, waivers of citation and all other writings obligatory in the nature thereof, with power to attach thereto the seal of the Company. Any such writings so executed by such Attorneys-in-fact shall be as binding upon the Company as if they had been duly executed and acknowledged by the regularly elected officers of the Company in their own proper persons." (Adopted October 7, 1981 - The Hanover Insurance Company; Adopted April 14, 1982 - Massachusetts Bay Insurance Company; Adopted September 7, 2001 - Citizens Insurance Company of America)

IN WITNESS WHEREOF, THE HANOVER INSURANCE COMPANY, MASSACHUSETTS BAY INSURANCE COMPANY and CITIZENS INSURANCE COMPANY OF AMERICA have caused these presents to be sealed with their respective corporate seals, duly attested by two Vice Presidents, this **6th** day of **September 2013**.




THE HANOVER INSURANCE COMPANY
MASSACHUSETTS BAY INSURANCE COMPANY
CITIZENS INSURANCE COMPANY OF AMERICA



Robert Thomas, Vice President


Joe Brenstrom, Vice President

THE COMMONWEALTH OF MASSACHUSETTS)
COUNTY OF WORCESTER) ss.

On this **6th** day of **September 2013** before me came the above named Vice Presidents of The Hanover Insurance Company, Massachusetts Bay Insurance Company and Citizens Insurance Company of America, to me personally known to be the individuals and officers described herein, and acknowledged that the seals affixed to the preceding instrument are the corporate seals of The Hanover Insurance Company, Massachusetts Bay Insurance Company and Citizens Insurance Company of America, respectively, and that the said corporate seals and their signatures as officers were duly affixed and subscribed to said instrument by the authority and direction of said Corporations.


BARBARA A. GARLICK
Notary Public
Commonwealth of Massachusetts
My Commission Expires Sept. 21, 2018


Barbara A. Garlick, Notary Public
My Commission Expires September 21, 2018

I, the undersigned Vice President of The Hanover Insurance Company, Massachusetts Bay Insurance Company and Citizens Insurance Company of America, hereby certify that the above and foregoing is a full, true and correct copy of the Original Power of Attorney issued by said Companies, and do hereby further certify that the said Powers of Attorney are still in force and effect.

This Certificate may be signed by facsimile under and by authority of the following resolution of the Board of Directors of The Hanover Insurance Company, Massachusetts Bay Insurance Company and Citizens Insurance Company of America.

"RESOLVED, That any and all Powers of Attorney and Certified Copies of such Powers of Attorney and certification in respect thereto, granted and executed by the President or any Vice President in conjunction with any Vice President of the Company, shall be binding on the Company to the same extent as if all signatures therein were manually affixed, even though one or more of any such signatures thereon may be facsimile." (Adopted October 7, 1981 - The Hanover Insurance Company; Adopted April 14, 1982 - Massachusetts Bay Insurance Company; Adopted September 7, 2001 - Citizens Insurance Company of America)

GIVEN under my hand and the seals of said Companies, at Worcester, Massachusetts, this 10th day of February 2025.

THE HANOVER INSURANCE COMPANY
MASSACHUSETTS BAY INSURANCE COMPANY
CITIZENS INSURANCE COMPANY OF AMERICA


J. Michael Pete, Vice President

THIS ENDORSEMENT CHANGES THE POLICY. PLEASE READ IT CAREFULLY.

BLANKET ADDITIONAL INSURED

(Includes Products-Completed Operations If Required By Contract)

This endorsement modifies insurance provided under the following:

COMMERCIAL GENERAL LIABILITY COVERAGE PART

PROVISIONS

The following is added to **SECTION II – WHO IS AN INSURED**:

Any person or organization that you agree in a written contract or agreement to include as an additional insured on this Coverage Part is an insured, but only:

- a. With respect to liability for "bodily injury" or "property damage" that occurs, or for "personal injury" caused by an offense that is committed, subsequent to the signing of that contract or agreement and while that part of the contract or agreement is in effect; and
- b. If, and only to the extent that, such injury or damage is caused by acts or omissions of you or your subcontractor in the performance of "your work" to which the written contract or agreement applies. Such person or organization does not qualify as an additional insured with respect to the independent acts or omissions of such person or organization.

The insurance provided to such additional insured is subject to the following provisions:

- a. If the Limits of Insurance of this Coverage Part shown in the Declarations exceed the minimum limits required by the written contract or agreement, the insurance provided to the additional insured will be limited to such minimum required limits. For the purposes of determining whether this limitation applies, the minimum limits required by the written contract or agreement will be considered to include the minimum limits of any Umbrella or Excess liability coverage required for the additional insured by that written contract or agreement. This provision will not increase the limits of insurance described in Section III – Limits Of Insurance.
- b. The insurance provided to such additional insured does not apply to:

(1) Any "bodily injury", "property damage" or "personal injury" arising out of the providing, or failure to provide, any professional architectural, engineering or surveying services, including:

- (a) The preparing, approving, or failing to prepare or approve, maps, shop drawings, opinions, reports, surveys, field orders or change orders, or the preparing, approving, or failing to prepare or approve, drawings and specifications; and
- (b) Supervisory, inspection, architectural or engineering activities.

(2) Any "bodily injury" or "property damage" caused by "your work" and included in the "products-completed operations hazard" unless the written contract or agreement specifically requires you to provide such coverage for that additional insured during the policy period.

c. The additional insured must comply with the following duties:

- (1) Give us written notice as soon as practicable of an "occurrence" or an offense which may result in a claim. To the extent possible, such notice should include:
 - (a) How, when and where the "occurrence" or offense took place;
 - (b) The names and addresses of any injured persons and witnesses; and
 - (c) The nature and location of any injury or damage arising out of the "occurrence" or offense.
- (2) If a claim is made or "suit" is brought against the additional insured:

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COMMERCIAL GENERAL LIABILITY

- (a) Immediately record the specifics of the claim or "suit" and the date received; and
 - (b) Notify us as soon as practicable and see to it that we receive written notice of the claim or "suit" as soon as practicable.
- (3) Immediately send us copies of all legal papers received in connection with the claim or "suit", cooperate with us in the investigation or settlement of the claim or defense against the "suit", and otherwise comply with all policy conditions.
- (4) Tender the defense and indemnity of any claim or "suit" to any provider of other insurance which would cover such additional insured for a loss we cover. However, this condition does not affect whether the insurance provided to such additional insured is primary to other insurance available to such additional insured which covers that person or organization as a named insured as described in Paragraph 4., Other Insurance, of Section IV – Commercial General Liability Conditions.

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